WHOLE SYSTEMS THINKING AS A BASIS FOR PARADIGM CHANGE IN EDUCATION: EXPLORATIONS IN THE CONTEXT OF SUSTAINABILITY

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ABSTRACT

WHOLE SYSTEMS THINKING AS A BASIS FOR PARADIGM CHANGE IN EDUCATION: EXPLORATIONS IN THE CONTEXT OF SUSTAINABILITY

The main *research problem* is why education as a whole, and environmental and sustainability education in particular, are limited in their ability to make a positive difference to the human or environmental prospect by helping assure a more sustainable future - and what bases and qualities of change might lead them to become more transformative in this regard. The research takes a systems view of the subject matter, and five nesting contextual levels are explored:

1. the nature of what appears to be an emerging *postmodern ecological worldview* (PEW) and, by implication, the nature of paradigm change through learning;
2. the nature of *whole systems thinking*;
3. implications of 1.and 2. for change to the dominant *educational paradigm;*
4. the revisioning of *environmental and sustainability education,* seen as a subsystem of education as a whole.
5. the nature of *sustainability*, which provides an integrative and overriding context for the research.

The structure of the Thesis reflects these nesting levels.

The difference between 'systems as discipline', and 'systems as worldview' is elaborated, and the historical and current bases of a more encompassing *whole systems thinking* that reflects and articulates an emergent PEW and participative epistemology are explored. Whole systems thinking is presented as a critical syncretisation of the worldview of ecological thought (ecologism), of a co-evolutionary ontology, and the methodology of systems approaches. The PEW is seen as manifesting a third order of change which transcends and subsumes the antecedent yet still current cultural 'moments' of modernism (first order) and of deconstructive postmodernism (second order).

A key three-part model of paradigm and experience is developed alongside Bateson's theory of staged learning levels, and these models are discussed as a basis for understanding transformative learning beyond the limits of modernism and mechanism, of postmodernism and text, and building on insights from revisionary postmodernism, systemisism, ecologism, and complexity theory. These ideas are employed to explore the difficulties, implications and possibility of intentioned paradigm change in education as a whole and in research paradigms. This discussion is then applied in more detail to the area of revisioning environmental and sustainability education, including implications for design and management.

Keywords: postmodern ecological worldview, epistemology, systems thinking, whole systems thinking, holism, sustainability, complexity, paradigm and paradigm change, epistemic and transformative learning, educational change and management, educational design.

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PREAMBLE

Purpose: to provide a perspective which places the origins of the Thesis and the nature of the inquiry into the context of personal experience.

1.1 Aim of the Thesis

The aim of the Thesis is:

To identify and clarify the nature of the shift of consciousness and cultural paradigm that appears necessary to the sustainability transition, through first, an exploration of the potential thought bases for this shift, and secondly, the development of conceptual tools and models for thinking about both the shift and the kinds of change in our collective view of education and learning that may be required to assist such a transition. In sum, I seek to reflect and develop an emerging 'theory of relation' able to transcend the dominant paradigm.

1.2 Summary of the argument

> *What is the nature of the change of consciousness that appears necessary to the achievement of a more ecologically sustainable society? What changes may be required in the way we view and practice education and learning if they are to contribute fundamentally to such a change of consciousness?*

These core questions have been at the heart of my professional practice and personal interest for more than three decades, and continue to occupy my energies and inform my sense of purpose. I see the questions as co-dependent, and paradoxical. This is because learning is fundamental to significant consciousness change, yet such consciousness change affects our view of the nature of learning, from a functional view towards a transformational view. This Thesis is presented as a partial summary of my own learning journey to date. I believe the Thesis as a whole goes some way to answering these core questions and illuminating their relationship. There are of course, no definitive or complete answers, but there are directions, concepts, and arguments, which I hope, as presented here, may help others evolve their own answers and practices in a spirit of collaborative movement through which education 'can serve as

the core of a lifelong journey towards wholeness' (Glazer, 1999, 3), and towards a more ecologically sustainable future.

The key questions cannot be simply or briefly answered, not least because they concern cultural, social and personal change that is at once fundamental, urgent and contentious. Therefore an inquiry that is wide-ranging, yet coherent and creative is required, and I have endeavoured to meet these demands. The broad scope of the inquiry follows from the approach I have employed which is informed by a systemic and co-evolutionary perspective whereby each identified focus is seen as influenced by its wider context, which in turn becomes the next focus. Therefore, I look at but also beyond my immediate professional field, which is environmental education, and view it within the larger context of debate and movement concerning dominant paradigms operating in education as a whole. This in turn is seen within the contextual framework of cultural change represented in the discourse of modernism and postmodernism. It is thus necessary to consider each contextual level to provide - as far as is reasonable and manageable - a whole picture of constraints, movement and possibilities which can then inform more detailed discussion.

Within postmodernism, I distinguish between deconstructionism and revisionary postmodernism, the latter suggesting an emerging, fragile, yet potent 'postmodern ecological worldview', which has profound implications for the visioning and realisation of a more sustainable society and future. The current of gradual but hesitant cultural change in Western society, through modernism and deconstructionism towards an ecologically informed revisionary postmodernism, I view as a deep learning journey through which earlier 'moments' and metaphors are not abandoned but become subsumed within a larger framework of understanding and meaning. I argue that such learning might either be *contingent* (by *default*, arising from our response to crisis) or *intentional* (learning by *design*, and so involving educational policy, theory and practice). I suggest the latter journey may be assisted and accelerated through the elaboration, articulation and employment of what I term 'whole systems thinking', and in this argument I echo a small but significant group of leading commentators concerned by global conditions of unsustainability, inequity and environmental degradation, who argue that these conditions can only be adequately addressed through a fundamental change towards more relational thinking and an integrative consciousness which is both critical and deeply connective. Essentially, this is a change in epistemology - of knowing 'more wholly' - which is both inspired by and manifests the postmodern ecological worldview, equivalent to what Gregory Bateson called a 'recursive' or

'ecological epistemology' (Bateson and Bateson 1988). I argue that 'whole systems thinking' arises from a desirable syncretisation of the concepts, tools and methodologies of *systems thinking* and the vision, values, and philosophy of *ecological thought* - movements which are otherwise often perceived and practised separately, to the detriment of both. These, and some of the other main roots and antecedents of this holistic epistemology - systems thinking, indigenous thought, the organicist tradition in Western science and philosophy, environmentalism, and the emerging complexity sciences - are outlined and discussed in more detail in **Appendix I.**

In essence, whole systems thinking involves an *extension* of perception, a quality of *connection* in our conceptual thinking, and *integration* in our planning and actions towards healthy systems - given that, in Bawden's words (2000a, 5), "actions are invariably also interactions". This triadic model of three interpenetrating dimensions of worldview change - summarised as 'Seeing', 'Knowing' and 'Doing' - is a central and recurrent theme in the Thesis. I argue that whole systems thinking both arises from and can assist paradigm change at collective and individual level, and suggests a shift of emphasis of cultural root metaphor from mechanism, and more latterly, text, towards organicism or a living systems metaphor. The theory of staged learning levels towards deeper learning developed by Gregory Bateson (1972) and echoed and adapted by others, is employed to shed light on the nature of the learning experience that paradigm change appears to involve, and this theory is supplemented with ideas about learning emerging from complexity theory and the 'biology of cognition'. The triadic model of paradigm and experience is revisited and employed in **Appendix I** to illustrate further this shift of worldview and a pattern of relationship between this model and Bateson's model of staged learning levels is suggested. In addition, the model is employed and substantiated through discussion of aspects of sustainability.

Throughout the Thesis, an evolutionary and emergent view of paradigm change is suggested as a more prevalent pattern of cultural change, in contrast to the Kuhnian revolutionary view of successive incommensurable paradigms which tends to be reflected in social science discourse (Kuhn 1962). The significance of this is that the evolutionary view acknowledges the *partial validity* of multiple preceding views and stresses the role of learning. Hence the methodology of the Thesis does not seek, for example, to affirm the ecological paradigm by simply negating mechanistic and dualistic thought, but by building from their partial validity. I argue that the three components of any paradigm may be seen as *ethos* (the affective, belief and imaginal dimension), *eidos* (the dimension of ideas and concepts) and *praxis* (the dimension of

reflective intention and action), and that these *dimensions of paradigm* are in relationship with the *dimensions of our lived experience* and knowing, that is, our epistemology, our ontology and methodology. I then argue that a fundamental change in each of these components - through greater *extension, connection* and *integration* within each and between them - brings us closer to an ecological worldview and to sustainable living.

The key ideas of learning, paradigm change, and whole systems thinking in relation to education and educational paradigms, are elaborated in Parts C and D. In particular, the paradox whereby education, internationally recognised for some three decades as the key to social change and sustainability, is at the same time a largely conservative influence, is analysed. A co-evolutionary view of the relationship between education and its social context is offered both as an explanation of this conservatism, and as a key to achieving systemic change within educational thinking and practice. A model of staged change describing the sustainability transition (O'Riordan and Voisey 1998) is paralleled against the Batesonian model of staged learning levels, and these inform a model of staged educational responses to sustainability. The nature of transformative or epistemic learning is explored, and I suggest that second and third order learning needs to take place, at least in parts of the educational community, in order to achieve a change of operative paradigm - the manifestation of which I call 'sustainable education', or education 'as' sustainability.

Thus, my theme is the intentioned reorientation of education, particularly its purposes and ethos, informed by an emerging worldview - a 'theory of relation' arising from such areas as ecological thought, systems thinking, and complexity and change theory. Such bases potentially provide a renewed sense of connectivity, community and meaning which is essential if we are to work towards a more sustainable and collaborative future in an otherwise fragmented and turbulent world.

- Key point: In sum, the Thesis seeks to bring together, develop and indicate the grounding for holistic theories *which may help* a transformed ecologically-oriented educational paradigm to emerge, *which in turn* supports transformative learning - *which in turn* is required to support the sustainability transition.

1.3 Some key ideas

What is new and interesting about this Thesis? It is not so much the 'parts' that are new, but their synthesis which has generated insights and tools that help me - and

hopefully, might help others - to better appreciate, understand and handle a complex whole. These parts or elements include ideas from systems thinking and systemic learning theory, ecological thinking and revisionary postmodernism, complexity and change theory, sustainable development theory, and sustainability education discourse - which together, indicate an 'alternative story' or 'theory of relation'. To indicate the nature of the content to the interested reader, I now summarise some of the concepts explained, explored and developed in the Thesis:

- the differences between systems thinking and ecological thinking
- Bateson's notion of epistemological error (as regards our sense of separation) in Western thought, and the difference between making a distinction and assuming dissociation
- the possibility of a closer relationship between systems thinking (systemisism) and ecological thinking (ecologism)
- the notion of whole systems thinking as a syncretisation of systemic thinking (systemisism) and ecological thought (ecologism), and of both critical and participatory orientations
- 'wholeness' as a touchstone of purpose, description and action, to counter fragmentation
- a view of paradigm as comprising the dimensions of ethos, eidos and praxis
- the development of a recurring triadic model to represent the three dimensions of paradigm and of experience/knowing
- the identification and elaboration of four contributory areas of thought to the emergence of a postmodern ecological paradigm and whole systems thinking - being systems thinking, indigenous thought, organicism and ecologism, and the complexity sciences
- the possibility of a meta-connective pattern bringing together ideas from systems theory, sustainable development theory and learning theory around the ideas of self-organisation, emergence and systems health
- the idea that 'hard' systems approaches may be seen as first order change, 'soft' systems approaches as second order change, and whole systems thinking as third order change
- the nature of revisionary postmodernism as an articulation of the postmodern ecological worldview
- an evolutionary view of paradigm change as opposed to the Kuhnian revolutionary view, and the possibility of affirming both realist (universalist)and idealist

(deconstructionist/constructivist) positions *within* an emergent and transcending participative or relational view - relationalism

- the idea that the realist, idealist and participative moments may be seen as respectively manifesting first order, second order, and third order change
- the identification of key shifts from the mechanistic metaphor and paradigm towards an ecological metaphor and paradigm (these being *reperception, connection,* and *integration)*
- identification of key thinking habits of the dominant paradigm, and key ideas of ecological thought
- ideas of resonance and the state of being as 'neither separate nor the same' as a challenge to dualism
- the implications of complexity theory in supporting a holistic and living systems view of the world particularly in the light of the metaphor of 'edge of chaos'
- elaboration of Bateson's model and derivative models of staged levels of learning from basic to deep and their use in developing a theory of differential response by educational actors and organisations to sustainability education. Juxtaposition with O'Riordan and Voisey's (1998) model of staged response to sustainability in society
- belief systems as resilient systems (as regards resistance to deep change)
- the importance of prior disposition and readiness in the person or group as regards the possibility of paradigm change
- the implications of a view of education as a subsystem of society, of society/economy as a subsystem of planetary ecology, and the whole as a nesting ecology
- the idea of ecological design as intention, and new ideas from sustainability theory including adaptive management and ecosystem resilience - and their possible relevance to educational design and management
- the idea of a 'sustainable education' paradigm
- seeing educational ethos, policy, and practice as a nesting ecology
- the need for and possibility of reconciliation of realist and idealist positions through relationalism
- intrinsic and instrumental values in education, and transmissive and transformative methodologies in education
- autonomy and integration as a system dynamic and its relevance to sustainability and to environmental education debate
- the possibility of positive co-evolutionary change in the relationship between education and wider society

- the implications of complexity theory for organisational change and educational design towards sustainability
- the possibility of designing 'critical learning systems' which encourage emergence.

What is important here is not each individual point, but their association: that they add up to a larger whole. My sense of this whole, or alternative story, has arisen from my personal and professional experience, and this is outlined below.

1.4 My story

The Thesis arises from my personal experience working in the field of environmental education, since entering teaching in 1972. This experience sets a background context as the evolution of my philosophical orientation has been enmeshed with my engagement in the professional field. Indeed, much of the Thesis rests on accumulated experience and reflection which evolved over the decades before the actual research period which effectively began in 1996. So I will briefly outline some of the key experiences, and 'lessons' that I have learnt from these experiences, in order to show something of the provenance of the aims, orientation and content of the Thesis.

From childhood to twenties – environmentalism and a systemic sense

I was born into a 'thinking family', socially aware, socially engaged, reflecting such liberal values as justice, peace, and equality, and politically leftwards leaning. As a child and young person, my political awareness and environmental interest began early, and I saw them as interrelated. In 1962, for example, I was reading serialised instalments of Rachel Carson's *Silent Spring,* in my *Animals* magazine, and Carson's narrative of pesticide pollution also contributed to an early systemic and political awareness. In my late teens and early twenties, I was engaged in the wave of environmentalism that marked these times. For example, I read reports written for the UN Conference on the Human Environment in 1972, and bought and read avidly Paul Ehrlich's book *Population, Resources, Environment*, and The Ecologist's *Blueprint for Survival.* I was also influenced by the Meadows' *Limits to Growth* (1972)*,* and their 'systems dynamics' approach to issues. I remember feeling strongly at that time that such thinking 'concerns everything', and questioning perceptual and conceptual boundaries and boxes became part of my outlook. My concern for the environment then, was not just born from evidence of environmental degradation, but from what I would call now, an extended sense of self, an empathy with a wider reality. This was reflected in and strengthened by an interest in Eastern philosophy, which appeared to me to suggest a more complete and holistic view of life and the world than that offered

by the mainstream Western traditions of analytic and linguistic philosophy. Later, when I was 31, I would take up Tai Chi. This embodiment of balance, flow and change which I still practise, echoed and supported my relational view of the world.

I seem to be a ‘natural’ systemic thinker. It was only later in life that I found this way of thinking had a name and a recognised tradition. For as long as I can remember, I have always sought pattern, coherence and meaning, and this was partly expressed through questioning norms which seemed to support a fragmentational outlook. Looking for connections and patterns seem to me to be a key part of how people learn, and is particularly evident in young children (I think of my own children here). Yet this way of seeing and knowing is not valued or very much recognised in Western culture which - rather - puts emphasis on binary logic, analysis, distinctions and unidirectional causality, rather than pattern recognition, synthesis and feedback.

In 1971, I came across an American book in a London bookshop entitled *Teaching for Survival* (by Mark Terry, 1971) which was the first book I’d seen on environmental education. Terry’s book was my ‘tipping point’ and having just graduated, I decided to become a teacher as I saw education as critical in helping address environmental issues. It was at a time when liberal humanism was the dominant ethos in education. I had lectures from R S Peters at the Institute of Education in London, and we studied such educational thinkers as Bruner, Piaget, Dewey, Rogers, Holt, A S Neill, and Stenhouse. It was a view of education with which I felt largely in tune, and one that I now feel we need to recover and revalue, as part of the task of re-visioning and reclaiming education. I was lucky to start my career in a demanding but rewarding role as a member of a comprehensive school staff team characterised by a strong collective ethos, energy, creativity, and commitment. After some years teaching in England and Canada, I took a diploma in environmental education at the University of Reading, and this year out of the classroom deepened my understanding of this developing field. An instrumental belief in the role and nature of education, that raising awareness and understanding about the environment would change thinking and behaviour towards it, was widely shared at the time - and is still a strong current in environmental education discourse and practice. This construction of environmental education was also reflected at the Council for Environmental Education (CEE) based at the University of Reading, which I joined as assistant director in 1978. I stayed eight stimulating years working with many of the leaders and principal organisations in the field.

Just before joining CEE, I had taught on a Cree reserve in Northern Saskatchewan, working with native children, some of whom were emotionally disturbed. From that experience, I learnt that in the most unpromising and difficult circumstances, building good relationships might be the only thing you can usefully work at and perhaps is a prerequisite for anything else, and secondly, that there is always some constructive possibility in any situation.

My thirties - ecologism, ethics and education

In 1981, I read Skolimowski's *Ecophilosophy* (1981), a book which, while not exactly changing my life, clarified a good deal of existing thought, and introduced the profoundly radical notion that Western culture perceived and understood the world in an inadequate way: an idea I later found echoed in Bateson's writing. From this point, the already nascent idea that the Western crisis was fundamentally a perceptual one became a critical part of my own belief system. After reading Skolimowski's book, I subsequently attended his ecophilosphy conference at Dartington, in 1982, and was inspired to become involved in the ethics and education elements of the UK response to the World Conservation Strategy. This was followed by reading Fritjof Capra's *The Turning Point* (1982), which - excitingly - argued that there was a strong 'emerging culture' or social paradigm which wove together many of the interests and beliefs I already held or had sympathy for. I also read Morris Berman's *The Re-Enchantment of the World,* (1981) a book which introduced me to Gregory Bateson's ideas, and one which I found both rigorous and visionary. These were formative, or perhaps more accurately, transformative years for me, when an exciting ferment of ideas which hitherto had intuitive coherence began also to assume intellectual coherence, and therefore became more communicable. This clarification took shape in a book that I handwrote at the time. I never intended it should be published, but the ideas provided a platform for further work. This included a paper on ethics and worldviews for *The Environmentalist* in 1985, which led to an invitation to join the IUCN Ethics Working Group, and to contribute a paper 'Towards an Ecological Worldview' to an international collection of essays published in 1990 (Sterling 1990). One of the Group's seminars was held in the US, and I was pleased to meet there David Orr, Herman Daly and Donella Meadows - the latter's work in particular has been a key influence on my own thinking. I subsequently withdrew from direct involvement in this debate, partly through time constraints, but also as I made a distinction between 'ecological ethics' indicating a changed worldview, and the predominant 'environmental ethics' which seemed to me to maintain a questionable dualism between people and nature. Meantime, Capra's *Turning Point* had kindled a latent interest in systems theory, and I followed this up by

attending in 1993 one of his month-long courses at the newly established Schumacher College, ‘an international centre for ecological studies’ in Devon. This proved something of a ‘turning point’, being the beginning of a strong association with the College which was subsequently critical to the process of conceiving and writing the Thesis.

Meantime, I increasingly viewed my professional work in environmental education through the lens of holism, systems thinking, and ecologism - as opposed to a ‘simple’ environmentalism. Through my work at CEE (which I had left in 1987), and subsequently as a consultant, I sought to help extend the discourse in environmental education. This included affirming the global dimension in environmental education (through running two influential conferences in the mid-eighties); and identifying and exploring the implications of sustainable development. I was one of the first in the field to use and explore the term ‘education for sustainable development’ (ESD) (in a keynote address in New Zealand, Sterling 1992a), and subsequently co-wrote and edited the report *Good Earthkeeping - Education, Training and Awareness for a Sustainable Future* (Sterling and EDET Group 1992), which was produced by UNEP-UK for the 1992 Rio Summit. *Good Earthkeeping* was seen as innovative, and was widely influential. This experience led to my joining the founding team of the ‘ground breaking’ distance-learning Masters’ course on environment and development launched at South Bank University, London, in 1994, and my subsequently writing the first Masters-level module on education and sustainability in the UK. Such work was both difficult and exciting, as it involved a good deal of research and also required the generation of ‘new knowledge’ or insight. As a course team, we felt we were creating a new path for sustainability education with our students, and I engaged in the debate and feedback that arose as far as possible. The students have come from a range of cultural and professional contexts in different parts of the world, and they both apply theory in their practice and contribute to theory through their practice. As a tutor, I have felt privileged to learn from the students, as well have the opportunity to develop innovative course materials.

Exploring sustainability and transformation

In the early nineties, I became involved in strategy and organisational change, working with organisations in Eastern Europe struggling to assert themselves in the new post-Communist order, and this led to an interest in the relationships between change, management and learning. Also in the early nineties, I wrote a book chapter (Sterling 1993), and a number of conference papers exploring holistic approaches to

‘sustainability education’, and one of these - delivered at the Association for Teacher Educators in Europe (ATEE) conference held in Prague in 1994 - was sufficiently well-received that I took seriously a suggestion that I should think about turning it into a doctoral thesis. I had felt for some time that I should put my converging areas of interest into a research programme that would, at least, help me make more sense of the whole: environmental education and its broader educational context, learning and change theory, sustainable development, worldview change, ecological thought, and systems thinking.

What matters, I feel, is the pattern of relationships between these areas, and it is in perceiving and clarifying this where I feel I have some ability and contribution to make. What is surprising is that there is so little written that brings together insights on all these areas, although in the years during which this Thesis has been drafted, I have been increasingly aware of people becoming interested in such syntheses, not least, those with whom I have discussed the research. Yet, for the most part, these areas have tended to develop in - and been studied in - relative isolation. For example, in my experience, many people - if not most - who espouse an ecological worldview know little or nothing about systems thinking, and similarly, environmental education discourse is largely lacking in expressed systemisism.

In 1995, I registered with the University of Bath on a part-time and self-financed basis. Having outlined what I wanted to do, my supervisor advised against an empirical element as diversionary from the main task which was to be demanding enough in itself. Secondly, we felt that my past and on-going professional experience provided more than sufficient grounding for the ideas which I was to explore: indeed, the Thesis was largely to spring from and be tested against that engagement with the field.

Meantime, a number of consultancies at local and national level, both in the UK and Eastern Europe, stimulated my interest in the nature of change and appropriate strategy for change. It was the mid-nineties, and it was already apparent that the hopes set in train by the Rio Earth Summit of 1992 both for sustainable development in general and environmental education in particular were meeting with a degree of frustration. I felt that at least part of the problem was both a lack of sufficient recognition and critique of the dominant paradigm which influenced the perception and conception of environmental education, and of the elaboration of a constructive alternative discourse, or at least, an extension of existing discourse. My contribution to debate at this time was to co-edit and contribute chapters to an Earthscan book,

Education for Sustainability (Huckle and Sterling 1996) with John Huckle, a leading socially critical theorist in environmental education. On-going debate with John Huckle over a period of years helped me clarify my contrasting, more ecocentric, perspective. We believed our Earthscan volume to be the first to appear anywhere with such a title, and indeed the book was widely regarded as breaking new ground. In the spring of the same year, I facilitated a course led by the influential American environmental educator and author David Orr at Schumacher College, and engaged more closely with his work and thinking.

In the autumn of 1996, I returned to Schumacher College as a helper, and stayed for two months. Whilst I had registered for my doctorate at Bath in 1995, this two-month period was the first real opportunity to research, think and write intensively. The College library - dedicated to ecological and new paradigm thinking - and the ambience created by the mix of leading teachers and experienced participants made for a rich and stimulating environment for writing. In that short period, two experiences in particular were noteworthy. First, in September, I attended the 'Emerging Approaches to Enquiry' conference in Stroud, co-ordinated by Peter Reason and Judi Marshall from the Centre for Action Research in Professional Practice (CARPP) at the University of Bath. At this conference I was excited to discover more about the meaning of a 'participative research paradigm' as advocated by CARPP - work which echoed and complemented my own interests, and also I felt, lent a degree of legitimacy to an area of enquiry in which I had felt isolated and which was largely absent from environmental education discourse. Secondly, whilst still working at Schumacher College in October, a group of systems students from the Open University came to study for a week. One of their OU tutors was Paul Maiteny, whom I knew as he was also a South Bank tutor on our MSc course. What struck me was the obvious difference between the OU view of systems as a discipline on the one hand, and the College's ethos of Schumacherian ecologism on the other. To that point, I realised that I had rather assumed that there was a natural resonance between the systems view of the world and the ecological view of the world, but the tensions that arose that week suggested an altogether more complex picture. Paul and I had a number of very interesting conversations about this issue that subsequently were to prove formative in my doctoral thinking.

Earlier in 1996, I was asked to evaluate 'Reaching Out', a programme of in-service training and professional development for teachers on education for sustainability, that WWF-UK had developed and run nationally since 1993. This programme had been developed by a skilled team of writers and trainers - including John Huckle - and was

delivered through face-to-face courses with teachers and other educators, including consecutive weekend courses involving action research and co-operative inquiry. The programme was gaining a reputation as a catalyst for significant personal and professional change, and this was confirmed by the findings of the evaluation. Subsequently, I was pleased to be asked to co-direct the programme for WWF between 1997-2000. My engagement with Reaching Out as an evaluator, and later, trainer and manager further fired my interest in the kinds of learning situations and experiences that can foster significant personal change. It was at this time I came across literature on transformative learning which helped me understand better the 'special experience' that many participants on Reaching Out courses reported and which had been verified by a further independent evaluation carried out by Manchester Metropolitan University. WWF's programmes also included grants and on-going support for institutional change (the Curriculum Management Award Scheme), and I became involved in WWF's on-going internal debate on and experience of supporting systemic change in educational institutions. I also worked with the WWF Education Department on organisational change. We tried to achieve greater cross-departmental synergy between sections of the Department, and between separate outreach programmes and their effects. Meanwhile, I was teaching on the South Bank University MSc, which attracted experienced and committed mature students keen to improve their capacities as 'reflective practitioners' and 'change agents'. Over those years and to the present, the students and tutor team felt they were part of a research community that was at the forefront of elaborating the theory and practice of education for sustainability. Again, this experience helped me develop my own thinking and engage with the wider debate.

Tensions in sustainability education

In the late 90s, the growing interest of policy-makers in education for sustainable development (a term they favoured) was manifest in the appointment of a government advisory group, the Sustainable Development Education Panel, in 1998. I was asked to carry out two consultancy tasks: first, to write a research and briefing paper on the definitional issue surrounding ESD, and second, to chair a subgroup of the Panel to work on a document subsequently published as *Education for Sustainable Development in the Schools Sector* (Sterling 1998). This latter document, which partly drew on an internet research group involving both practitioners and academics, directly influenced the new national curriculum. The seven key sustainable development concepts that were identified by the document have since become seminal, and are widely reflected in policy and curriculum documents both nationally and internationally.

In the same year of 1988, I also worked on a *Teacher Education Specification* for the Forum for the Future's HE21 project - outlining key concepts for initial teacher education (Ali Kahn and Sterling 1998). Those involved in these projects, including myself, felt satisfied that we had both interpreted and communicated the slippery concept of sustainable development in educational terms and made an impact on policy. Yet I also felt a degree of disquiet - a sense that education for sustainable development, paralleling sustainable development in wider society, was being accommodated by the mainstream. I had taken the lead role in this work, but the experience left questions again in my mind about the nature of change, and of resilience to change, and whether in this instance, the gains of incorporation of isolated sustainability ideas into the curriculum outweighed the disbenefits. I remember asking a member of the government's Qualifications and Curriculum Authority (QCA), in 1999, whether the government's rather fragmentary response to our submission indicated that the government understood ESD and therefore felt the need to contain it and render it safe, or did not understand it and therefore had dealt with it in the usual 'bolt-on' way. I did not receive a clear answer.

Meanwhile, the international community was grappling with the relationship between environmental education and the newer ideas of education for sustainability and education for sustainable development. Tensions and contesting interpretations were in evidence at the UNESCO conference 'Environment and Society: Education and Public Awareness for Sustainability' held in Thessaloniki in 1997, and in the international internet 'ESDebate' held by IUCN in 1999 to try to clarify and advance the debate. As an active participant in these and other key international events, I felt the ecological and systemic view that informed my own thinking was largely missing, but also, that it potentially indicated a way through some of the perceptual and conceptual difficulties that were in evidence in the debate. At least, I felt it could introduce the dimensions of ecological and holistic thought, of systemic learning theory, and systemic change that were often weak in environmental education discourse.

As I was working both as a part-time tutor for South Bank University, and as a consultant to WWF and on other projects, my main method of working on the Thesis was to find the odd week or two-week slot and use a study bedroom at Schumacher College for short intensive spells of work. As my son was born in February 1997, and my daughter was four in the same year, 'getting away' was often essential to any progress. Irregular periodic visits to the College between 1996-2002 had other benefits. In that time I gained from meeting and listening to many of the scholars who came to

teach at the College including Fritjof Capra, Arne Naess, Charlene Spretnak, Rupert Sheldrake, Warwick Fox, Henryk Skolimowski, Henri Bortoft, David Orr, John Todd - and Brian Goodwin who became resident when he lead the MSc in Holistic Science started at the College in 1998. From such encounters, I deepened my understanding of ecophilosophy and deep ecology, Gaia theory, revisionary postmodernism, systems thinking, complexity theory, holistic science and the biology of cognition, ecological design, and sustainability. In 1998, I was asked to lead a week's course on 'Systems Thinking and Learning for Change' at the College. I worked with Paul Maiteny, Jane Reed (whose background was in deep ecology, ecoliteracy, and school improvement), and Roger Packham from Hawkesbury College in Australia, a leading centre of systemic thinking and pedagogy. In that week, we attempted to create a transformative learning situation - and to bring together the perspectives of systems as discipline or methodology, and the ecological worldview that the College studied and represented. For me, running this course further stimulated reflection on how far systems thinking in some form was necessary to achieving systemic change in individuals and organisations.

Testing the water – the 'sustainable education' Schumacher Briefing

Meanwhile, the political neo-liberal agenda of managerialism and marketisation was affecting educational thinking, policy and practice in the mainstream. Whilst this tendency was not new, I was increasingly conscious of the narrowing effects on curriculum and pedagogy at school and higher education levels, and the often deleterious effects on children and teachers, from evidence from our local schools, from colleagues and the educational press, and from my doctoral research. The top-down, impositional, managerial ethos seemed to me to be contrary, if not antithetical, to the caring essence and ethos in the meaning of education derived from the original Latin *educare* and *educere* which invoke nurturing, fostering and drawing out.

Whilst conducting research for the Thesis in the late nineties, I felt that my analysis was increasingly validated - that the argument needed to shift from a focus only on 'environmental education' or 'education for sustainability' as contained sets of theory and practice, towards the much more ambitious and difficult task of envisioning and articulating an alternative educational paradigm. If, as I felt, there was evidence of an emerging postmodern ecological paradigm capable of challenging modernism and going beyond deconstructionism, then logically, it had implications for most areas of human thought and endeavour. This was about far more than getting ecological concepts into the curriculum, it was about re-visioning education through the

employment of ecology as the fundamental organising metaphor. As I would later write, it was less about the 'learning of ecology', more about the 'ecology of learning' (Sterling 2003). In 1999, and with the Thesis barely half-written, I was offered the opportunity to contribute to the Schumacher Society's 'Briefing' series on aspects of sustainability. I decided to write the education Briefing as a way of accelerating the Thesis research, but also as a way of getting some key ideas out into public debate. I soon decided on the title 'sustainable education' as way of suggesting the need for a shift of culture in educational thinking and practice itself, rather than 'education for sustainability' which tends to put the emphasis on the effects of education - a distinction between education as 'subject of change', and as 'agent of change' which I had made earlier in the 1996 Earthscan book. Using systems ideas, I saw this important difference in terms of the need for at least second-order change - a significant shift in the way we view education and learning achieved through deep reflexivity - rather than the first-order change (making adjustments in the existing system) so often assumed in education for change movements. By mid-2000, the Briefing was half completed, and I was able to both inform and test the ideas at my second Fritjof Capra course held at Schumacher College - an experience which gave me confidence and inspiration to finish the Briefing. It was published as *Sustainable Education - Re-visioning learning and change,* in June 2001 (Sterling 2001). The term 'sustainable education' has since entered the debate.

Also in the late nineties, I was asked to help WWF Scotland with a project on systems thinking, education and (initially) river management. This evolved into the 'Linkingthinking Project' and I became lead writer for the generic units which attempted to introduce relational thinking skills and concepts to teachers, lecturers and students in as jargon-free a way as possible, and fill a gap in the 'thinking skills' debate which hitherto had seemed to ignore systemic thinking entirely. The very positive feedback from the trialling stage has indicated a real need for such materials and approaches in education, and in my own mind I have viewed the project as one practical expression of the whole systems thinking ideas that I have worked on at a more philosophical level in my Thesis.

Whilst the process of writing the Schumacher Briefing consumed valuable Thesis writing time, its publication assisted the Thesis in other ways. Not least, the very positive reaction from readers and reviewers and take-up of the notion of 'sustainable education' strengthened my belief that the basic argument was not only sound but resonated with many people's sense of crisis and opportunity in educational thinking

and practice. Further, I found that the book was quickly being used by people at different levels of the educational system from policymakers (for example the Ministry of Education in Sweden) to course leaders and students, and non-governmental organisations (NGOs). Therefore the Briefing has proved a useful 'litmus test' for the more extensive argument that I proceeded to work on in my Thesis during 2001 and 2002. The Briefing suggested a model of staged change in learning and the need for and value of transformative or deep learning in relation to sustainability. I was aware that a significant number of participants in the learning community facilitated at Schumacher College had, over a period of years, reported such learning experiences. I was pleased, therefore, in 2002 to be invited to co-conduct an evaluation of learning at the College and employ an interpretation informed by a systemic approach (Sterling and Baines 2002). This work threw further light on the nature of the transformative learning experience and possible implications for formal education.

Looking back – and forward to the Thesis

Over the two past decades, I have worked with feet both in the academic and the NGO worlds. Being freelance for most of this period, I have not fully belonged to either sector, and felt this to be an unusual stance which has perhaps afforded insights I might not have otherwise gained. I have enjoyed engagement in the academic debate on the nature of environmental education and education for sustainability (which only gained any real momentum from the late eighties) - but been frustrated by the tendency of academic debate to be divorced from action. I have enjoyed the ability of the NGO world to innovate and respond quickly to opportunity with innovative programmes, but been frustrated by its tendency to oversimplify theory on education and sustainability. This dual involvement reflects my own interest both in theory and philosophy on one hand, and practice and change on the other, and I have seen them as co-informing in my own work. This is also a stance which the South Bank University programme, with which I have worked since 1992, reflects in its approach.

Throughout the period described above, I feel I have elaborated a coherent but ever-evolving personal view of the world informed by ecologism, holism, organicism, and systems thinking at philosophical level, and by both Taoist and panentheistic influences at a spiritual level, giving rise to a sense of transpersonal ethics - essentially, a deeply relational view of the world. I have an empathetic sense of 'the Other' both living and non-living, and an awareness and belief that the quality of relation affects everything we think and do. In 1997, I trained in Reiki healing, and this of itself altered my view of

non-material reality and the relation between this and the biophysical world. All this has influenced my outlook on and voice in environmental education.

From joining CEE in 1978 through to the present, I have developed an international reputation in the professional field. In undertaking the doctoral research, I have brought these two strands, the personal and the professional together - and for both personal and professional reasons. At the personal level, I was curious to take my methodological approach (described above) of seeking pattern and coherence to see how far my intuitive sense regarding the integrity and potency of the ecological paradigm was valid. I had an increasing sense that many of the thoughts and insights that I had come across or developed over the years suggested the possibility of a more whole, coherent and credible argument and I wanted to research and test this further. At the professional level, I felt a responsibility for the ideas that I was presenting in papers, lectures and workshops, and I wanted to investigate their deeper grounding and validity. I hoped that the inquiry would reveal a stronger and more articulate basis for arguing for ecological and systemic approaches in education in general, and environmental education in particular. Further, I hoped that I would develop ideas and models that would help educators - with whom I either had direct or indirect contact - develop ways of progressing their own ideas and practice and overcome the obstacles that many found in common, even in different parts of the world.

I am motivated by a deep concern for the state of the world and the planet, and by the belief that it is our individual and collective worldview that is the key both to crisis and resolution. Essentially, the Thesis concerns how far we are learning towards some kind of sustainable future, and how an ecological consciousness might be advanced through re-visioning the nature and role of education and of learning. In this sense, the investigation began in my experiences many years ago, and the doctoral research is but the latest and formalised stage of an on-going process which has occupied much of my personal and professional life as related above.

In the eight-plus years that the Thesis has been worked on, I feel that systemic and ecological thinking have, at least to some extent, become more recognised in public discourse. Even where the labels have not been used overtly, more holistic, connective, integrative thinking and approaches are increasingly in evidence both in education and wider society - and yet it feels we are still in the early stages of any significant change in consciousness.

This sense of emergence, learning and transition means that the whole Thesis is a reflexive exploration, as indicated in the title. Many of the arguments made, the conclusions drawn, the models and frameworks developed, the relationships suggested, are tentative and offered in a probing and invitational spirit of enquiry, rather than assertion.

The quotes I have chosen to head Part A reflect my assumptions and starting points for what follows in the rest of the Thesis:

- *the Einstein quote - that we need to be able to see 'with new eyes' in order to move beyond the problems the prevailing consciousness has created and this applies at both micro and macro levels:*
- *the Clayton and Radcliffe quote - that sustainability requires a far deeper and more extensive response than a simple environmentalism;*
- *the Bateson quote - that how we perceive and construe the world affects how it comes to be, for good or ill;*
- *the Shakespeare quote - that the quality of thinking is intimately linked to the quality of our experience;*
- *The Schumacher quote - that there is a need for qualitative change in the purposes and practice of education;*
- *The Lyle quote - that ecology implies and requires a changed worldview.*

1.5 Framing the research - asking the questions

My experience, as related above, led me towards a number of research questions related to environmental education. In wider society, I discerned limits to the efficacy and influence of systems thinking and environmentalism, and saw all these issues as parts of an interrelated whole. Such issues gave rise to a list of personal concerns, including:

- What is the root of the ecological and associated crises, and why do we find it so difficult to resolve them?
- How and why are environmental and sustainability education limited in their ability to make a significant difference to social change?
- What is the essential nature of the dominant paradigm that influences thought and debate in society as a whole, and in educational thinking and practice?
- How can we perceive this paradigm if we are part if it, and it is part of us?
- What evidence is there for an emergent postmodern ecological paradigm?

- What is the essence of ecological thinking and does this offer a credible way forward beyond modernism and deconstructionism?
- Why has not systems thinking been more successful in countering reductionist and objectivist thought?
- Why are 'the environment' and environmentalism often seen as separate by and from the mainstream?
- What is, and what might be, the relationship between ecological thinking and systemic thinking and can these be brought together in 'whole systems thinking'?
- How do these forms of thought relate to the sustainability debate, and to the cultural context of modernism and postmodernism?
- Do emerging metaphors such as 'living systems' and the tentative insights of complexity theory help us escape the dominance of mechanism as an operative metaphor in thinking and practice, particularly in education?
- What quality of learning appears necessary to facilitate a shift of consciousness from the dominant paradigm to one which is more healing and conducive to sustainability?
- What do we know about the relationship between transformative learning and paradigm change?
- What are the implications of whole systems thinking and an ecological paradigm for change in educational thinking and practice, and in particular in environmental education?
- How can all this be brought together in a logical, clear and accessible way, and in a way that enables me and interested others to move forward?

I focussed these questions down to the following:

- Why are education as a whole, and environmental and sustainability education in particular, limited in their ability to make a positive difference to the human or environmental prospect in terms of helping assure a more sustainable future - and how might they become more transformative?

This gave rise to a research agenda, which is described in Part A.

1.6 Achievement

Whilst it is for others to judge the achievement of this inquiry, my overall assessment is as follows:

I have explored the grounding of revisionary postmodernism, systemisism, and ecologism through analysis, have employed abductive approaches to explore common patterns within the four fields that I have identified as foundational to whole systems thinking, and synthesised a key model and theory of learning and change which, I believe, by its articulation, helps us move beyond the grip of mechanism in our personal, social and educational paradigms, through clarifying the possibility of deep learning. I have suggested why and how systemic thinking and ecological thought/thinking should develop a closer synergy in addressing the challenge of the sustainability transition, and indicated what this means for environmental and sustainability education within the contexts of systemic change in education as a whole, and of signs of transformative change in our cultural worldview.

1.7 To the reader

The Thesis is long. However, I have tried to write it so that any Part, or even any section, can be read meaningfully without necessarily referring to the rest of the text. Second, because of an iterative structure, any theme of interest to the reader - such as 'learning levels' - can be picked out from the Contents and followed through the Thesis as a flow of argument, discussion and application. More details of the structure of the Thesis may be found in Part A, subsections 1.1 and 2.4 below.

1.8 A last word

The Thesis has taken some eight years to write, as it has been self-financed and in my 'spare time', coinciding with the birth of one and the early years of both our children, and with a need to keep my freelance career and family income reasonably afloat. There have been many interruptions and difficulties as a result. Over this period, my ideas have evolved and new sources have kept appearing or have been discovered. Hence, I found some of my older writing had to be revised, edited or discarded. It would have been much easier to write in two years full-time - yet, I've been aware of the benefit of a gradual maturation of ideas and a slow but deeper learning process occurring, which I hope is reflected in the actual writing. If I had known at the outset what I have learnt over these years, no doubt the Thesis as a whole would be more concise, elegant and sharp, but inevitably the path was made in the writing, and not before. However, I hope it is readable and accessible, and brings some clarity to an area of thought which I believe more strongly than ever, is critical to our common future.

PART A – INTRODUCTION

Purpose: to outline the rationale of the research, state the research questions, discuss methodology and research problems, introduce the field, and summarise the 'findings'.

Introduction

Part A is the foundation of the rest of the Thesis. In section 1, I outline the rationale, focus and scope of the research, and introduce the main foci - being the *postmodern ecological worldview*, *whole systems thinking,* and paradigm debate within *education as a whole*, and in *environmental and sustainability education*. The research questions are then outlined. In section 2, issues of methodology and validity are discussed including the assumptions I bring to the inquiry, and my thinking behind the organisation of the Thesis is outlined. In section 3, I introduce some key concepts and models employed in the Thesis, and then an introduction to the field of inquiry is presented. Part A finishes with a summary of key propositions arising from or confirmed by the research inquiry.

Setting the scene

The following quotations indicate my assumptions and the territory to be explored…

'No problem can be solved from the same consciousness that created it. We have to learn to see the world anew.'
- Einstein (in Banathy 1995)

'The fundamental challenge of sustainability goes far beyond that of environmentalism. The question is whether we can fulfil our unique potential as human beings, to understand our behaviour and its consequences. To do this, we must be prepared to discard our prejudices, and to review every area of human life. We must transcend the current limitations on our thinking if we are to become aware and rational beings in a way that no other species has ever had to do or been able to do before.'
- Clayton and Radcliffe (1996)

'The world partly becomes - comes to be - how it is imagined.'
- Bateson (1980)

'There is nothing either good or bad, but thinking makes it so.'
- Shakespeare (Hamlet, II, ii)

'The volume of education has increased and continues to increase, yet so do pollution, exhaustion of resources, and the dangers of ecological catastrophe. If still more education is to save us, it would have to be education of a different kind: an education that takes us into the depth of things.'
- E F Schumacher (written 1974, published 1997)

'The development of ecological understanding is not simply another subject to be learnt but a fundamental change in the way we view the world.'
- John Lyle, 1994

1 RATIONALE

1.1 The focus and scope of the research

What is the nature of the change of consciousness that appears necessary to the achievement of a more ecologically sustainable society? What changes may be required in the way we view and practise learning and education if they are to contribute fundamentally to such a change of consciousness*?* What is the nature and basis of whole systems thinking and what is its relation to an emerging ecological worldview? Is whole systems thinking a key to paradigm change in education and wider society? These are the broad themes of this Thesis which underlie the more tightly focussed research question, with which this doctoral work first began:

> 'How might whole systems thinking assist the revisioning of (environmental) education in the light of an emergent postmodern ecological worldview?'

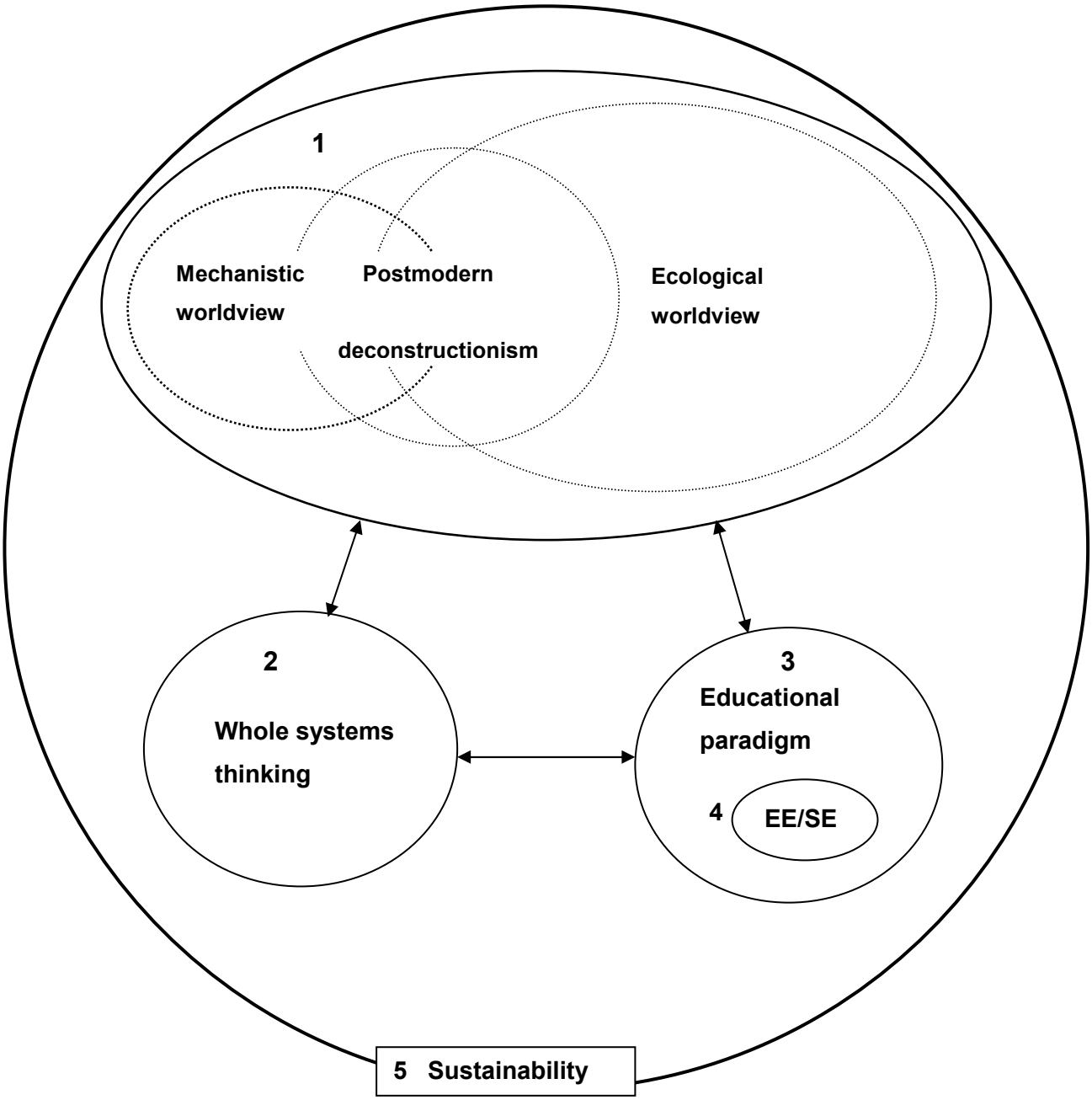
These questions emerged from some thirty years involvement in the field of environmental and sustainability education, as summarised above in the Preamble. From this experience, I have come to believe that the interlocking global crises of unsustainability require a far more fundamental social learning and educational response than environmental education, as a largely marginalised and contained body of thought and practice, has yet been able to effect. So while my focus begins with environmental education because this is my field, my main question (indented above) implies the need for a deeper and more extensive inquiry concerning education as a

whole - hence ‘environmental’ is shown in parentheses. This deeper inquiry is suggested in the opening questions above.

I intend to look at the issues through taking a systemic perspective: looking for ‘the big picture’ first, rather than the detail, the whole rather than just the part. Systems thinking argues that “valid knowledge and meaningful understanding comes from building up whole pictures of phenomenon, not by breaking them into parts” (Flood 2001, 133). Thus, in considering the issues raised, I settled on five interrelated dimensions of inquiry, as follows (see Diagram A.1(a) below).

1. the nature of what appears to be)an emerging *postmodern ecological worldview,* challenging mechanism and modernism and also going beyond postmodern deconstructionism (the main focus of Part B);
2. the nature of *whole systems thinking* (introduced in Part B and elaborated in **Appendix I**);
3. implications of 1) and 2) for change of dominant *educational paradigm* (the main focus of Part C);
4. the revisioning of *environmental (EE) and sustainability education (SE),* together seen as a subsystem of education as a whole. (Part D);
5. the nature of *sustainability*, which provides an integrative context for these areas of study, and is considered as a recurrent theme in the Thesis.

Diagram A.1 (a): The five dimensions of inquiry



In what follows, I have taken a 'systems view' of the subject matter, and have employed systems ideas and models to analyse and synthesise concepts. Thus, the first four main foci are explored in contextual relation as a set of encompassing '*nesting systems'*, i.e. systems of ideas. I believe this to be a clear and helpful way of

suggesting their relationship. Hence, the emergence of the *postmodern ecological worldview* is the context for the emergence of what I am calling here '*whole systems thinking'*, which in turn has implications for *educational paradigm change,* which in turn sets a context for change in *environmental and sustainability education.* It is important to note that my reference to 'education' and 'education system' refers mainly to all levels of formal education, as this is the field of my experience, although I also refer in the Thesis to non-formal and community education where appropriate. As I am concerned with designed or intentioned educational experience, I am not including informal education which is usually seen as referring to incidental learning experiences. Following this introductory Part A, each focus provides the basis of a subsequent Part of the Thesis. The more detailed elaboration of whole systems thinking is located in **Appendix I** for reasons of economy of space. The idea of nesting systems is dealt with in more detail in A.2.2 below - see 'Use of models'.

Whilst Diagram A.1 (a) shows the five main dimensions of the inquiry, Diagram A.1 (b) (in **Appendix II**) shows how a whole systems thinking perspective has been used to explore a number of interrelated subtopics.

Box A.1: Clarifying sustainability education terms

In common with general practice, I use the term *sustainability education* as a catch-all to include the terms 'environmental education' (EE), 'education for sustainable development' (ESD), 'education for sustainability' (EfS), and 'education for a sustainable future' (ESF). Beyond these terms, I use *sustainable education* to suggest a change of educational paradigm, rather than a modification of or to the existing paradigm. A more detailed discussion of these terms and their meaning may be found in Part D.

I define 'sustainable education' as, "a change of educational culture which both develops and embodies the theory and practice of sustainability in a way which is critically aware. This would be a transformative paradigm which values, sustains and realises human potential *in relation to* the need to attain and sustain social, economic and ecological wellbeing, recognising that they are deeply interdependent" (Sterling 2001, 22).

I now introduce briefly the four main foci and explain why they are examined in the Thesis.

Paradigm change

The cultural worldview, or social paradigm, is a story about the way the world works. It is both a projection and reflection of how the world is seen, and is a characteristic of any society from history to the present. As Fromm has noted (1976, 137), “The impressive fact is that no culture has been found in which such a frame of orientation does not exist. Neither has any individual”.

In a stable society, the dominant and mainstream story accommodates differences of view and debate within accepted parameters, and on the basis of accepted axioms and assumptions which are often unexamined and unarticulated. It has a *descriptive* aspect, influencing which aspects of and how the world is seen, and a *normative* and *purposive* aspect which legitimises courses of action. So two components of paradigm can be distinguished, the *eidos* which refers to the cognitive or intellectual paradigm (the “guiding idea” - Grundy 1987, 23) and the *ethos*, which refers to the affective level, values and norms. These give rise to and influence the *praxis,* a term which I am using here to refer to the ‘theory in action’ and behaviour, both what is done (and not done) and how it is done. Of these three dimensions of paradigm, it is the ethos which is often most hidden from people's immediate awareness.

- Key point: I use these three descriptors of the components of paradigm *ethos, eidos* and *praxis* extensively in the Thesis as a fundamental model of paradigm.

Thus the dominant shared worldview in any society affords a largely coherent epistemological and ontological sense, within which both examined and unexamined values, beliefs, assumptions, ideas and actions are played out. But there is growing evidence that the ‘knowledge system’ (Marglin 1990) that has dominated Western society for more than 300 years is unsustainable as a system of thought, and is giving rise to unsustainable patterns in human activity systems. My starting point here is based on Bateson’s work. Gregory Bateson was a critically important figure in the history of systems thinking, and his influence on current developments is still strong, if not always recognised. Fritjof Capra (1988, 74) suggests that he will come to be regarded by future historians as “one of the most influential thinkers of our time”. According to Bateson (1972) - and to many others since - our worldview is founded upon an ‘epistemological error’, a perception of and belief in separateness that makes it so. As Bateson (1972, 463) states:

> I believe that (the) massive aggregation of threats to man and his ecological systems arises out of errors in our habits of thought at deep and partly unconscious levels.

If this is so - and it is a point of view to which I subscribe - it raises the question of how we might escape this trap, and on what bases of thought.

Within the history of the modernist paradigm, there has always been tension between the dominant *mechanistic* and the alternative *organicist* ways of viewing the world. Hence Capra (1996, 17) states:

> The basic tension is one between the parts and the whole. The emphasis on the parts has been called mechanistic, reductionist or atomistic; the emphasis on the whole holistic, organismic, or ecological.

This remains in my view, the most fundamental struggle. Yet in the current age, the attention of mainstream debate has been the relation and tension between modernism on one hand, and postmodern thought on the other. But I will argue that the focus of the historic struggle - if we are to attain a more sustainable and just world - needs now to move on. Whilst a fundamental and important debate continues between modernism *and* deconstructive postmodernism, I will argue that *revisionary (or constructive) postmodernism and ecological thinking* suggest the possibility of an emergent social paradigm that allows Western thinking and culture to both subsume and go beyond the limits of modernism and deconstructionism, towards a more holistic alternative. Further, I argue that our collective experience of these worldview 'moments' allow us to transcend them through our developing a more integrative way of seeing the world.

I argue that the three fundamental 'moments' - of modernism, deconstructive postmodernism and revisionary postmodernism - may be seen as a deep and historic cultural learning journey. It is not at all clear cut. The use of worldview labels simplifies the complexity of relationships and currents involved, and the fact that for many people, their perceptions and thought processes are simultaneously enmeshed with a number of outlooks which are in tension, perhaps consciously, perhaps unconsciously. This, it would appear, is symptomatic of the transitory times that we live in.

Thus, according to Heron (1992, 251):

> Today, a significant minority have abandoned the Newtonian-Cartesian belief system in favour of some elaboration of a systems theory worldview. But it may be that they, and certainly the majority of people, still *see* the world in Newtonian-Cartesian terms. It is a big shift for concepts to move from being simply beliefs held in the mind to beliefs that inform and transform the very act of perception.

Whilst Bateson suggests:

> We are most of us governed by epistemologies that we know to be wrong. (1972, 461)

Many commentators maintain the most fundamental issue is a 'crisis of perception' which most of us share, and that a change of cultural worldview based on some form of systems thinking or holistic view is both necessary and emerging (Capra 1982, 1996, Harman 1988, Clark 1989, Bohm 1992, Wilber 1996, Ho 1998). This appears to entail a shift of emphasis from relationships based on separation, control and manipulation towards those based on participation, appreciation and self-organisation. Increasing numbers of writers are pointing to the emergence and nature of this ecological worldview, predicated on the idea of a co-created or participative reality. Thus this worldview is variously called 'participative' (Heron 1996, Reason and Bradbury 2001) 'co-evolutionary' (Norgaard 1994), or 'living systems' (Elgin 1997), and referred to as the ‘postmodern ecological worldview’ (Zweers 2000).

This movement expresses - to quote Capra (1996,3) - a “new perception of reality” which has “profound implications not only for science and philosophy, but also for business, politics, health care, education, and everyday life.” Evidence of this emergent paradigm can be seen in aspects of ecological and integrative thinking, particularly in ecophilosophy, social ecology, eco-psychology and creation spirituality, as well as more practical expressions in major areas of human endeavour such as holistic science, ecological economics, sustainable agriculture, holistic health, adaptive management, ecological design and architecture, and efforts to develop sustainable communities.

This movement may be as a manifestation of epistemic learning, ultimately a profound transformation based on realisation of the arbitrary nature and inadequacy of the prevailing existing paradigm. Capra claims (1982, 1996) that humanity, or at least

Western and Westernized culture is at the beginning of a paradigm shift, equivalent to the first Scientific Revolution, informed by this new view. Davies and Gribbin (1992, 23), well-known writers on new science, state “the paradigm shift that we are now living through is a shift away from reductionism and towards holism; it is as profound as any paradigm shift in the history of science”. Yet the participatory worldview is more than a scientific revolution, it holds the promise of cultural change whereby “meaning and mystery are restored to human experience, so that the world is again experienced as a sacred place” (Reason 1994, 10). Through our knowing participation, the contemporary existential crisis of identity, meaning and purpose is addressed through a new sense of our belonging to a greater whole. However, given the lingering power and momentum of modernism and its ability to adapt and change, and despite the evidence of trends of environmental degradation and social decay, it is not clear how, when or even that the new paradigm will gain the ascendancy. Eckersley (1992, 52), for example, sees “nothing inevitable” about “a new, ecologically informed cultural transformation”. Eisler (1990, xx) adds that while a better future is possible:

> …it by no means follows (as some would have us believe) that we will inevitably move beyond the threat of nuclear or ecological holocaust into a new and better age. In the last analysis, that choice is up to us.

Not least, an ecological revisioning of the world and of ourselves involves a choice of alternative root metaphor, that of ecology or ‘the living system’. From all the reading and thinking I have done over the years, I believe the key to understanding a culture is its root metaphor. Therefore, in critically appraising modernity, I would not point first to rationalism, or scientism, or technocentrism, or economism, or capitalism, or industrialism, but to *mechanism,* which underlies the whole paradigmatic structure of modernity. As Berman points out (in a book which has been a key text for my thinking since it first appeared in 1981), “our culture hangs onto mechanism, and to all of the problems and errors it involves, because there is no returning to Hermeticism and - apparently - no going on to something else” (1981, 136). His inclusion of the Hermetic (alchemical) tradition signifies the fact that Western science was once much more qualitative, organicist and integrative than modern science allows. Berman’s own contribution to outlining the ‘something else’ that might in turn transcend mechanism, is significant. Based on ‘Batesonian holism’, it employs the root metaphor of ecology. ‘Ecology’ is still a science of course, but more significantly it is a powerful idea, and it is in this sense that it is discussed in this Thesis.

As Sachs suggests, since the 1960s:

> …ecology has left the biology departments of universities and migrated into every consciousness. The scientific term has turned into a worldview. And as worldview, it carries the promise of reuniting what has been fragmented, of healing what has been torn apart - in short of caring for the whole.
> (Sachs 1999, 63)

Often accompanying this sense of ecology is the notion of the 'living system' which gives rise to the notion of the 'sustainable system' which is at once healthy, viable, adaptive, and self-organising, and this metaphor can be applied to all system levels including individuals, groups, institutions, communities and whole societies as well as, by extension, having radical implications for human activity systems such as agricultural systems, production systems, companies, organisations and so on. This is not just an appealing idea, it represents in a sentence a profound shift of worldview, away from the Cartesian/Newtonian image of entities existing discretely in a deterministic and dead universe, to a dynamic view of process, relation and co-evolution.

What is often missing in calls for change of worldview however, is an elaborated theory both of what this 'new' postmodern ecological paradigm means in terms of ethos, eidos, and praxis, and of how paradigm change through learning might be accelerated, against a backdrop of mounting global ecological crisis. This, I believe, is the significance of whole systems thinking, as it appears to hold this important potential. However, with rare exceptions, notably Capra (1982, 1996), the nature and role of systemic thinking in relation to the new paradigm has been little explicated, and this again is one of the aims of the exploration in this Thesis. What is also often missing is a theory of why paradigms are resilient and resist change, or indeed, of how they can change. Here too, whole systems thinking offers a theory of learning - based upon Bateson and his successors - which offers powerful and useful insights. This theory centres on the idea of nested levels of learning, and this is introduced in section 3 below. Section 3 (subsections 1 and 4) also discusses 'paradigm' further, and contrasts views of paradigm change.

I now introduce my view and interpretation of whole systems thinking in more detail.

Whole systems thinking

The term whole systems thinking is used in literature, but more often in passing than in depth. My hope is that it will become much more familiar, and quickly in years to come.

I first encountered the phrase ‘whole systems thinking’ in Korten’s work where he critiques the conventional economic order and the thinking and belief system that supports it. Thus, he suggests:

> Whole-systems thinking calls for a skepticism of simplistic solutions, a willingness to seek out connections between problems and events that conventional discourse ignores, and the courage to delve into subject matter that may lay outside our direct experience and expertise.
> (Korten 1995, 11)

In some ways, this reflects my approach to the Thesis and the inquiry. But essentially, I see whole systems thinking as a quality of thinking that is suggested by the postmodern ecological worldview, and which can also suggest this worldview. That is, I argue that those who reflect such a worldview tend to perceive and think in whole system terms, whilst for others, beginning to think in this way can lead them towards such a worldview. A number of antecedents and contributory strands to whole systems thinking are explored in the Thesis, but essentially, I see it as a coming together, a syncretisation, between ecological thought and systems thinking. It is equivalent then, to what is sometimes referred to as ‘ecoystemic thinking’ (Van der Hoorn 1995). It is interesting that the common phrasing is ‘systems *thinking’* and ‘ecological *thought’* rather than ‘systems thought’ and ‘ecological thinking’, implying a tendency towards an *active praxis in the former* and towards a *body of knowledge and ethical orientation in the latter.* Thus I see whole systems thinking as a synergy between the body of holistic thought inspired by an ecological view of the world, and the methodology of systems thinking: essentially a coming together of ecologism and systemisism, of critical thought and a sense of connectedness, yielding what might be termed ‘systems as worldview’. In practical terms, such an inclusive view regards “ethical, spiritual, cultural, and ecological judgement criteria...as being just as significant as the more conventional technical, practical, economic, social and political dimensions” (Bawden 2000a, 11).

- Key point: whole systems thinking is a syncretisation of systems thinking and ecological thought.

Zohar and Marshall (2000, 43) note that the Western model of ‘thinking’ is inadequate because thinking is not just a cerebral matter of ‘IQ’: “we think not only with our heads, but also with our emotions and our bodies (emotional intelligence), and with our spirits, our visions, our hopes, and sense of meaning and value (spiritual intelligence)”. They make a distinction between ‘serial thinking’ which is linear, logical, rational and rule-

bound, ‘associative thinking’, which is habit-bound and pattern recognising and associated with emotional intelligence, and ‘unitive thinking’ “which makes it possible for us to do creative, insightful, rule-making, rule-breaking thinking...with which we reframe and transform our previous thinking” (2000, 39). Zohar and Marshall’s view of ‘spiritual intelligence’ appears to close to what I am calling here whole systems thinking.

At the heart of it is *wholeness* and *health* (both words having the same semantic root). These are hard words to define because they are qualitative, but they invoke the ideas of integrity, of both the unfolding and maintenance of creative potential in a dynamic state, of an aesthetic and of quality. For a culture focussed on detail and analysis, “the whole contains a richness, a perspective, a dimensionality not possessed by parts” (Zohar and Marshall 2000, 18). Hence, I argue that whole systems thinking, particularly when seen in relation to the quest for sustainability, has a teleological dimension, that is, a sense of purpose. A fundamental issue concerns how to recognise, and work towards - what systems thinkers term - ‘goodness of fit’ or coherence between identified nesting system levels of ecosphere, society/economy, and education (and their identified subsystems): so that increasingly, each becomes - and together become - a ‘viable’ or healthy system. According to Bossel (1998,75), a viable system is one which is “able to survive, be healthy, and develop in its particular environment”. Similarly, I argue that sustainability implies the *survival,* the *security* and beyond these, the *wellbeing* of the whole system, whether this is seen at local level, such as community, or at global level. These are related stages; there is no wellbeing unless there is some level of security, and no security unless there is survival as a first step. So for example, aid agencies addressing extreme poverty and famine will work for immediate survival first, then for better food security and economic security, then for general social, economic, and environmental wellbeing.

Whilst necessarily imprecise, this notion of the healthy, sustainable system is a guiding idea in the Thesis, and applies at any and every system level. (Further ideas on the qualities of viable systems are given in the **Appendix II,** Part C.1.)

I now review why whole systems thinking is necessary. It is increasingly accepted that many complex issues in the contemporary world, and particularly those relating to the environment, can only be reasonably understood and effectively addressed by approaches which are multidisciplinary, holistic, flexible, and integrative; further, that culturally engrained analytic, linear and binary ways of thinking are no longer adequate

to understand and address many problems. Moreover, that the dominance of such 'incomplete' thinking can exacerbate problems which are fundamentally systemic in nature and characterised by complexity (Waddington 1977, Laszlo 1989, Meadows 1992, Clayton and Radcliffe 1996, Mulgan 1997, Bell and Morse 1999). For example, Senge, an influential systems writer suggests, "…the unhealthiness of our world today is in direct proportion to our inability to see it as a whole"(Senge 1990, 68). Similarly, Meadows (1982a, 101) states:

> The world is a complex, interconnected, finite, ecological-social-psychological-economic system. We treat it as if it were not, as if it were divisible, separable, simple, and infinite. Our persistent, intractable, global problems arise directly from this mismatch.

Gregory Bateson was amongst the first to point to the deep epistemological nature of the problem, pointing to a "massive aggregation of threats to man and ecological systems" which "arises out of errors of thought at deep and partly unconscious levels" (Bateson 1972, 463). Three decades later, it could be argued that the complex interconnections between problems are becoming increasingly apparent, forcing a gradually more holistic way of seeing the world. Commoner's 'laws of ecology' (coined around the same time that Bateson was writing), include his 'First Law' that "everything is related to everything else" (1971, 29), and as we struggle with, say, the links between energy use, transport, climate change, global trade, food security and safety and health, the reality of this 'law' is beginning to become more widely appreciated than when Commoner first wrote.

- Key point: A fundamental argument of the Thesis is that, as the issues that surround us are fundamentally *systemic,* we need to *think and learn systemically.*

More positive visions are also encouraging a changed, more integrative, outlook. The idea of sustainable development, given international credence by the Brundtland Commission (WCED 1987), may be seen as a response to the problems and possibilities presented by a deeply systemic world. Yet ecologically sustainable development requires an extension of thought, beyond that which was the norm for most of the 20th century, towards a much more integrative perspective that brings together (at least) society, economy and environment, and present and future dimensions. But integrative thinking, or systemic thinking, is still unfamiliar; it tends to be an effort rather than a habit of mind. Indeed, it is fragmentary thinking that is

habitual - which is unreflected upon. As Bateson's daughter and collaborator (Bateson MC, 2000, vii) comments:

> Even with current progress in chaos and complexity theory, we remain less skilled at thinking about interactions than we are at thinking about entities, things.

David Orr (2002, 285) suggests that economic and political structures work against systemic thinking:

> We have difficulty in seeing whole systems in a culture shaped so thoroughly by finance capital and narrow specialisation.

Shifting our focus and attention from things to process, from static states to dynamics, from 'parts' to 'wholes', is the fundamental challenge, and this is why systems approaches - which bring a set of ideas, tools, and valuative orientations - appear so relevant.

In essence, systems thinking is relational thinking, and stands in contrast to non-relational or fragmentary thinking. In Flood's words, it "helps us sense as well as appreciate our connection to a wider whole" (1999,2). The term 'joined up thinking' has enjoyed increasing currency in recent years - even if it is often superficially interpreted, but its emergence is perhaps significant as the limits of fragmentary and linear thinking become increasingly apparent. De Bono (1994,9) describes systemic thinking simply, by suggesting the dominant question changes from "what is this?" to "what does this lead to?" or "what does this add up to?" Similarly, Capra notes that it marks a shift of attention from 'parts' to 'wholes', from structure to process, and that it is concerned with relationship, connectedness and context.

> To understand things systemically literally means to put them into a context, to establish the nature of their relationships.
> (Capra 1996, 27)

For this reason, a number of commentators equate 'systems thinking' and 'ecological thinking', the latter not just denoting concern with natural systems but with all process and relationship (Capra 1996, Van Der Hoorn 1995). Hence Capra states in his book *The Web of Life,* "I shall use 'ecological' and 'systemic' synonymously, 'systemic' being merely the more technical, scientific term" (Capra 1996, 17). However - and this is a very important point, I argue that it is *important to distinguish between systems thinking*

and ecological thinking and acknowledge their different origins and nature (see Box A.2 below).

- Key point: Systems thinking and ecological thinking have some similarities but also important differences.

Other descriptors commonly used are 'holistic thinking', 'integrative thinking', 'connective thinking' and 'linking thinking'. Yet the use of these terms does not necessarily imply that the user recognises the specific contribution that 'systems thinking as a discipline' has made and can make to this view of the world. My view is that systems thinking, that is 'systems as discipline', can help make holistic thinking and ecological thought - the nature of which are more often intuited than articulated - more comprehensible, accessible, communicable and operational. There are subtleties and arguments in the use of terminology which I return to later, but in Box A.3 below, I have tried to indicate the main differences.

A further key descriptor is '*epistemic',* which means that systems thinking can give rise to a qualitatively different epistemology than that which is currently dominant. However, this is *not necessarily the case*, and this is why in the Thesis I make the distinction between most systems thinking and 'whole systems thinking', although this is a soft rather than a hard distinction. Through over 50 years of evolution, systems thinking has developed a number of schools of thought and practice, based on systems science. These are concerned with *systems as discipline* - and a discipline which is primarily methodological in emphasis. Although this observation is a simplification, it is nevertheless generally valid - the idea of problem-solving from the outside or 'intervening in the system' for example, is a fundamental part of systems approaches. As Flood writes (2001, 135):

> The methodology is an intervention that begins with problem identification and concludes with some final solution, perhaps with expectation that things will attain a desirable condition. The challenge is to find the most efficient means to achieve this predefined end.

My argument (which is expanded later in Part B.2) is that although systems thinking is founded in holism, and has attempted to present alternatives to reductionist and objectivist thinking, its various schools have nevertheless been operating within the context and constraints of the dominant cultural paradigm, and therefore the methodological and problem-solving aspects of systems thinking (which are more

pragmatically useful, and offer less challenge to the dominant paradigmatic ethos) have been in evidence, rather than the ethical and philosophical aspects which *are* challenging. As Richard Bawden comments:

> While practitioners of the 'systems approach' have long claimed that they do embrace fundamental concerns for 'ethical defensibility', their record has not been particularly noteworthy.
> (Bawden 2000a, 5)

At the same time, the applied and 'hard systems' approaches deriving from an engineering tradition have been in more general use in recent decades, than the 'soft systems' more participative approaches (although this is changing). It is for this reason that many environmentalists have tended to shun all systems thinking, seeing it as 'part of the problem' rather than 'part of the solution' - serving instrumental values too often rather than intrinsic human and environmental values. But this is to throw out the baby (systems thinking) with the bathwater (mechanistic worldview) before the baby has a chance to grow and prove itself: in my view systems thinking is, at very least, a critical part of realising a more sustainable future. Yet I believe it needs re-inventing in a 'more whole' and more accessible, comprehensible and ethically oriented form.

To denote such a form of systems thinking, I use the term 'whole systems thinking' as a neologism. It is not entirely new: an internet search using this term reveals its use by a number of institutions, but mostly the meaning of the term is not differentiated from 'systems thinking'. At first sight, the term appears tautologous as systems thinking is about wholes anyway. I would say in answer that the term indicates a difference from how *systems as discipline* is seen and practiced. In suggesting a stronger synergy and syncretisation between systemisism and ecologism, 'whole systems thinking' manifests *systems as worldview*, rather than systems primarily, or only, as methodology. In this sense, 'systems as worldview' is an articulation or expression of the postmodern ecological worldview - its emerging ethos, eidos and praxis - using relational or systemic language and concepts, and reflecting a transpersonal Earth ethic of 'inclusive wellbeing' (Bawden 2000). Further, I argue that this worldview addresses the contemporary existential crisis of meaning and alienation which characterises both modern and postmodern thought, by offering a sense and possibility of healing and wholeness - a spiritual sense of connection with "some larger, deeper, richer whole that puts our present limited situation into a new perspective" (Zohar and Marshall 2000, 18).

'Whole systems thinking' is not arising, of course, from a vacuum but from a number of foundations, and appears to be intrinsic to a new worldview arising as part of a historic process or movement. One of these foundations is the movement within 'systems as discipline' which is currently embracing and exploring the implications of the new sciences of complexity in tandem with the emerging 'living systems' view of the world (see 'Paradigm change' below). The four contributory foundations I have identified - being systems thinking, indigenous thought, organiscism and ecologism, and complexity sciences - are outlined further in subsection 3.3 below and subsequently examined in the Thesis (particularly **Appendix I**).

In sum, I suggest that 'systems as worldview' is a larger conception than 'systems as discipline' - a context that can incorporate, revitalise and change the nature of 'systems as discipline' and also that, for a number of reasons, the time has come for the elaboration of whole systems thinking in this sense. At the same time, systems methodology, seen within a larger framework of whole systems thinking, can be used to articulate and advance aspects of the ecological worldview. Further, I argue that 'whole systems thinking' helps a bridge to be built from dominant habits of thought towards a more holistic, ecological worldview in society as a whole which can support and substantiate the theory and practice of ecologically sustainable development. In other words, the articulation of whole systems thinking might be key to what has been termed the 'sustainability transition' (O'Riordan and Voisey 1988).This is elaborated further in Part B.1.8.

The following two Boxes help define key terms and relationships in the fields or orientations of systemisism, ecologism and holism: Box A.2: 'Clarifying terms', and Box A.3: 'Clarifying relationships'. They are my own definitions or descriptions. These relationships are discussed in subsection 3.3 below 'Systems thinking and changes in worldview'.

Box A.2: Clarifying terms relating to systems and ecological thinking

Systems thinking - modes of thinking which recognise relationship and process as the primary reality.

Systemic thinking - this term is sometimes used synonymously with 'systems thinking'. However, other writers use this term to distinguish between 'first-order' systems

thinking, and ‘second-order’ systemic thinking whereby the observer is fully cognisant of his/her construction of his/her own reality including his/her view of any system.

Systemisism - a belief or view that a systems view of the world is an appropriate metaphor for understanding the world, our interrelationship with it and acting in it. A related term is used to describe the systems practitioner, as in ‘systemisist’.

Systems as discipline - an inclusive term for the various schools of systems thinking which emphasize systems thinking as a *methodology.* Has not embraced the ecological worldview, although some parts of systems thinking are based on organic metaphors and there is growing interest in the implications of complexity/living systems theory. Systems as discipline is not necessarily interested in sustainability and related matters – but there is a recent and current trend in this direction within the field.

Ecological thinking - the thinking that characterizes those who espouse aspects of, or represent, the emerging postmodern ecological paradigm. This recognises the primacy of relationship, but is not necessarily aware of systems as discipline. Further, those who identify with this position do not necessarily recognise the term ‘systems thinking’. While their thinking is essentially systemic in character, this systemisism is implicit and applied rather than articulated. Ecological thinking embraces the issues of sustainability, and expresses ecologism. Ecological thought is the body of ideas that have emerged from ecological thinking.

Ecologism - a belief or view that ecology offers the most appropriate metaphor for understanding the world and acting appropriately in it. Ecologism suggests the need for a radical change in our relationship with the natural world, and in social and political life, and is distinguished from simple environmentalism.

Holistic thinking - a way of thinking which is attentive to wholeness, being the apparent tendency for living systems to produce complex wholes with properties that cannot be predicted from the properties of their parts.

Whole systems thinking - a form of thinking which attempts to explicate the ecological worldview, through revisioning epistemology, ontology and methodology in terms of wholeness. In so doing, it attempts to bring together and syncretize the methodology of

systems thinking, a co-evolutionary ontology, and the worldview and ethical orientation of ecological thought.

Box A.3: Clarifying relationships

My research has led to these conclusions about the relationship between descriptors of forms of thinking:

All systems thinking is holistic, but not all holistic thinking is systems thinking. This means that holistic thinkers are not necessarily aware of the ideas and concepts that have become associated with the field of systems thinking.

Ecological thinking is essentially holistic, but not all holistic thinking is ecological. This means that not all holistic thinkers necessarily share the ideas, values and beliefs of ecological thinkers who articulate an ecological worldview.

Some systems thinking is ecological and some is not. This means that many people use systems thinking for all sorts of purposes and ends, but do not necessarily have an ecological perspective.

Some ecological thinking uses systems ideas, concepts and methods, but much does not. Many people who regard themselves as having an ecological perspective, often do not know much - if anything - about systems ideas.

Educational paradigm

I have argued elsewhere (Sterling 2001, 14) that “most mainstream education sustains unsustainability - through uncritically reproducing norms, by fragmenting understanding, by sieving winners and losers, by recognising only a narrow part of the spectrum of human ability and need, by an inability to explore alternatives, by rewarding dependency and conformity, and by servicing the consumerist machine”. To escape this matrix, I argue for ‘revisioning’ of the educational paradigm, but also that such change needs to be seen in the context of wider society.

Using a systems approach, I suggest below that the theory and practice of education may be seen as a ‘human activity system’ (Banathy 1991, 1992). Further, that it may be usefully seen as a subsystem of wider society, rather than as a parallel system. If this is a tenable analysis, it would suggest that education is deeply influenced by the socio-cultural worldview or paradigm of society which affords the context within which education operates (Banathy, 1991). From this point of view, the expectation - from the UN Stockholm Conference on the Human Environment of 1972 onwards - that education is the key to change towards sustainability in society may be seen as based on a simple and linear view of change and causation between ‘education’ and ‘society’, which ignores a large number of factors.

Hence, American educationist David Orr (1994, 17), describes a crisis ‘of’ education, which refers to its limited present ability to contribute to a better world and its reproduction of dominant assumptions. Secondly, he suggests a crisis ‘in’ education: its limited ability to assert humanistic and democratic values and practices. Whilst politicians and editorial writers are frequently occupied by a perceived crisis in education relating to ‘standards’, the larger crisis of education goes largely unnoticed. What is limiting education - I will argue - is the fundamental educational paradigm which informs its thinking and practice, and which derives from the context of the wider socio-cultural paradigm and its view of the nature and role of education. These frameworks have been overlain in recent years - not just in the world of education, but also in local government, health, police and other areas of public life – by quasi-market and managerialist ideas and forces which, arguably, have narrowed our shared conception of what education means and entails (Marshall and Peters 1999, Smyth and Shacklock 1998).

Meanwhile, the environment/development crisis continues, fuelled partly - as Orr has pointed out - by the human legacy of the last century’s educational practices. Clearly, ‘more education’ is not the answer to this crisis - or at least, not more of the same. This is something that E F Schumacher recognised some thirty years ago (see quotes heading Part A). Schumacher’s plea for an ‘education of a different kind’ begs the question regarding its nature, and also, how we might be able to learn our way towards forms of education that are more suited to the conditions of complexity, unsustainability and systemic breakdown that characterise our times. It is not that the idea of paradigms is unfamiliar in education - it is just that debate tends to be about or largely at the level of ‘subparadigms’ jostling largely within the framework of the larger

modernist-mechanist-reductionist cultural paradigm whose assumptions and values still tend to shape and colour thinking and debate.

One possible route out of this trap is systems thinking, as promulgated by what I have termed above 'systems as discipline'. But here, very limited progress has been made. Ray Ison, who, as professor at the Open University's Centre for Complexity and Change, is well placed to judge, comments thus:

> To date, the emphasis must be placed on 'potential' as the extent to which systems thinking has been applied in (education) remains relatively limited. For example, there is a very limited literature on the use of systems ideas and methodologies…
> (Ison 108, 1999)

The key issue is not about winning tokenistic change within the framework of an uncomprehending and uninterested dominant educational paradigm, but how to encourage systemic change in that paradigm towards holism and systemisism. In other words, I make a key distinction between 'learning *through* education' (relating to *provision*) which is the usual subject of educational discourse, and 'learning *within* education' (relating to the guiding *paradigm*). This is a shift of attention from education as '*agent* of change' (which is how it has often been represented in international mandating documents and by a variety of education for change movements), towards education as '*subject* of change'. This is a simple but critically important distinction which I first made in my Earthscan book (Sterling, 1996). Learning within education - primarily by policymakers and the educational community - requires both a theory of change, and a philosophical basis that can challenge and transcend the norm. This is where I believe whole systems thinking offers hope. The argument developed in the Thesis turns on the idea of different systemic *levels of paradigm*, and associated *levels of learning*, which derives from Bateson's work on logical types and learning. This model is outlined in more detail in section 3 below, and again in Part B 1.3.

The effect of patterns of unsustainability on our current and future prospects is so pressing that the response should not be predicated only on the 'integration of sustainability' into education, because this invites a limited, adaptive, response. Rather, I will argue, we need to see the relationship the other way round - that is, the necessary transformation of education towards the integrative and more whole state implied by a systemic and ecological view of sustainability in education and society, however difficult this may be to realise. I introduce and explicate the term 'sustainable

education' to indicate this visionary state, to distinguish between this and forms of sustainability education which tend to be contained, constrained and often marginalised. I now look at such forms, and specifically environmental education.

Environmental education

Issues here concern the status, constraints upon, and nature of *environmental education* (EE) and forms of sustainability education such as *education for sustainable development* (ESD). Again, using a systems approach, I suggest it is helpful to regard environmental education and education for sustainable development as systems of interest, and as overlapping subsystems within the larger context of the education 'human activity system'. *Sustainability education* is often used as a term which subsumes other related terms.

Whilst discourse within the environmental education field has developed rapidly in the last decade, arguably, the fact that this discourse has taken place largely *within* rather than affecting thinking *beyond* the field indicates that progress with the 'ecologisation' of education as a whole has been marginal, and in some respects behind the greening processes in wider society. If it were possible to assist systemic change in the dominant educational paradigm, which is considered in this Thesis, it might create more opportunities whereby environmental education could flourish further and influence the whole, rather than remain marginalised. Eventually, perhaps, there would be no need for any separately identified 'environmental education'.

A second issue concerns how far environmental education, education for sustainable development (ESD) and related fields of 'education for change' - such as development education, peace education, future studies, anti-racist education, human rights education, global education, human-scale education and holistic education - are also influenced by the larger educational paradigm within which they operate and which they seek to affect. I will argue that environmental education and education for sustainable development are inevitably shaped by this paradigm, particularly as regards an instrumentalism which gives insufficient attention to the nature of education and of learning, and that their claims to holistic bases are only partially valid. Yet at the same time, I will argue that because these fields link - to some degree - into progressive social and environmental movements, this lends them a certain power to effect change in educational systems and institutions that are often relatively closed in relation to these currents of change. To realise this power, however, sustainability

education needs to shake free of the instrumentalist and behaviourist assumptions that have underpinned much policy, discourse and practice for some decades.

Since the UN Stockholm conference of 1972 and the present, there have been many international resolutions and reports which identify and give a mandate to education as the most critical key to change with respect to addressing environment and development issues and ushering in a more sustainable society. In my work at national and international level, I've seen very many iterations of this idea; yet there is little evidence of social change at any other than the micro scale as a result of formal environmental education programmes.

It became apparent to me that however good specific environmental education programmes might be, and perhaps however widely provided, education as a whole is shaped by predominant values and beliefs in wider society. As Miller (1999, 193) suggests:

> ...holistic education is not going to save our society. We cannot educate a new generation and then hope they will change the world...it will only become accepted and widespread, to the extent that our culture itself changes.

Therefore, the question of the role of education in social change demands a whole systems view which looks at change in society and culture, and the opportunities and dynamics this affords in the relation between education and society. This view also has to take into account the important fact that formal education is but one influence among the many that form the total milieu that affects the individual or group.

For me, the question became less one of ‘how can environmental education change people’s behaviour in respect of the environment’. This has been a dominant question underlying much environmental education discourse over the last thirty years - one which reflects an instrumental view of education, and a rationalist and linear view of change, albeit for the best of intentions. If we see instead education and society in a co-evolutionary relationship, the key question then becomes ‘how can education and society change together in a mutually affirming way, towards more sustainable patterns for both?’ This is a change of focus which allows a more creative and perhaps subtle response to the sustainability issue. In systems terms, it is seeking a ‘positive feedback loop’ whereby change towards sustainability in wider society supports sustainable education, which supports change in wider society, and so on. It takes us from a model of education as one of social reproduction and maintenance, towards a vision of continuous re-creation or co-evolution where both education and society (or at least

parts of them) are engaged in a relationship of mutual transformation - what has been called a “future-creating, innovative and open system” of education (Banathy 1991,129) which can explore, develop and manifest sustainability.

Seen this way, and as suggested above, environmental education can potentially play a transformative role in helping re-orient wider educational thinking, policy and practice - and particularly if it can become more genuinely holistic in the ways which I explore later in the Thesis. Again, systems thinking and systemic approaches to learning and research have a key role to play in taking EE and ESD closer to being holistic modes of enquiry, but I have found relatively little development in this area. Work which clarifies the nature and potential of systems thinking in education for sustainable living, and which shows how to encourage a 'systemic literacy' relating to awareness, understanding and insight, competence and a sense of responsibility appropriate to a systemic world, is quite rare - particularly involving explicit (as opposed to implicit) systems approaches. According to Milbrath, this orientation is missing from education as a whole. Ecological thinking, he suggests, “requires people to learn how to think systemically, holistically, integratively, and in a futures mode” (Milbrath, in Slaughter 1996, 194).

At a deeper level, ‘whole systems thinking’ implies that educational purpose should go beyond nurturing systemic literacy towards developing a sensibility, an understanding and a *systemic wisdom* arising from a deepened appreciation of, understanding of and engagement with the connectedness of phenomena. This includes but transcends what has been termed ‘environmental literacy’ in two ways: one, that literacy tends to imply the ability to ‘read and write’ the environment, i.e. is concerned with perceptual and descriptive aspects, rather than wisdom which is to do with *action* as well as perception and conception, and second, systemic wisdom implies a changed epistemology and ontology towards a participative, relational view which is not necessarily the case in the environmental literacy debate. My assumption, examined here, is that both collectively and individually we need to re-discover and nurture this sense of engaged participation, for its own intrinsic value as part of becoming more whole and integrated persons, as well as allowing us to address more effectively and wholly the pressing issues of our age. From a whole systems viewpoint, these 'internal' and 'external' aspects are intimately connected.

Most environmental education discourse seems relatively unaware of the implications of the nature of revisionary postmodernism and ecological thought, and of the participatory research paradigm which is associated with this emerging paradigm. However, over the eight years of my research, the situation changed to some degree, and this is examined further in Part D.

In sum, I argue that the future efficacy of *environmental education* as regards the sustainability transition, depends largely on greater attention:

- to operative values informing ethos and practice and to working for change in the dominant *educational paradigm*
- to the nature of *learning levels* and the need for transformative learning
- to the significance and nature of *systems thinking and ecological thought*,
- to signs of change in *cultural worldview* towards a more ecological orientation
- to *sustainability* in relation to complexity theory.

These conditions are also relevant to education as a whole, and to systems thinking (see Box A.4 below).

Scope

The scope of the research is wide and includes:

- the predominant way we think (perceive, value, conceptualise and act) individually and collectively,
- the nature of limits to this thinking,
- the changes in thinking that appear necessary if people are to build more ecologically sustainable and equitable modes of living,
- the degree to which these are happening as part of a cultural movement,
- why deep learning is difficult and how it can occur,
- and the implications of such change for a transformed and transforming mode of education,
- evidence for the emergence of an ecological worldview in Western culture as a postmodern phenomenon, and arguments by commentators that this change is necessary to a liveable future.

An emerging neological conception of systems thinking - whole systems thinking - which goes beyond conventional systems science will be identified, elaborated, and critically justified both as an inherent and evolving part of the ecological worldview, and

as a rationale for change in education through which education might in turn better assist the realisation of ecological thinking in cultural change. The explication of whole systems thinking in Part B (and further elaboration in **Appendix I**) leads to an exploration of its potential and meaning for education in general and environmental education in particular, in terms of both 'change *in* education' and 'education *for* change' in Parts C and D. I argue for cultural change in education as a whole and introduce the label 'sustainable education' to describe this qualitative change.

In sum, my research interest is in the discovery, exploration and development of a theory (or set of theories) which:

- help explain the lack of fundamental change in educational paradigm, (that is, the relative inability of the prevailing educational culture as a system of thought to change through learning),
- help construct a theory of transformation that might assist such fundamental change - which would in turn…
- enable a transformed educational paradigm to support a quality of transformative learning necessary to societal movement towards sustainability.

➢ Key point: In sum, the task is to bring together, develop and indicate the grounding for holistic theories which may help a transformed and ecologically-oriented educational paradigm to emerge, which in turn supports the kind of transformative learning, that will support the sustainability transition.

The conditions for the emergence of such a paradigm are summarised in Box A.4. below. Clearly, the scope of the Thesis demands both sufficient breadth to embrace a large enough 'whole' in order to contextualise the parts of the argument, and sufficient depth to substantiate the argument. The difficulties of managing and bounding this are reviewed in section 2, Methodology.

Box A.4: Articulating and realising an ecological worldview in education - five conditions

Towards the end of the research period, I arrived at five critical conditions which may be used to assess progress towards articulating and realising an ecological worldview at an epistemic level, through the construction and articulation of a 'sustainable education' paradigm.

My argument is that if *education as a whole* and *systems thinking* and *environmental education* met these conditions, we would be close to realising such a sustainable education paradigm.

There is an *order of realisation:* generally speaking, systems thinking and environmental education might be seen as equally close (or equally far away from, depending on how one looks at it) to realising the ecological worldview through meeting these conditions – but in different ways. Education as a whole however, is way behind. The word 'sufficient' denotes that these conditions are relative rather than absolute. What I am calling 'whole systems thinking' in this Thesis, would be 'sufficient' i.e. would fulfil the conditions.

We need to ask how far *education as a whole*, how far *environmental education* and all forms of sustainability education, and how far *systems thinking,* viewed as systems of thought and communities of practice, each shows, respectively*:*

1. Sufficient awareness of its own value base at a deep level - in relation to dominant worldview - and of the influence of the dualistic epistemological 'error' or inadequacy.
2. Sufficient awareness of learning levels and the need for epistemic learning
3. Sufficient awareness of the postmodern ecological worldview
4. Sufficient awareness of whole systems thinking
5. Sufficient understanding of sustainability in relation to complexity theory

Each of these themes recur in the Thesis and the background to each is explored.

1.2 Relevance and significance

The research is based on my professional experience, as outlined in the Preamble, and on existing literature. I have both developed and evaluated many of the ideas that are elaborated here in my professional work, not least through my previous publications and teaching. Further, I've had a good deal of feedback over recent years to indicate that much of my work has been influential, and this indicates both a degree of validation and demand. My aim here is to explore, develop, consolidate, and present the argument as a deeper platform and integrated whole which can both further inform practice and help make a difference to discourse.

The relevance and significance of the research lies in the contribution the research might make, in the longer term, to help close the theory-practice gap between

international rhetoric and reality by offering a paradigmatic theory which might help explain why the reorientation of education towards sustainable development is slow and difficult, and how a number of tensions and limitations in environmental and sustainability education discourse and practice arise, and might be transcended.

Further, and more specifically, I see the research as a contribution towards a theory of whole systems thinking that might be used, post doctorally, as a foundation for applied research on the development of curriculum, pedagogy, and organisational change that can embody and enhance 'systemic literacy' and indeed ‘systemic wisdom’ particularly in relation to sustainability issues.

As regards originality, I am not aware of work of this scope and integrative nature taking place, although there is a good deal of contributory work to draw upon within the fields embraced here - systems thinking, ecological thought and its manifestations, revisionary postmodernism, complexity theory, sustainability theory and adaptive management, environmental and sustainability education. Indeed, it is the bringing together of concepts and insights from these fields which make for originality. Despite increasing calls for integrated and whole systems thinking, its nature and implications are little articulated, and I wish to make a contribution to that end. Further, whilst there is some interplay between systems methodologies, sustainable development discourse and practice, and participative theories of learning, there appears to be real potential in exploring those connections further, particularly in relation to ecological thought and implications for education.

In addition, I anticipate that the research will make an original contribution to discourse on the form and development of environmental and sustainability education and perhaps even on education generally. An anonymous referee for an unsuccessful ESRC bid based largely on this work stated that the proposal was 'intellectually exciting' and 'pertinent and timely' (ESRC 1997). Ultimately, and as discussed further in ‘Methodology’ below, the validity of the research hangs on its worth in influencing thinking and practice. This dimension is discussed further in Part D.

1.3 The context of the research

This subsection paints some of the contextual background to the research undertaken. This background can be set out as two groups of *starting points* which have informed the inquiry. The first group relate to:

Sustainability and the response of education

1. The critical state of the world in terms of the four dimensions of sustainable development identified by the Brundtland Report (WCED 1987) (environment, equity, quality of life, and legacy for future generations) and related indicators; increasing and urgent calls for reorientation of economic, social and political life towards more sustainable patterns, and progress in understanding and enacting sustainable development (World Resources Institute 2000, Brown 2001, Loh 2002).
2. The systemic nature of the world, accentuated by and manifested through economic and cultural globalisation, global electronic communications, and social and environmental stresses.
3. The repeated identification of education as 'the answer' in international rhetoric on environment and development issues. Between the UN Stockholm Conference of 1972 and the present, numerous statements have pointed to the key role of education from creating “new patterns of behaviour of individuals, groups and society as a whole towards the environment” (UNESCO 1978) to being “critical for promoting sustainable development and improving the capacity of the people to address environment and development issues” (UNCED 1992). Agenda 21 talks of the need to 'reorient' education towards sustainable development (UNCED 1992). . At the same time, debate has taken place regarding the constraints on education to fully realise the rhetoric regarding 'reorientation' towards sustainable development (Fien and Trainer 1993, Huckle 1996, Mayor 1997, Parry and Scott 1997, Fien 2000).
4. A quite separate discourse on the purpose of education in the postmodern world (Delors 1996, Hargreaves and Fullan 1998) has taken place, whilst at the same time, policymakers have put new emphasis on the need for 'the learning society' as response to a perceived need to develop skills to suit changing economic conditions, rather than to anticipated future sustainability crises.

Therefore, at one level, the research inquiry centres on the ‘response-ability’ of education - how far it is able to respond to the challenge of unsustainbility and contribute towards the reorientation of society towards more sustainable living patterns. By taking a 'whole systems approach' this leads to investigation of a deeper problem which concerns why society is characterised by unsustainable patterns of activity. This then raises the question of the dominant social worldview or paradigm, the need to examine its nature, and alternatives.

This points to a second set of starting points which have informed the inquiry. These relate to:

Changes in worldviews and the emergence of systems thinking

1. Critiques of modernism and of postmodern deconstructionism, and calls for new thinking based on recognition of a 'crisis of perception' (Spretnak 1997).
2. The emergence of and manifestations of an ecological paradigm in a number of fields within the context of postmodernity, such as holistic science (Waldrop 1992, Goodwin 1994, Harman 1994) ecological economics (Costanza1991, Daly 1996), and ecological design (Todd and Todd 1994, Lyle 1994, Wann 1996).
3. Renewed attention to systems thinking as an approach to addressing the challenge of sustainability (Meadows 1992, Clayton and Radcliffe 1996, Bossel 1998, Bell and Morse 1999).
4. Calls for whole systems thinking in education and learning (Milbrath 1989, Meadows 1992, Sterling 1996a and 2001, Mulgan 1997, Laszlo 1997), and work on alternatives to dominant neo-liberal views of education and learning based on more integrative and holistic values (King and Schneider 1992, Smith 1992, Toyne 1993, Posch 1996, Sterling 1996a, Banathy 1991, Delors 1996, Hargreaves and Fullan 1998, Laura and Cotton, 1999, O' Sullivan 1999, Smith and Williams, 1999). Further, the emerging idea of 'social learning' (Finger and Kilcoyne 1995, Slaughter 1995) pointed to the process and possibility of deeper cultural change.

These two sets of starting points present respectively, the 'bad news' and the 'good news'. The first invite an inquiry into how far a systems perspective can illuminate and explain both the unsustainable nature of current courses of development and the difficulty education has in responding to this critical issue. The second invite an inquiry into how far whole systems thinking and perspectives can renew and re-vision education generally and environmental education in particular to help create a more sustainable society and future.

1.4 Research questions

As stated above, the primary research question is:

> 'How might whole systems thinking assist the revisioning of (environmental) education in the light of an emergent postmodern ecological worldview?'

As noted earlier, the Thesis attempts to take a systems approach through identifying interrelated levels of inquiry. Four contextual levels are identified (which correspond

with the four foci identified in subsection 1.1 above. In terms of systems logic, these four questions can be seen as a nesting hierarchy which starts at the larger context and works down. (Note that sustainability is treated as an overarching context and is therefore a recurring theme.)

Thus, the first task is to examine the nature of change at the most fundamental and most general contextual level of study. This involves critical reflection on the idea of 'paradigm' (largely used here interchangeably with ‘worldview’); the idea of 'paradigm change' in the current context of postmodernity; and evidence for and the nature of what appears to be an emerging postmodern ecological worldview in Western culture. Hence the first subquestion is:

1. What is the postmodern ecological worldview?

Exploration of this question will cover the following themes:

- modes of thinking, thought as a system, worldview and paradigm
- the nature of paradigm change and Bateson's learning levels
- outline of the bases of Western thought
- the postmodern condition and perceptions of crisis
- the possibility of revisionary postmodernism in the light of deconstructionism
- identification of and evidence for the postmodern ecological worldview

The next step is to examine the development of systems thinking, primarily in the last century. Secondly to critically reflect on how far systems thinking is ecologic, and ecological thinking is systemic, and how they may be coming closer together in whole systems thinking as an expression of an emerging postmodern ecological worldview in Western society. A simple original model or framework is suggested here to illustrate the meaning of whole systems thinking, representing philosophical, theoretical and practical aspects.

Hence the second subquestion is:

2 What is whole systems thinking and what is its contemporary significance?

Exploration of this question will cover the following themes:

- the emergence of systems thinking and a brief review of different schools of systems thinking

- emergence and development of whole systems thinking as part of the ecological worldview - including historical precedents and current developments, particularly in science
- differences and continuities between systems-as-discipline and whole systems thinking
- systems thinking as a bridge to and a means of understanding the postmodern ecological worldview
- an integrative model of whole systems thinking and key concepts
- systems thinking and sustainability
- criticisms and limits of systems thinking

The third subquestion examines the extent to which the theory-practice gap - as regards calls for education to lead towards a more participative and sustainable society - might be closed through the increased manifestation of whole systems thinking in cultural worldview and in education.

3 How might whole systems thinking inform paradigm change in education as a whole?
Exploration of this question will cover the following themes:

- the relative lack of engagement of education in sustainable development
- calls to clarify the nature of and role of education in the postmodern world
- different systemic visions of a transformed and transforming education
- paradigm discourse and the possibility of a participative, ecological paradigm
- a systems view of paradigmatic change through epistemic or transformative learning
- social learning and the current prospects for systemic change in overall educational paradigm towards sustainable education through a co-evolutionary relationship between change agents within education and in wider society
- management and design and the possibility of transformative learning systems

This discussion then allows the paradigmatic development of environmental education to be examined against a systems viewpoint. The idea that environmental education is ostensibly holistic but, seen as a 'subsystem', has largely been bound by larger educational and environmental paradigms is explored, particularly in relation to the emerging concepts of 'education for sustainability' and education for sustainable development. The extent to which an ecological paradigm is excluded or encouraged

by dominant paradigms in environmental education is examined by looking at some recent trends.

This includes discussion of which aspects of current thinking and practice in environmental education might be questioned, complemented or extended from a whole systems perspective, as well as a critical evaluation of the limits of whole systems thinking. Thus the fourth and final question focuses on how far whole systems thinking might lend greater coherence and direction to the theory and practice of sustainability education.

4 What is the relevance of whole systems thinking to environmental education theory and practice?

Exploration of this question will cover the following themes:

- the underpinnings of environmental education (educational and environmental paradigms)
- the limits of environmental education in relation to sustainability
- elements of systems thinking in environmental education discourse
- theory of systems change
- implications of whole systems thinking for ethos, curriculum, management, pedagogy and learning
- the limits of whole systems approaches

If this nesting hierarchy is seen from the bottom up, it seems that it is not possible to answer question 4 adequately without looking at the context of 3, or 3 without looking at the context of 2, and so on up the hierarchy. It should also be noted that a jump from 1-4, or 4-1 is difficult and therefore each stage is part of building the whole picture. Therefore, the Thesis structure reflects its argument: that understanding and meaning is deepened through consideration of context.

Sustainability is an overarching fifth theme, as noted in section 1.1 above. The main questions here are:

- how do systems thinking and ecological thought respectively view sustainability, and how do these views differ from mainstream views?
- how does sustainability imply the need for whole systems thinking, and how does whole systems thinking contribute to sustainability?

Lastly, the main research question implies further discussion of specific practice and effect which may be summarised by these questions:

- What pedagogies and methodologies exist or can be developed to nurture systems thinking competence in people?
- How does the introduction of systems thinking contribute to systemic awareness and sustainability?

These important questions are answered to some extent below, particularly in sections on transformative learning, but their detailed consideration lies largely outside the intended bounds of this particular study. There are two reasons for this: one that they lie beyond the main purpose of the Thesis which is primarily philosophically oriented, and second, they require a full study in their own right.

2 METHODOLOGY

2.1 Placing the research methodology

The nature of the inquiry

I now discuss the nature of this inquiry.

- It falls into the tradition of scholarly inquiry, rather than empirical study.
- It concerns an open and broadly-drawn question, and therefore is itself broad in scope.
- It is philosophically oriented, looking at fundamental questions of worldview, epistemology and ontology.
- It is partly descriptive, partly explanatory - and partly exploratory and speculative.
- It is an ‘informative inquiry’ not a ‘transformative inquiry'. It is an informative inquiry about transformation, that I believe might help others engage with issues of transformative learning and paradigm change.

Heron (1996) makes a distinction between informative and transformative inquiry, as the two pillars of co-operative inquiry, the first being essentially descriptive and explanatory, the second exploring practice and in so doing being transformative of it. I believe the Thesis will have transformative potential for some readers (judging at least, by feedback on my Schumacher Briefing, Sterling 2001, which was based on my then uncompleted Thesis).

The research tradition

I have tried to employ a methodology consistent with my understanding of the emerging new research tradition of *participative inquiry,* which, I argue, can be seen as an expression of the ecological worldview within the field of research. Alternatively, (but consistently), this might be also be seen as a *systemic inquiry.* Thus, the Thesis is not in the traditions of positivism or critical theory (although it has more in common with the latter than the former in that it embraces constructivism and is to an extent reconstructionist), and while it has some commonality with interpretivism, I believe goes beyond this liberal research tradition. It may be that it should be named 'deliberative theorizing' (Scott, 1996) which is concerned with normative rather than empirical questions, but again I believe it transcends this interpretive position. It may be that it is 'critically reflective inquiry' (Hart 1993) but this appears too directly associated with the emancipatory tradition. I recognise the contribution and value of this tradition but emphasise 'appreciation' before 'emancipation' as a guiding value in methodology.

I think my methodological position is inclusive rather than exclusive, that is, it acknowledges the validity of mainstream research positions, whilst in some ways reaching beyond them. It has something in common with established research traditions, but can also be differentiated. This argument is pursued in some depth in Part C.

The methodology can be best positioned in the light of the 'new' research paradigm that is associated with the concept of *participative reality* (which as noted earlier, is a fundamental concept in this Thesis). This paradigm (discussed in Part C) is variously known as 'co-operative inquiry' (Heron 1996) or 'participative inquiry' (Reason and Bradbury 2001).

> (It)...is a form of participative, person-centered inquiry which does research *with* people not *on them* or *about* them. It breaks the old paradigm separation between the roles of researcher and subject.
> (Heron 1996, 19)

How can I call a literature based research study 'participative'? Firstly, it is *about* participativism, but also it is founded on my own experiential knowing from many years of full-time active participation in the environmental education and sustainability education debate and communities, interacting with many of the leading players as well as working with teachers and other educators. It is also active in the sense that I have

played a *creative* role in the research, and according to Heron (1996, 202) - referencing Popper - there is no precise methodology for creating new ideas. A number of the ideas arising in this research have been exposed to and derive from personal interaction with others, particularly through my association with Schumacher College, Dartington, an 'international centre for ecological studies' where I led a course on 'Systems Thinking and Learning for Change' in April of 1998, and have been privileged to engage with leading ecological thinkers and scholars over the decade of the nineties.

It is also participative in that I have as far as possible tried to be aware of my dialogue, (Greek *dialogos* 'through meaning') i.e. my engagement, with the meaning of those written sources to whom I owe great debt. 'Participative' is one word I would use in describing the methodology, but other descriptors may also be usefully employed. Not least, I see it as a systemic inquiry. These further descriptors are outlined below.

Methodology descriptors

I have claimed above that I have employed a 'systems approach' in writing the Thesis. What I mean by this is that it is underpinned by an essentially relational view of the world, that I seek to discover and explicate pattern, and that I use systems concepts and models, not least in the structure of the Thesis. In addition, to *systemic* I believe the following additional descriptors are appropriate:

- *appreciative* - my approach has been integrative, recognising and building from disparate 'partial validities', that is, different truth claims
- *creative* - I attempt to develop new ideas by bringing together insights and concepts from different areas
- *deliberative* - both analytical and developmental
- *critically reflective* - it is reflexive with regard to others and my own ideas
- *informative* - it is presented as a body of thought that can inform the debate
- *epistemic* - it is about an emergent epistemology: the research has changed me, and might help radical change in others' perspectives; and as far as possible I have sought to be critically aware and transparent about the role of my own values and perceptions.

Of these, I will comment more on the first descriptor ('appreciative') as I think it is one of the keys to the approach I have endeavoured to use. One of the recurrent themes in the Thesis is the persistence of dualism in our individual and collective psyche, and in our thinking. This extends to discourse whereby one party attempts to assert validity or

veracity by negating or disproving the opposite viewpoint. This is a method which is an inherent part of academic debate. It is an expression of binary thinking - 'I am right because you are wrong'. Whilst a useful and appropriate approach at times, it tends to ignore the value and veracity of 'opposite' views. Rather than this 'either/or' thinking, we can employ 'both/and' thinking, which does not deny difference but does recognise partial validity. Wilber (1997), for example, suggests that no mind can be 100 per cent wrong, and therefore he seeks to integrate partial truths into a greater, or more adequate, whole. This is consistent with the idea of multiple views of reality and that any claim to a more adequate view must embrace multiple views.

This appreciative approach links to *abduction* which is discussed in the subsection below.

Methods - and the role of abduction

The main methodological tools I have used are:

- *collection* - gathering sources across the field of inquiry. This included material and ideas gathered years ago, up to and including the whole period of Thesis writing. In terms of 'data' (although this is a somewhat arid term for the informational and conceptual sources of this Thesis) the main sources have been a large number of books and papers, followed by conferences, courses and seminars, and informal discussion. Four courses attended at Schumacher College, Dartington, between 1993 and 2000, ranging from one week to four weeks in duration, have been key influences on my thinking and writing. For one of these I was the lead tutor, for another, the facilitator, and a participant at the remaining two - including a month's course with Fritjof Capra in the summer of 1993.
- *analysis* - examing the elements to look at their relevance to the whole field of inquiry.
- *abduction* - attempting to perceive pattern between disparate elements.
- *synthesis* – using these findings to distill and substantiate insights, assertions, and generic models.

The process has included intense and continuing reflection, reading, note-making, cogitation, unplanned moments of insight, constant 'triangulation' of ideas against others' ideas, and iterative learning over a period of eight years. I have had discussions on aspects of the Thesis over the years with a small number of colleagues interested in systems thinking and learning.

Of the four methods described above, I wish to comment on abduction, as again - like appreciation - it is a key to my approach here. Bateson (1972) differentiates between *deductive* and *inductive* thinking on the one hand, and *abductive* thinking on the other. This is fundamentally about recognising patterns of likeness between things, and reasoning by analogy - 'this is to this, as that is to that'. In his seminal work *Mind and Nature* Bateson (1980, 9) coined the phrase 'the pattern that connects' - a phrase that has been much used by holists since. Van der Hoorn (1995, 63) whose research on 'ecosystemic thinking' (which I take as largely synonymous with 'whole systems thinking') is largely based on Bateson states:

> Abductive thinking involves perceiving patterns that connect by using both non-rational and rational logic. The usual duality between rational and irrational is complexified by the introduction of non-rational logic as a viable and scientifically valid form of reasoning. Non-rational logic encourages scientists to look for patterns across apparently disparate phenomena. Doing so may give rise to creative insights which cannot be generated through rational logic.

This describes an approach which seems to me to be part of my perceptual being, rather than just a methodological tool. As noted in the Preamble, I am constantly wondering how things relate, always looking for pattern in complexity. I seem to have an ability to find parallels and patterns of thought between and within different sources, and used this to a great extent in my use of written sources.

Along the same lines, the systems thinker Senge makes an important distinction between what he terms 'detail complexity' and 'dynamic complexity'. The former concerns situations characterised by many variables and "complex arrays of details" (1990,72), while the latter concerns subtle patterns of change over time. Senge's idea of systems thinking is very much centered on dynamic complexity, with "helping us see the deeper patterns lying behind the events and the details" (73). This perhaps echoes the holistic idea of being able to 'see the wood as well as the trees', and seems to tie in with Bateson's view of abductive thinking.

The field of inquiry - education, learning, holism, systems thinking, complexity theory, sustainability, and paradigm change - is enormous. If we take a 'detailed complexity' approach to this field, we are literally lost. It is not possible to make this intelligible by the analytic tradition of breaking the area up into separate parts. Instead, I have looked for *pattern,* to render dynamic complexity intelligible. And so the Thesis is largely about exploring tentative ideas and theses based on patterns, analogies or 'relations between

parts' (Bateson 1980, 9*).* Essentially, I am interested to explore this question: w*hat is it that mutually illumines learning, education, sustainability, systems thinking, ecological thinking, and sustainability - are there patterns that connect these areas*?

Intuitively, and before this doctoral research began, I felt there were important patterns, and part of the motivation for the Thesis work was to discover, explore the substance of, and suggest such patterns - together with any insights that arose in the process. Hence, in advocating a 'whole systems' approach, I have tried to use whole systems thought, that is engage my feeling and intuition, and my non-rational logic, as well as my rational intellect.

This brings me to assumptions informing the research, and this is discussed next. (Further discussion of my interpretation and use of the terms 'epistemology' and 'ontology' may be found in section 3.1 below.)

Assumptions

My ontological assumptions are that:

- reality is ultimately unknowable, but this does not deny the existence of an independent reality.
- that reality has both physical/material and non-material/mind/spiritual dimensions, and that 'everything is connected to everything else' - that is, I proceed from an assumption of connection rather than disconnection, of relationship rather than separateness.
- that mind and matter are not separate in the Cartesian sense, but complementary, co-defining and co-arising (a panexperientialist view).
- that the cosmos is one of fundamental self-organising order rather than chaos and randomness. For example, I would agree with Flood's reading of complexity theory that it suggests if not fully explains "a hidden order, or simplicity, in the seemingly impenetrable complexity of the world" (1999, 2).
- that some form of holistic/systemic/ecological thinking and knowing allows us a more adequate approximation than oppositional realist or idealist positions allow.
- that an ecosystemic or whole systems view of ontology takes us beyond the realist and idealist argument whilst recognising the partial validity of both views. I call this position *relationalism*, a position which recognises a 'participative reality' (Heron 1996).

- that we live in a time of planetary sustainability crisis which has ecological, economic, social, and political aspects, rooted in an existential crisis of purpose, meaning and perception in Western culture.

My assumptions about epistemology are that:

- the adequacy of our epistemology particularly in Western culture is critical as we are in a participatory relationship with reality (whether we realise it or not).
- we know both far less about the world (in the ontological sense) than we think we know, and far more (in the intuitive, inspirational and non-rational sphere) than we commonly appreciate (if we did but recognise and access it).
- we therefore need to value and develop our capacities for 'other ways of knowing' - including intuitive and non-rational knowing - in addition to rationality, empiricism and scientific knowing.
- we need to recognise the subtle and pervasive power of dualism, separation, and reductionism in our perception and epistemology, even where we believe we have surmounted them (reference Bateson's epistemological error).
- propositional knowing based on rationality or empiricism is only part of our current knowing, and that the ecological, participative worldview implies an extended, deeper and more integrated epistemology.
- the knower is implicated in the known, and awareness of this is 'participatory knowing'.
- participative knowing involves both a sense of connectedness and critical thinking
- discussion about epistemology does not necessarily affect our operative epistemology.
- although epistemology and ontology are often discussed and considered separately, in our day-to-day operative worldview they are co-defining.
- 'system', 'organism' and 'ecology' are useful metaphors for understanding phenomena, and are key to an ecological epistemology.
- as taught by Eastern traditions of enlightenment and Western mystic traditions over hundreds of years, we can state that is possible to achieve greater levels of awareness and self-realisation in life through a process of 'coming to know', which can be triggered through transformative learning.
- epistemic, or transformative learning, inevitably leads towards some form of ecological or relational worldview.

This last point is key. It is a point which I have discussed personally with Richard Bawden (July 2003) (whose work has influenced mine) and with which he concurs.

My assumptions about the role of values in research is that they are inescapable and need as far as possible to be recognised and transparent. I believe my own values are apparent from the much of the text above, particularly the Preamble and Methodology sections. Essentially, I am interested in transformative research - work which makes a positive difference to the human and non-human prospect, and I hope that this Thesis may fufill this description to a useful degree. I now discuss some of the issues that have arisen in developing the Thesis.

2.2 Methodological issues

Paradigm change and self-reference

The key issue turns on the question of paradigms. The Thesis attempts to explore how we might transcend our shared cultural paradigm through whole systems thinking. The problem here concerns how far talking about worldviews inevitably still remains within the parameters that one wishes to escape. It is a problem of self-reference, which is indicated by this quote from Meadows (1999a,105):

> It is so hard to talk about worldviews. It's like trying to see the lenses of one's own eyes, trying to bite one's own teeth, trying to explain one's language without using that language.

In terms of the concept of learning levels (as discussed below in A.3.1 and B.1.3) the Thesis is trying to talk about transcending the trap of self-reference, and the possibility of re-constructing our cultural paradigm at a higher order of learning which represents a change of worldview.

Most discourse however, takes place within the bounds of what what systems thinkers term first order learning, whereby fundamental assumptions lie unexamined. Even where paradigms are the subject of debate, for the most part, this discussion is at a different and 'lower' logical level (than is being attempted here) and essentially concerns subparadigms within a constant (largely mechanistic) paradigm that remains fundamentally unchallenged. In other words, most debate and discourse revolves around differences of perspective, but within accepted parameters and on the basis of accepted axioms which are often unarticulated. This facilitates communication and discussion and reduces the need to negotiate common starting points, even where

viewpoints appear diametrically opposed. But where 'a new paradigm' is being discussed, by definition, the parameters and axioms change, beyond the limits of 'conventional wisdom'. They need to be identified, articulated, and negotiated. These new ideas challenge assumptions within the existing dominant paradigm, and can therefore be viewed as threatening, heretical or nonsensical.

Consequently, it can take considerably more time and space to generate understanding and facilitate discussion, because the new paradigm pushes boundaries outside common experience and norms. There are further problems. If there is indeed a current cultural shift in whole or in part towards a 'new ecological paradigm', no one can know for certain where on the spectrum of change societies (or parts of societies) may now be situated, where such change might be going; or even what - with any certainty - constitutes a paradigm which is in the process of formation. (Such understanding would only be achieved with the hindsight of our descendants.)

Therefore, clear identification and articulation of the characteristics of a worldview still-in-the-state-of-becoming is not simple. Then too, the dominant paradigm of modernism is not at all dead but in a state of adaptive change and in tension with postmodern deconstructionism. These orientations may or may not allow the growth of the 'postmodern ecological paradigm', with which they overlap. Further, as a product of the dominant paradigm, I may be advocating systemic thinking with a mind far more deeply rooted in reductionist and dualistic ways of thinking than I realise or can consciously know, and any reader might be similarly handicapped. As noted above (Heron 1992, 251), “It is a big shift for concepts to move from being simply beliefs held in the mind to beliefs that inform and transform the very act of perception”. In other words, it may well be possible to discuss ‘whole systems thinking’ in a way which conforms with analytic logic and reason, but does not embrace forms of knowing which are suggested by a more holistic way of thinking and being.

The limits of propositional knowledge

Academic convention favours propositional knowledge, almost exclusively.
As Heron (1996, 33) remarks, academic research “rests on the unquestioned assumption that intellectual knowledge is the only valid and respectable outcome of systematic inquiry. This one-dimensional account of research offends a fundamental principle of systemic logic, the logic of whole systems”. Hence, he suggests that propositional knowledge should be seen as part of a larger or extended epistemology which includes other ways of knowing. Similarly, Reason (1994,12) suggests that the

Western separation of intellect from experience means that intuitive, practical, affective, analogical and spiritual knowledge is valued less highly.

Following academic conventions, the argument in the Thesis is largely presented as propositional knowledge, which is perhaps contrary to the idea of a larger epistemology implied by whole systems thinking. But I am at least aware of the limitation here: and the argument is informed by my own experiential, intuitive, and practical knowing. Further, my effort to reflect a systemic logic in the structure of the Thesis (see 2.4 below), to reflect systemic thinking approaches and models in the argument, and use abduction, distinguishes the text from a conventional linear narrative. At the same time, and in common with many ecologically oriented writers, I am intentionally using propositional argument as a 'necessary but not sufficient' means of attempting to help shift the mainstream ground of intellectual debate.

Writing and reading the Thesis holistically

One of the problems with an abductive approach is that as a writer, you cannot always explain how you made the connective leap between elements, and if you do try, you run the risk of losing the reader in 'detail complexity'. As I have tried to write more holistically - to indicate pattern, to use recurring models, to use iteration, to employ nesting system structures - it requires the reader to also read differently than is the norm, at least to some exent. Some of the content of this Thesis does not yield itself to simple critical analysis; rather it requires the reader to also engage in making connections, and to think integratively, to come with an appreciative mind first and critical mind second, and aware of his or her own participation with the Thesis in part and as a whole. In other words, to balance the tradition of academic rigour with a participative imagination.

A good deal of normal intellectual discourse is about detail complexity, rather than context and pattern, and while analytic rigour over details remains important, so too is an ability and willingness to recognise insights and arguments derived from overview and connectivity. In working towards a systemic worldview, Mary Catherine Bateson suggests "analysis is only a fraction of the task, for analysis has always been a means of control" and rather, suggests that what are required are "*moments of imaginative recognition*" (Bateson 2000, xiv, my italics). This phrase captures the essence of abductive thinking.

Use of models

The attempt to write in an holistic rather than 'building block' way about holistic content presents two related problems. The first concerns the difficulty of conveying multiple relations and connections in a sequential text, the second concerns the extent of material that might be covered. Because the territory is potentially borderless, not only does one have to decide where to draw one's *boundaries* (and this is a critical concept in systems approaches), but also, be able to navigate the territory.

To tackle both these issues, I have worked on, developed and used models a good deal (and this is a strategy I have used for many years in writing and teaching) because I believe they help change or deepen perception. As Lissack (1999, 4) writes:

> …old models of thinking persist long after they are productive. New ways of thinking don't just happen; they require new models that have to be learned.

To take a dictionary definition, a model is:

> an abstract way of presenting the relations between…phenomena. Models will not necessarily perfectly represent the actual world but will provide devices which simplify and aid understanding of the essential mechanisms involved. (Abercrombie *et al.* 1984, 158)

Models are essential to human understanding. From simple concepts like 'dog' or 'tree', to metaphors, diagrams, complex theories, and indeed whole paradigms (the Greek word *paradeigma* means model), their function is to represent and interpret the world. They are very powerful, not least as so often we confuse the map (model) for the territory, and can either liberate and enlighten or constrain and confuse.

Models and modelling are essential parts of systems approaches, to represent and generate new insights on a given reality. Following Bateson, I have sought to find and elaborate 'the pattern that connects' the many ideas and lines of enquiry I have tried to touch on in this study. In sum, I have tried to use a *systemic approach to develop systemic models to clarify a systemically related field.*

In so doing, I am aware that the models I have elaborated, do simplify – like all models. But I hope that they clarify and make the field more understandable. They are, to quote

the title of Waddington's unusual book of 1977 which was written to encourage relational thinking, 'tools for thought'.

The secondary meaning that models represent always raise questions of validity. As Heron (1996, 185) says, in a comment which might apply to the validity claims of the whole Thesis as well as the models presented therein:

> It is all the time a moot point how much (our) conceptual maps….reveal primary meaning by reflecting it and pointing towards it, and how much they obscure it by irrelevant, imported theorizing. There is no final account; only one that strikes the best available deal between (our) lived experience of primary meaning on the one hand, its linguistic and cultural context on the other, and (our) transformation into secondary meaning, which mediates between them.

In this Thesis, my emphasis is on sense making: I use conceptual maps to make further sense of my lived experience, in a way which, I hope reflects and points towards it rather than obscures it, and I hope, might help others.

Box A.5: Models developed in the Thesis

The main models elaborated are:

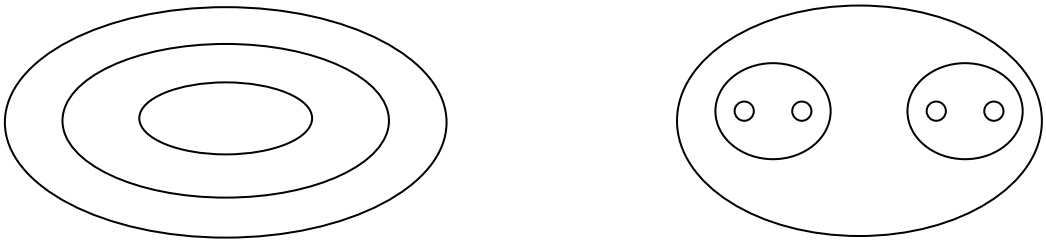
- Three part model of learning levels
- Three part whole systems model of paradigm (human experience and knowing)
- Nesting systems models (several)
- Four part model of learning responses – towards transformational learning
- Mechanistic v ecological management model
- 'Education in change' and 'Education for change' model
- Education *about, for* and *as* sustainability model
- 'Edge of chaos' model of learning

Apart from the first (which is after Bateson and others), and the nesting systems as a common device, these models are original and have been developed during the course of the research.

The 'nesting systems' model is employed frequently and variously in the Thesis both in the text and as a framework for the contents, and I shall explain it further here. One of the most important concepts in systems thinking, nesting systems derive from General Systems Theory (see Part C.1.1) and was notably developed in Koestler's (1967) idea

of ‘holons’. According to this idea, reality can usefully be modelled as a hierarchy of systems nesting within each other, where the bigger context (suprasystem or metasystem) shapes, limits and helps give meaning to the smaller part (subsystem), rather like the analogy of the Russian doll. This is often drawn as a series of simple concentric circles, as in the diagram on the left. The diagram on the right is a variation to show nesting subsystems at equivalent level.

Diagram A.2: Nesting systems



The nesting systems model is particularly useful in helping distinguish between contextual levels and helping understanding of the relationships between them. Yet, where one draws boundaries in any system model, or what the boundaries mean, is often a matter of debate - and sometimes contention. The ‘real systems’ that such models describe are open to a greater or lesser degree, and interact with sub- and supra-systems to a greater or lesser degree. For most purposes, the hierarchies of social, economic and environmental systems “culminate in the Earth system” or ecosphere (Clayton and Radcliffe, 1996, 48).

- Key point: The importance of the ecosphere as the bounding context is at the heart of the Thesis’ argument.

Finally, there is a point here about labelling and sequence. Rapport (1998, 15) suggests that *models* describe how things work, whereas *theories* explain things, but *conceptual frameworks* help us think about phenomena - to “order material, revealing patterns - and pattern recognition typically leads to models and theories”. So it may be that whereas I have used the term ‘model’, it would be more appropriate to call these models ‘conceptual frameworks’. In the sense that they are all abstractions and representative, I am not convinced a hard distinction between ‘models’ and ‘conceptual frameworks’ is necessarily helpful, and I suspect they co-arise to some extent. But certainly, the models I have developed here are intended to assist pattern recognition.

For me, they both help give rise to and help articulate the sometimes tentative theories advanced in this Thesis.

Structure

Like any writer who seeks to adopt a holistic approach to be consistent with their holistic subject matter, I have been faced with the tension between systemic and systematic modes of organisation. Systematic order is reflected by sequence and the gradual building of argument. Otherwise, I have tried to follow systems ideas in the design of the Thesis. So for example, the four Parts (which follow Part A) are presented as nesting systems. Further:

- Keypoint: I have tried to write so that each Part has systemic coherence in itself and can be read alone, but also, so that the Thesis as a whole has systemic coherence from each of the Parts. In this way, the whole is suggested in the Part, and the Part is in the whole.

The task has been more akin to making a net than building a wall, and has often been difficult - how to convey backward and forward links, levels of meaning, and contexts as the text develops. I can identify with Goldsmith (1992, xvii), who, describing his account of writing 'an ecological worldview', *The Way,* observed, “the task has been more difficult than I originally thought, because it has meant describing each of its…propositions in terms of all the others, and hence in terms of the whole”. So rather than construct discrete building blocks, I see each of my Parts as coalesences of ideas strung on themes that run like seams throughout the whole - themes such as postmodern ecological worldview, paradigm change, learning levels and transformative learning, sustainable systems, and so on.

Bounding the research

Boundaries are a key concept in systems approaches, particularly in ‘second order systems thinking’ which involves recognising and questioning assumptions and values. So the question arises - how have I bounded this research? The answer is approached by looking at two levels of boundaries which concern respectively the ‘map’ and ‘the territory’. I recognise the difference between these - that my account say, of the postmodern ecological worldview, may differ from somebody else’s account or map, as a cultural worldview cannot be definitively captured as such, quite apart from the limitations of language.

Further, I recognise that my interpretations (including of others' interpretations) are filtered, and constructions influenced, by my worldview and values. I recognise that this is not (and cannot be) a neutral or objective inquiry. I have an interest in substantiating the case for whole systems thinking, for an ecological worldview, for paradigmatic change - although this does not diminish the rigour of the work, I hope. Thus, I have chosen to look at the fields and those authors which help me build the argument, although I have acknowledged varying and sometimes counter views within the overall construction. I further recognise that how I conceive and present 'whole systems thinking' is influenced, and perhaps constrained, by my own perceptions.

A second boundary issue is what I've chosen to include and exclude from the territory in terms of subject matter. The continual paradox has been that while I develop and advocate the idea of whole systems thinking - which implies that to be consistent I should take a very inclusive approach to the content - one always has to exercise limits. The subject matter is potentially boundary-less, and judgements about what was necessary to the argument, and what was interesting but not necessary, were ever part of the process. Periodically, I have indicated below where and why I have drawn boundaries. Finding valid and coherent patterns and conclusions rather than dealing with exhaustive content has been the key here, but I always had to decide how much background was necessary in order to inform and justify any conclusion or assertion. The juggling was between breadth and depth.

First, *breadth.* The Thesis constitutes a similar volume of work as more conventional doctoral studies but is more a 'horizontal' sweep than a vertical in-depth study. This breadth is consistent with the emphasis on looking at whole systems, and allows me to look at and draw out patterns from range of fields, and thereby I think strengthen the validity of the argument as a whole. For example, the system writer Banathy suggests that in designing new educational systems we should "develop the largest possible picture of education within the largest possible societal context" (1991, 16), but this is a formidable task, and boundaries must still be drawn. I have at times been daunted at the difficulty of doing justice to the richness and relevance of this field of enquiry.

I could instead have concentrated specifically on systems thinking as a competence and its place in environmental education in a very focused way, and indeed, this might be a more conventional approach. In the attempt to demonstrate rigour and find some virgin territory where the flagstaff of originality can be implanted, research degrees tend to be in-depth, and by so doing often omit reference to broader levels of context.

Arguably, this can be problematic from both environmental and epistemological aspects. Orr's quite scathing remarks illustrate a view of the first point. In a chapter with a title (adapting Thoreau), 'What Good is a Rigorous Research Agenda if You Don't Have a Decent Planet to Put it On?' he comments:

> the fact that human survival now hangs in the balance is not itself of much interest to social scientists unless it can be translated into familiar terms, and converted into a well-funded research agenda.
> (Orr 1992, 164)

Another reason for the breadth adopted here is that the subject matter of the Thesis is probably contentious in as much as it challenges some conventional wisdoms, and therefore it is necessary to indicate the contextual justification for some of the directions and arguments that are explored here. Lastly, there is a danger that systemic approaches become incorporated by modernist paradigms in education, and unable to perform any useful transformational role. For this reason, it is necessary to review the broad foundations of the case for whole systems thinking in environmental and sustainability education, rather than leap into elaboration of say, practical methods, which might be regarded by others only as an ‘add on’, rather than a paradigmatic challenge to dominant educational theory and practice.

Despite the breadth of the research, I have deliberately made decisions to limit some lines of inquiry. In particular, the Thesis is less detailed on the history of systems philosophy, ecopsychology, ‘inner knowing’ and spirituality, thinking skills, critical realism, and detailed examples of sustainable education and transformative learning. It covers design and management for change briefly: it would be wrong to omit this, yet I recognise this is a large subject in its own right. Other areas - including my chosen four bases of whole systems thinking, and ecological design and adaptive management - are discussed in **Appendix I**. These decisions were largely made on grounds of space and economy. Intentionally, I do not discuss the politics of knowledge in terms of critical theory in detail, or employ a deconstructive approach to paradigm and language. This is because my first concern is with the primary power of the dominant paradigm in shaping Western identity, thought, discourse and action.

The potential cost of breadth is lack of *depth.* I was reluctant to go into areas of interest where it was obvious that only superficial treatment would be possible. I have tried to provide enough depth to capture the essence in any area - to be simple but I hope, not simplistic.

Triangulation

Another problem is that because the thinking both researched and developed is fairly 'leading-edge', there aren't many critiques of the ideas which can be drawn on. This made it difficult to assess validity at times. Similarly, a further problem has concerned 'triangulation'. As a creative researcher, it has been difficult to find sufficient people with expertise and similar interests to bounce ideas off, and my supervisor has been honest about which areas he felt less qualified to comment on. Where discussions have taken place, it has often been on specific aspects of the argument rather than greater wholes. Again, Schumacher College has been important resource in this respect.

This brings me to the next subsection which concerns validity.

2.3 Reliability and validity

Conventional measures of reliability i.e. dependability are not appropriate to this research. The orientation and findings of the research are consistent with an emerging understanding in this area, not least evidenced by a growing literature which reflects integrative thinking in the areas of sustainability, ecology and education. The extensive Reference section is a reflection of this movement. What is more questionable is how far my interpretation of and contribution to the field is sound, and this raises the question of validity. On this matter, I've drawn particularly on Heron who, in advocating the participative research paradigm that I also outline in the Thesis, assesses the questions of validity in relation to more established research traditions.

Thus, Heron (1996, 172) states that 'informative inquiries' are valid according to three criteria: *linguistic* (meaning grammatical and intelligible); *logical* (showing internal coherence of meaning) and *contextual* (relating to propositions made by others in the same field of inquiry). He adds that they also need to be grounded, on the basis of *experiential knowing*. On all these criteria, and in particular on the basis of my own lived experience both personal and professional, I believe the research can claim validity i.e. can claim well-foundedness. In particular, I think the Thesis displays *systemic coherence*, and that the argument as a whole, is more than the sum of its parts. It relates to and draws on others' propositions, and it is grounded in my own experiential knowing. Heron (1996, 173) notes that, "A proposition about the world is well-grounded in experiential knowing when it integrates both empathic communion with the interior presence of what is there, and intuition of significant pattern in its perceptual appearing" and this I believe reflects my approach.

Further, in relation to the contextual criterion - I have demonstrated a critical awareness of key debates - for example, between systems thinking and systemic thinking (or first order and second order systems thinking), between simple environmentalism and ecologism, between deconstructive and revisionary postmodernism, between realism and idealism and their expressions in the sustainability education literature, and so on. I've shown and discussed brief histories of the main fields discussed to put them into context.

I also recognise, as noted above, that my perspective will still be *my* perspective, even where I seek to describe what I claim here to be an increasingly shared perspective. But in writing the Thesis, clearly I am making some truth claim, not in absolute terms but in the sense of 'articulating reality' - which Heron defines as "a combination of both revealing and shaping, of finding meaning in and giving meaning to". Thus, whole systems thinking implies knowing, and knowing implies some relation with truth in the sense that Heron uses the term.

However, to the extent that the research is creative and concerns an emerging field of study, validity will be shown partly in hindsight. Further, some aspects of validity will only be established through practical manifestations of the research findings: I agree with Heron's assertion that an informative inquiry is not complete until the outcomes are taken into transformative enquiry (practical validity), although to no small degree this has happened and is happening through my previous work: this is described in more detail in Part D. Direct and indirect feedback on this work has helped validate the sort of ideas that are presented here: people working at different levels of educational systems are finding them practically useful.

Post-structuralists and postmodern deconstructionists, might want to critique this Thesis and question its claims to validity. I believe their position has certainly helped the health of intellectual debate, but is also problematic for reasons which I present in section B.1.5. Most notably, in relation to the crisis of unsustainability, I think deconstructionists leave us intellectually adrift, that is with no guidance on action. Heron goes further in describing the poststructuralist denial of the possibility of validity as "suicidal and nihilistic" (1996, 158). There is a further issue here relating to both the value and limits of constructivism, and this is returned to in some detail in Parts C/D.

2.4 Organisation of the thesis

As described above under ‘Structure’, the conceptual framework of the research inquiry is consistent with an approach that characterises systems thinking, that is, it looks at the broader picture through distinguishing different but interrelated *levels of context* in order to provide and enrich meaning. During the writing process, it took some time for this to emerge clearly. The content and organisation of the Thesis were a major challenge, and both underwent a number of radical changes.

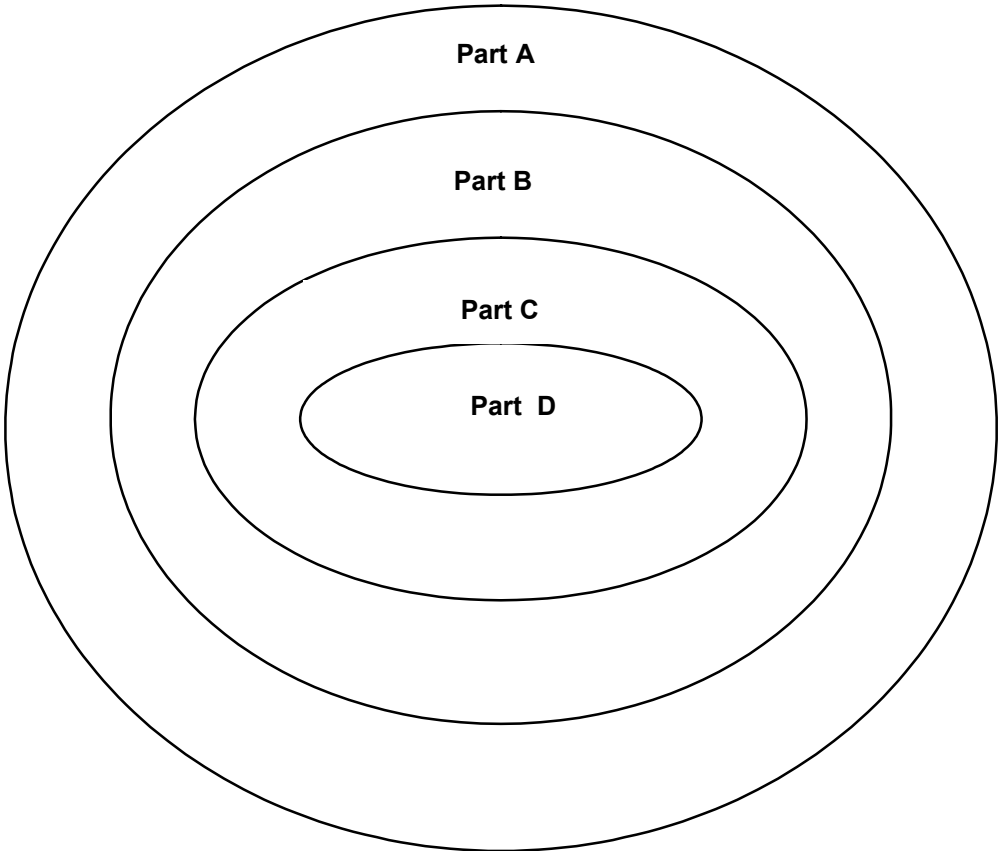
The Parts

With the exception of the Conclusion (Part E), the structure of the Thesis largely follows the main nesting hierarchy (described in subsection 1.1. above, and in the Reearch questions):

Part A: Introduction
Part B: Worldviews in Change (including the emergence of whole systems thinking)
Part C: Whole Systems Thinking in Education and Learning
Part D: Revisioning Environmental Education through Whole Systems Thinking
Part E: Conclusion

A substantial Appendix I ‘Elaboration of Whole Systems Thinking’ provides more detailed discussion of the bases of whole systems thinking, and the implications of the triadic model developed in the main Thesis.

Diagram A.3: Nesting structure of the Thesis (Parts A-D)



- Keypoint: At a more detailed level, this main hierarchy can be seen as incorporating two further nesting hierarchies. While they are less explicit in the structure of the Thesis, they informed and helped organise my thinking. They are:
- Whole systems thinking as *emergent change* - 'systems in society' bias.
- Whole systems thinking as *potential change* - 'systems in education' bias

'Systems thinking as emergent change' hierarchy

This bias is essentially *descriptive* and concerns evidence of systems thinking within the four foci reflected in the research question (as introduced in A.1.1):

Level 1 is the nature of the postmodern ecological worldview and, by implication, of paradigm change

Level 2 is the emerging nature of whole systems thinking

Level 3 is evidence of systems thinking in the educational paradigm

Level 4 is evidence of systems thinking in environmental and sustainability education

This hierarchy funnels down from the broad landscape of social paradigm, to the detail of environmental education discourse. To some extent, these themes are also treated *iteratively* throughout to clarify the relationship between them and to provide as far as possible a holistic perspective within an otherwise sequential text.

'Systems thinking as potential change' hierarchy

This second hierarchy is more *speculative* and concerns how conscious adoption of a more systemic way of thinking and organising particularly in educational endeavour might move us towards holistic education - which I term ‘sustainable education’ - and a more sustainable society.

Here, five levels of context are envisaged:

Level 1 is whole systems thinking as *cultural worldview*. The potential role of whole systems thinking in clarifying and progressing an emergent postmodern ecological worldview through social learning and education.

Level 2 is whole systems thinking as *educational paradigm.* The implications of whole systems thinking as a basis for an overall educational paradigm, and its possible challenge to dominant educational paradigms which influence discourse, policy and practice in education.

Level 3 is whole systems thinking as *design and management.* How it might be reflected in systemic change and systems management in the areas of curriculum theory and design, organisational ethos and management, and community/social links.

Level 4 is whole systems thinking as *pedagogy and practice.* How it might be reflected in classroom practice, in teaching and learning method.

Level 5 is systems thinking as a *subject and competencel.* The teaching and learning of systems thinking as a discipline in educational practice.

In sum, these may be restated as whole systems thinking:

1. as cultural worldview
2. as educational paradigm
3. as educational design
4. as educational practice
5. as a competence

Again, these levels can be viewed as a nesting hierarchy of subsystems, which support and reflect each other, with Level 1 as the suprasystem and the others as nesting subsystems. Thus, 1 implies and 'contains' 2; 2 implies contains 3; 3 contains 4 and so on. Banathy (1991) argues that such levels are operational in current educational discourse and practice, and therefore any effective redesign of education must take account of all levels, changes within them, and their relationship to each other.

To address each of these levels and the relationship in depth between them would be a very large task. The perhaps most obvious focus would be to concentrate solely on Level 5, which is the most immediate and practical area of enquiry. While there has been relatively little research in this area to date, there is some work (Keiny and Zoller 1991, Sheehy 1997, Wylie 1998). Whilst systems practice and competence is important, a sole research focus at this level would be unlikely to take full cognizance of the influence of the larger contexts on this level.

While the contextual Levels 3 and 4 are considered towards the end of the Thesis, the main part of this inquiry is devoted to Levels 1 and 2, in the belief that progress here will clarify and inform the tasks that I or others might undertake in the future with respect to the more practical levels. The reason for this emphasis is first, that there is a good deal of material emerging that relates to systems perspectives at the paradigm level which has hardly been explored in relation to environmental education as far as I am aware, and second, I believe clarification of theory in the area of paradigm both energises and indicates directions for practical research and there is evidence from my own work and others' that 'thinking differently' does indeed open new doors. In addition, and not least, having worked for years in levels 3-5, I have become increasingly convinced that deeper change is required.

Navigation, summaries and iteration

Given the length, I have provided summaries at the head of each Part. Cross-referencing indicates where important points are dealt with in other parts of the whole. Keypoints which might otherwise get buried in the general argument are indicated as such. Further, iteration is used to remind and help the reader, and carry the argument forward. Thus, a key idea such as 'learning levels' is revisited several times, but each time the argument is in more depth. This device also allows a reader to read Parts and sections in isolation and get some sense of the whole, without reading the whole Thesis.

In sum, navigation in the Thesis is facilitated by the following devices:

- 'Purpose' of Part set out concisely at the head of the Part
- Introductions and Summaries provided in each Part
- Summaries at the end of sections within the Parts
- Keypoints used in the text to highlight key or summary arguments
- Cross-referencing
- Taking stock and iteration where necessary to remind reader

Heading

Note: there are four main weightings of heading:

- the Part (e.g. Part A);
- the Section (e.g. Section A.1);
- the Subsection (e.g. A.1.1),
- and the 'sub-subsection' indicated by unnumbered italic and bold heading.

3 INTRODUCING THE FIELD

In this section 3, I outline more of the territory that is to be explored in greater depth in subsequent Parts of the Thesis. A 'Key concepts' subsection reiterates, defines and develops some of the main ideas and further indicates my interpretation and starting points. This is followed by subsections on calls for a new worldview, on the potential and limits of systems thinking, on paradigm and paradigm change, on learning levels, and on the educational context.

3.1 Key concepts

To assist the reader, some of the key concepts employed and elaborated in the Thesis are introduced. Following on from the 'Methodology' section above, this further 'sets out my stall' or starting points.

Epistemological error

Gregory Bateson suggested that Western thought was characterised by what he termed an 'epistemological error' which he saw as the root of the ecological crisis.

Thus he states:

> When you separate mind from the structure in which it is immanent, such as human relationship, the human society, or the ecosystem, you thereby embark, I believe, on fundamental error, which in the end will surely hurt you.
> (Bateson 1972, 461) (*and*)
> When you narrow down your epistemology and act on the premise 'what interests me is me, or my organisation, or my species', you chop off consideration of other loops of the loop structure.
> (Bateson 1972, 460)

- Key point: Bateson's notion of the 'epistemological error' is a critically important argument and problem which underpins the Thesis as a whole.

Hence he pointed to both a *perception of* and *belief in* separateness which, while it works to a degree, is ultimately destructive. Hence, he suggests:

> Epistemological error is all right…upto the point at which you create around yourself a universe in which that error becomes immanent in monstrous changes of the universe that you have created and now try to live in.
> (Bateson 1972, 461)

Global warming, to consider just one major critical issue, comes to my mind, on reading this passage. I consider Bateson's insight, which stands as a radical challenge to the individualism, anthropocentrism and dualism of most Western philosophic traditions, to be profoundly important. However, I prefer the term 'epistemological inadequacy', which recognises our dominant epistemology as representing 'part-truth'.

Epistemology

It is important to explain further my view of what I mean by 'epistemology' and how I use this term in the Thesis. Conventionally and in philosophy, it is seen as the study of the nature of knowledge, its origins, structure and validity. Harries-Jones, a Bateson scholar, contrasts the conventional philosophic sense with Bateson's own interpretation. Thus he suggests Bateson means by epistemology "the examination of knowledge in an operational sense: the 'how' of knowing and deciding, rather than the 'what' of the origins and validity of knowledge" (Harries-Jones 1995, 8). This *operational* sense is reflected in Bateson and Bateson's (1988, 208) definition of epistemology being about "the necessary limits and other characteristics of the processes of knowing, thinking and deciding". Similarly, Keeney (1983, 13), a colleague of Bateson, suggests epistemology refers to "how people...know things and how they think they know things; how people come to construct and maintain their habits of cognition". Harries-Jones (1995, 83) suggests that both Wittgenstein and Bateson thought that epistemology should no longer simply talk about metaphysical propositions, but "aim at improving thinking in everyday life" and that both writers "consistently try to demonstrate thinking as an 'operation' of everyday living".

I use 'epistemology' here then, to mean or describe the operative way of knowing and thinking that frames people's perception of and interaction with the world. Hence, Milbrath (1994,117) describes worldviews as "epistemological structures for interpreting reality that ground their picture of 'reality' in their own construction". Thus, in brief, and to illustrate the point, the operational epistemology or 'knowledge system' of the dominant techno-scientific worldview which influences us all, is essentially positivist, objectivist and reductionist, and based upon the root metaphor of mechanism.

Therefore, I suggest (following Bateson) there is a close association between epistemology and perception - between how we know and how we see. I believe that our perception is not 'neutral' but coloured by our spiritual grounding and awareness, our belief system, our creative imagination, and our experiential histories. Thus perception is informed by the *inspirational*, the *affective*, the *imaginal*, and the *experiential* domains. I argue that purpose is associated with or informed by epistemology because, if we take a view of perception that includes *a priori* knowing, or revelation - what Bawden (2002) calls inspirational knowing as opposed to 'just' experiential knowing, or 'just' a sensationist view - then it is hard to divorce this from values and beliefs. If this is the case, then it is important to see worldview, perception

and epistemology, ethos and ethics as (consciously or unconsciously) all *operationally associated* rather than as separate, and I would argue that this is an holistic and extended interpretation of epistemology. Bateson similarly saw epistemology in inclusive terms. It is:

> ...the great bridge between all branches of the world of experience – intellectual, emotional, observational, theoretical, verbal and wordless. Knowledge, wisdom, art, religion, sport and science are bridged from the stance of epistemology.
> (quoted in Harries-Jones 1995, 9)

Therefore, a change in epistemology implies a change in worldview. This is suggested by Keeney (1983, 7):

> The deepest order of change that humans are capable of demonstrating is epistemological change. A change in epistemology means transforming one's way of experiencing the world.

I argue in the Thesis that that the postmodern ecological worldview implies a changed and extended epistemology, based on *participativism*. Bateson called this a 'recursive or ecological epistemology'.

In sum, the meaning of 'epistemology' in discourse is complicated by its differing use by authors. It is either employed in a broad umbrella sense (as above) to imply paradigm - and by inference therefore also implying an associated axiology, ontology, and methodology (as above), or in the more conventional and restricted sense to mean beliefs about the nature of knowing. In this latter - more conventional - sense, epistemology, is *one part* of paradigm, the other parts being *ontology* (belief about the nature of being or reality), *axiology* (belief about values) and *methodology* (intrepretation in practice) (Bawden, 2002).

From a systemic point of view, what seems important is the *relationship* between these aspects of knowing. To dissociate epistemology, ontology and methodology seems to be characteristic of the fragmentary paradigm we need to transcend. If, as Bateson suggested, "epistemology is that science whose subject matter is itself" (quoted in Harries-Jones 1995, 9), then it would appear logical that we need to view our currently prevailing reductionist epistemology through an holistic lens if we are to transcend the former. Accordingly, a number of authors see the relationship between epistemology

and ontology as being so close that they conflate the terms, and certainly Bateson made no hard distinction.

Thus, my view and use of these terms follows Bateson's (1972, 314) which I see as a systemic view of their interrelation:

> In the natural history of the human being, ontology and epistemology cannot be separated. His (commonly unconscious) beliefs about what sort of world it is will determine how he sees it and acts within it, and his ways of perceiving and acting will determine his beliefs about its nature.

Ontology

In philosophy, ontology is the branch of metaphysics concerned with the study of existence and reality and includes "the assumptions about existence underlying any conceptual scheme or any theory or system of ideas" (Flew 1979, 256). Thus, for example, realism, materialism, and idealism are ontological positions. I argue in the Thesis that the postmodern ecological worldview transcends the realism/idealism argument by subsuming them within a wider framework of relationalism. Paralleling my Batesonian view of epistemology, I use ontology to mean our lived or operational sense of reality.

Having argued (above) that it is helpful to view a pattern of association between our (both personal and culturally shared) *epistemology,* our *ethos* and our *perception*, I similarly argue that it is helpful to recognise a pattern of association between our *ontology,* our *eidos and* our *conception,* that is our belief about reality and being is directly related to how we conceive and articulate it.

Methodology

Methodology means 'the logos of method', the principles upon which a method is based (Checkland 2002, 105), but it is also used to describe the practice dimension of paradigm, arising from and related to theory and epistemology. It can be used in this broad sense, or in relation to a particular set of procedures or practices.
In the Thesis, I largely use the former sense. Again, I argue that it is helpful to recognise a pattern of association (rather than equivalence) between *methodology, praxis* and *application*.

Participative reality

The idea of participative reality, to quote Heron (1996, 10), holds that there is "a given cosmos in which the mind creatively participates, and which it can only know in terms of its constructs, whether affective, imaginal, conceptual or practical…Reality is always subjective-objective". This is a systemic view of the dialectical relationship between the cosmos and our continuing interaction with it and in it. This view of reality appears to be confirmed by the 'biology of cognition' associated with Maturana and Varela (1987) which holds that our view of the world is not representational but biologically constructed.

The problem is that if we imagine the world inadequately, founded upon an insufficient metaphor and through a narrow epistemology, then dysfunctions arise in the world - as noted by Bateson (1972). The challenge then is both to gain a more adequate epistemology and worldview, and at the same time, achieve a participative consciousness (Berman 1981) and critical subjectivity (Reason 1993) more able to recognise the nature of - and responsibility of living in - a participative reality.

Realism, idealism, relationalism

The idea of a participative reality takes us beyond the ontological positions of - and beyond the schism between - realism and idealism. Realism is a view that suggests there is a reality or world that exists independently of perceptions of or beliefs about it. It is the dominant view, reflected in empiricist, positivist, analytically based philosophy that has informed Western thought in modern times. In philosophical study, this view is usually contrasted with idealism, which suggests that what appears to be the external world is created by mind. In extreme form, idealism (or strong social constructivism) suggests that there is no independent material reality, while in a more moderate form it suggests that material reality exists but cannot be known, only our constructions of it. I suggest that whole systems thinking transcends, subsumes and integrates these contesting positions. It incorporates the ecological realism fundamental to much environmentalism, but *also* fully acknowledges the role of perception and of language emphasised by idealists and constructivists. It transcends the limits of the realist-idealist divide by marrying both positions within what I call ‘relationalism’, essentially a panexperientialist view. It suggests new metaphors of ecology and living systems which can overcome the pervasiveness of the influence of the mechanistic metaphor, and the limitations of text as metaphor.

Connective pattern

I use abductive thinking to investigate the possibility of what I call a meta-connective pattern between ecologically sustainable development practice and an ecological view of education. Rather than an ethos of manipulation, control, and dependence arising from the modernist and mechanist paradigm, the ecological paradigm emphasises capacity building, self-renewal and self-organisation in the individual and community as a necessary basis for 'systems health' and sustainability. I look at such principles as diversity, holarchy, relative autonomy, resilience, emergence, community and integrity, and practices such as ecological design, adaptive management and participative inquiry to indicate relationships and parallels between sustainability practice and ‘sustainable education’. Thus, I argue, ‘learning and education’ and ‘sustainability’ appear far more closely related than is commonly supposed. The former often emphasises autonomy, capacity building, and participation, the latter emphasises self-organisation and self-renewal, community and resilience. Both are essentially about process and emergence, rather than about product and control. It is therefore valid to distinguish ‘learning as sustainability’ which I equate with transformative learning, from the more common terms and practices labelled ‘learning about’ or ‘for’ sustainability.

Paradigm and paradigm change

I use the term 'worldview' and 'paradigm' interchangeably, (except that paradigm is necessarily a collective term, see B.1.1). These concepts are discussed in more detail in B.1.1 but for now, Harman's definition (1988,10) - which reflects a broad consensus of opinion amongst commentators - is useful. A paradigm is:

> the basic way of perceiving, thinking, valuing, and doing associated with a particular vision of reality.
> (Harman 1988,10)

I distinguish three components of paradigm the *ethos,* which refers to the affective level, values and norms, *eidos* which refers to the cognitive or intellectual paradigm, and the *praxis,* which refers to 'theory in action' and behaviour, both what is done (and not done) and how it is done.

In terms of paradigm change, I share the Kuhnian view that change occurs when there is realisation of a critical mismatch between the prevailing paradigm and conditions in the environment. However, while Kuhn suggested that science as a 'community of interest' underwent *revolutionary* change characterised by the emergence of a new and incommensurable paradigm, in terms of individual and social learning, I subscribe to an *evolutionary* view of paradigm change characterised by learning and implying a degree of overlap and commensurability (Wilber 1996). This is touched on at several points in the Thesis (see for example, A.3.4 below) and applies to the historic 'three moments of paradigm change' outlined next.

The three 'moments' of paradigm change

This table suggests and summarises the historic movement from the still dominant modernist paradigm, to the idealist/constructivist position or moment, and pointing towards the emergent postmodern ecological worldview. By grouping key words under these three positions, I am not suggesting their equivalence, but under each moment, a broad coalescence or pattern of more or less compatible ideas. The evolutionary relationship between these positions is indicated by Diagram A.1 earlier.

Table A.1: Mapping fundamental paradigmatic positions: moments, movements and metaphors

	Moments and movements	
First order change	**Second order change**	**Third order change**
Modernism	Postmodernism (decon.)	Revisionary postmodernism
Foundationalism	Pragmatism/critical theory	Participativism
Realism	Idealism	Co-evolutionism
Materialism/dualism	Dualism	Panexperientialism
Universalism	Relativism	Relationalism
Objectivism	Subjectivism	Critical subjectivity
Positivism	Constructivism	Participatory knowing
Environmentalism	Ecologism	Whole systems thinking
Hard systems	Soft systems	Whole systems thinking
	Root metaphors	
Mechanism	**Text**	**Living systems/organicism**
(Organicism)	Mechanism	(Text)
	(Organicism)	(Mechanism)

The relative influence of root metaphors is roughly illustrated by whether they are shown in bold, ordinary type or in brackets. Hence, under the postmodern ecological worldview, 'mechanism' and 'text' are subsumed rather than dominant. Note that I have not shown 'critical realism' on this table. I would place critical realism as somewhere between the second order and third order positions - as indicating a pathway towards the third order position because it seeks to reconcile realist and idealist positions.

Domains, aspects and dimensions of experience (triadic model)

In writing this Thesis, I have developed what I call a whole systems triadic model which attempts to map three interrelated *domains* of human experience (referred to as Seeing, Knowing, and Doing). Each of these domains reflects *aspects* of, or

perspectives on, human experience (being *cognition*, *knowing*, and *paradigm* or belief). In turn, each of these aspects could be said to have three components or *dimensions*. This model is summarised in Table A.2 below (and further explicated in **Appendix I,** section 2.) I suggest it is both valid and helpful to recognise a pattern of correlation between *three dimensions of cognition*, *three dimensions of knowing,* and *three dimensions of paradigm* or belief, and that such a model helps simplify and clarify important relationships and use of terms. The first set of terms (re cognition) is favoured by those interested in learning, the second set (re knowing) by those interested in philosophy and research and the third set (re paradigm) by those interested in belief systems. By bringing them together, I am not suggesting equivalence, but relationship, pattern and influence.

The triads are brought under the headings of the Seeing, Knowing, and Doing domains as follows:

Table A.2: Aspects and dimensions of Seeing, Knowing, Doing

ASPECTS ⇩	***Seeing domain***	***Knowing domain***	***Doing domain***
Dimensions of cognition:	Perception	Conception	Practice
Dimensions of knowing:	Epistemology	Ontology	Methodology
Dimensions of paradigm:	Ethos	Eidos	Praxis

This affords a simple systemic model through which all these broad facets of knowing - however described - may be seen in interrelation. The Venn Diagram A.4 below suggests the dimensions exist in interrelationship within the three domains of Seeing, of Knowing, and of Doing. Further, I think this 'whole systems model' allows us to represent the ecological critique of Western culture, of Western ways of seeing/knowing/doing, as well as indicating an integrative ecological alternative. It is a bold claim, but I am suggesting that much of the body of discourse on this subject can be represented through this model. Thus, virtually all writers from an ecological perspective, in some way point to *dissociation* between or within these three dimensions of knowing, and/or to the *narrowness* of each of them in the mainstream culture. By the same token, virtually all ecological writing seeks to both broaden/deepen and re-integrate these areas of knowing: I return to this theme in Part B.1.6 'The postmodern ecological worldview – looking at essential ideas'.

Learning

Following thinking in the systems field about learning, I understand learning to have two essential characteristics, correction and meaning-making. 'Correction' is not meant in any moral sense, but in the stochastic sense of accommodating the change in the environment that leads to learning, for example through a change in factual knowing, belief or behaviour. Meaning-making refers to the cognitive attempt to interpret and understand the learning stimulus.

Learning levels

The notion of staged learning levels is central to the Thesis. Whilst paradigm change is essentially about learning - if there is no learning, there can be no paradigm change - it is clear that most learning that goes on within and outside learning institutions normally makes no difference to individuals' or to society's overall paradigm. Yet, education and learning are consistently advocated as 'the answer' to addressing the issue of sustainability. To address this paradox, I use and adapt Bateson's theory of nested learning levels. The significance of this is that it helps us to distinguish different qualities of learning and associated levels of change, and thereby helps clarify the nature and challenge of deep change that, I maintain, the transition to a more sustainable society requires. Bateson distinguished four main orders of learning and change (from 'zero-learning' to Learning III), corresponding with increases in learning capacity. These levels may be seen as nested systems whereby the learner recognises the wider context of his/her previous learning level. This theory has been adopted and adapted by learning and change theorists, particularly in the field of systemic learning and organisational change.

Specifically, I employ the theory of learning levels to help illuminate paradigm change. Whilst Bateson was interested in fundamental change in epistemology, he did not specifically elaborate on worldview change in relation to his learning level theory. While the theory can be used to understand situated learning such as in organisational change, it is also applicable to the issue of cultural worldview change. Moreover, his view of 'Learning III' as a state of awareness whereby "every detail of the universe is seen as proposing a view of the whole" (Bateson 1972, 277) implies a consciousness of interrelation which, I argue, would give rise to an operative ecological worldview and epistemology.

Bateson's writing often appears opaque and he was frequently misunderstood in his lifetime (Harries-Jones 1995). He intentionally used non-linear forms of argument to

suggest the nature of the knowledge he was trying to convey. Whilst this was intended to change the context of his readers' thinking, it also lead to difficulties of comprehension (Harries-Jones 1995, 81). As regards learning levels, various authors have interpreted and adapted Bateson's fundamental idea of learning levels differently, whilst following his logic of nesting systemic levels. My own use might differ from what Bateson strictly meant, but it is consistent with other interpretations, for example Hawkins (1991) and particularly Bawden (1997a, and 1997b), and I would defend its elaboration on grounds as to whether it is meaningful, helpful and practicable. Following Richard Bawden's work, and his experience at Hawkesbury College, Australia (which is outlined in more detail in Part C) I explore the notion of third-level 'epistemic' or transformative learning which I argue is fundamental to paradigm change. I argue that sustainability ultimately requires such a deep learning response, and that this corresponds with the necessary 'change of consciousness' outlined above and implied by the need to resolve Bateson's 'epistemological error'. This clearly may have far-reaching implications, not only for educators, but for educational organisations, institutions and policy-makers, and this is explored in Part C.

Transformative learning (epistemic learning)

I interpret 'transformative learning' to mean a quality of learning that is deeply engaging and touches and changes deep levels of values and belief through a process of realisation and re-cognition. It is equivalent in meaning to other terms such as deep learning, triple-loop learning, and epistemic learning. I argue that it inevitably gives rise to a heightened relational sensibility and sense of ethical responsibility.

Levels of educational response, and sustainable education

I employ the idea of learning levels to analyse the 'response-ability' of educational institutions, actors and the 'educational system' as a whole to the challenge of sustainability. I parallel and compare learning levels in wider society as regards the 'sustainability transition' (O' Riordan and Voisey 1998) with the response of education to sustainability using a model of three staged changes, being 'accommodation', 'reformation' and 'transformation'. I argue that, rather than 'education *for* change' or 'learning *through* education' - the common approach to education for sustainability - prior attention needs to be given to 'education *in* change' or 'learning *within* education', that is to the paradigm that underpins and informs the ethos, purpose, policies and provision in education. I suggest and outline the nature of an ecological educational

paradigm, and introduce the term ‘sustainable education’ to imply the change of educational culture that would arise from such a paradigm.

Use of the word ‘system’

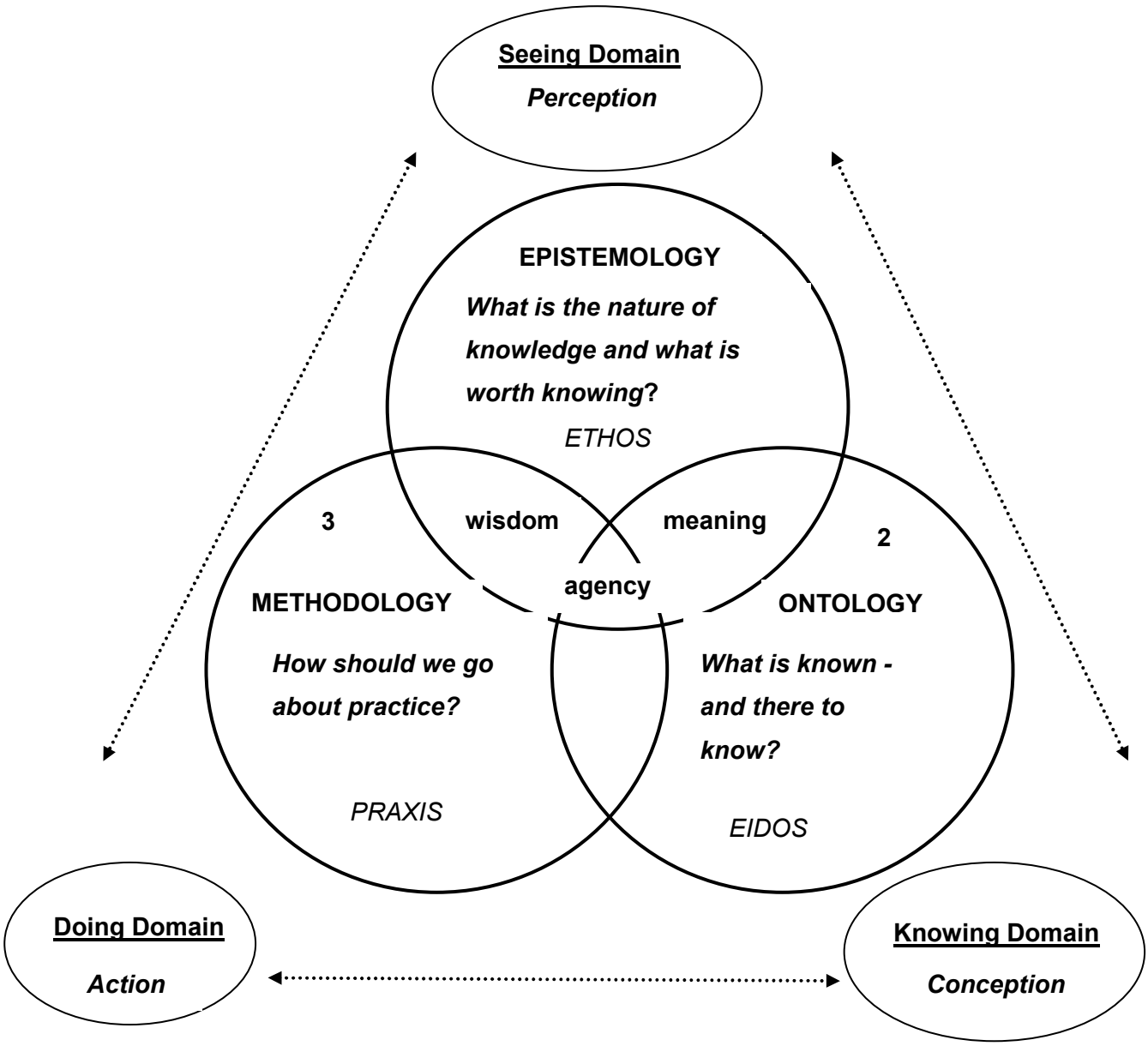
An epistemological use of the word ‘system’, as in second order systems thinking, involves the use of the concept to help make sense of the perceived world, whereby the observer treats some phenomenon ‘*as if it were* a system’, that is, he or she is knowingly involved in defining the system. This is distinguished in the systems movement from an ontological use of the word system whereby a complex whole is regarded as an actual system (as in the common parlance such as ‘education system’ or ‘legal system’). Second order systems thinkers argue that an ontological use of the word ‘system’ tends to remove the observer from conscious responsibility for defining the boundaries of any system so defined.

In the Thesis, I use the word ‘system’ in both ways (as do many systems writers) depending on context. As second order systems thinkers see first order use as a special case *within* the broader stance of systemic inquiry (Checkland 2002), I maintain that using the word in both ways is acceptable, as long as I am aware of my use at any one time.

Representing paradigm, knowing and cognition – a key model

This is one of the most key diagrams in the Thesis. The model suggests relationships *within* sets (e.g. paradigm: ethos, eidos and praxis), and *between* sets (paradigm, knowing, and cognition), as described in Table A.2 above.

Diagram A.4: Domains, aspects and dimensions of experience (triadic model)



Key:

Epistemology, Ontology, Methodology: dimensions of **Knowing** aspect

Ethos, Eidos, Praxis: dimensions of **Paradigm** aspect

Perception, Conception, Action: dimensions of **Cognition** aspect

This model is a recurring heuristic in the Thesis and is explicated further in **Appendix I.**

3.2 The calls for new thinking

The Thesis attempts to explore territory that commentators tend to penetrate briefly, if at all, in their calls for a change in human thinking. The critical questions concern 'from what?' - and 'towards what?', and 'how'? This issue is explored in more depth in Part B, and introduced here.

In recent years, there have been an increasing number of high level warnings which state that humanity as a whole has little choice but to move towards sustainable living patterns or face a scenario of increasing systemic breakdown and possible catastrophe, whether ecological, social or economic or some combination (WCED 1987, King and Schneider 1992, IUCN, UNEP, WWF 1991, Meadows *et al.* 1992, World Resources Institute 2000, Loh 2002).

Whereas early calls emphasised resource limits as the critical issue (Meadows, Meadows and Randers, 1972), a number of more recent studies echo Clayton and Radcliffe (quoted at the head of the Thesis) in calling for a fundamental change in *human thinking* as the key to sustainability. Thus Meadows' 1992 updated study of the limits to growth, twenty years on from the first seminal book on the same subject states:

> We see 'easing down' from unsustainability not as a sacrifice, but as an opportunity to stop battering against the earth's limits and to start transcending self-imposed and *unnecessary limits in human institutions*, *mindsets, beliefs, and ethics.*
> (Meadows, Meadows and Randers 1992, xvii) (my italics)

According to this view - and it is one that is shared by many commentators - the root of the 'world problematique' (Peccei 1982, Ekins 1992) (the nexus of seemingly intractable and tightly bound ecological, social and economic issues that characterise our times) lies in a crisis of perception; of the *way we see the world* (Bateson 1972, Skolimowski 1981, Laszlo 1989, Capra 1982, 1996, Spretnak 1997, Orr 1994). Accordingly, there are calls for 'a new way of thinking' (Clark 1989, Bohm 1992, Laszlo 1997, Capra 1996, Korten 1999, Elgin 1994, Milbrath 1989) or 'reperception' (Harman 1988) which allows us to transcend the limits of thinking that appear to have led to the current global predicament. From this perspective, the challenge of sustainability

invokes much more than technical or ‘rational’ solutions. Laszlo (1997,13) a noted holistic scientist and systems thinker, in a report for the Club of Budapest think-tank, states:

> To live in the third millenium we shall need more than incremental improvements on our current rationality; we shall need new thinking joined with new ways of perceiving and visioning ourselves, others, nature and the world around us.

Similarly, O’Riordan and Voisey (1998, 3), writing on the need to achieve what they call ‘the sustainability transition’, suggest that it “is as much about *new ways of knowing, of being differently human* in a threatened but cooperating world, as it is about management and innovation of procedures and products” (my italics).

Such writers follow the logic of Einstein's statement, quoted at the head of this Thesis, which insists that problems cannot be solved using the same consciousness or mode of thinking that created them, and that instead we need to perceive the world anew. Examination of many writers' descriptions of what the desired 'new way of thinking' might be, and which might transcend this trap, reveals much use of terms like ‘integrative’, ‘holistic’, ‘systemic’, ‘connective’, and ‘ecological’ yet their interpretation of these terms is rarely fully developed - and this is particularly the case as regards environmental education discourse. Mary Clark, in a lengthy work subtitled ‘The Search for New Modes of Thinking’ argues that it is “the West that is most in need of the ‘new modes of thinking’ that Einstein demanded” (1989, 472) because of the rate of environmental change that the science and technology associated with this worldview has created. This worldview, she maintains, has “grown maladaptive”. Similarly, Rich (1994, 288) points out the danger of the dominance of this worldview: “the consequences of maladaptation in a single, global culture may entail disaster on a scale unprecedented in human history”.

Following Bateson, others including Clark, Laszlo, and Senge (1990) suggest not only the need for a change in consciousness, but that we need to ‘take charge’ of the evolution of our own consciousness, at individual and social levels. According to Clark (1989, 235) in the last 2500 years, there have been only two “major periods of *conscious* social change, when societies deliberately ‘critiqued’ themselves and created new worldviews”. So, following the example of Athenian and Renaissance societies, it would appear that our own time needs to be third period of deep reflection and change. A recent Worldwatch Institute report advocates that we should tap our

potential “as conscious agents of cultural evolution” in order to create a sustainable civilization (Gardner, in Brown 2001, 206). Seen from such perspectives as these, ‘the learning society’ is one that seeks to understand, transcend and re-direct itself through *intentional learning*.

Whilst I attempt to explore in this Thesis the nature of an emergent ecological cultural paradigm - which perhaps is evidence of this deep learning beginning to occur - the habits of mind associated with fragmentary and linear thinking are still very much with us. Mary Catherine Bateson (MC Bateson 2000, xiv) suggests that they:

> can be seen in every newspaper or newscast; the search for short-term solutions that worsen the problem over time; the focus on individual persons or organisms or even species seen in isolation; the tendency to let technological possibility or economic indicators replace reflection; the effort to maximize single variables (like profit) rather than optimizing the relationship among a complex set of variables.

Thus there appears to be a fundamental mismatch between the deeply systemic world we inhabit (and in part have created), and the fragmented way we predominantly perceive and think. In brief:

- Keypoint: we inhabit a relational world but we of the Western mind are informed by a fundamentally non-relational philosophy.

We might reasonably ask therefore, whether and how systems thinking might help us achieve a more integrative, more systemic ‘change of mind’ both at the level of individual and of shared culture. Yet to date, systems thinking has not achieved its early promise - and this is a view that is reflected in the systems community (Checkland 2002). As Flood states (1999, 27):

> Pockets of committed people across the globe…have kept alive aspirations of systemic thinking since its entrance in the 1930s and 1940s into Western thought. Apart from a number of forays that gave hope, but did little more than raise dust, systemic thinking has remained pretty much in the outback...as a vision of marginalised groups struggling to penetrate the educational and social mainstream.

Part of the problem is that for most people, systems thinking either appears obtuse and inaccessible, or it is simply unknown - quite apart from what Meadows (1982b) calls people’s ‘innate sense’ of systems, a sensibility which does not rely on systems language as such. Thus part of the challenge to the systems community is to connect

with and engage people far more frequently and effectively than has been the case to date, and this includes of course, the education community. Clearly, there is much to do if systems thinking is to help us achieve the ‘change of mind’ that appears to be required.

3.3 Systems thinking and changes in worldview

According to Senge (1990, 68), the “essence of the discipline of systems thinking lies in a shift of mind”. Senge’s own work and its considerable influence in the field of ‘the learning organisation’ goes some way to exemplify the change in worldview he advocates, (although I would agree with Flood 1999 in his book *Rethinking the Fifth Discipline* that Senge’s work is a limited representation of systems thinking).

The 'fifth discipline' identified by Senge in his book of the same name is systems thinking, which together with complexity theory, is increasingly seen as an essential to understanding and guiding organisational change, particularly in businesses (Ray and Rinzler, 1993). This interest in systems thinking in business seems to be evidence of a deeper change in the way some organisations think about themselves, which appears to accord with an incipient cultural change in worldview, at least to some degree. Incidentally, this interest in the business sector far outstrips interest in systems thinking in the education sector.

Senge’s description of systems thinking is a useful starting point for elaborating its meaning and import. Senge (1990, 68-69) states:

> Systems thinking is a context for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots". It is a set of *general principles* distilled over the course of the twentieth century...It is also a set of *specific tools and techniques...*And systems thinking is a *sensibility* - for the subtle interconnectedness that gives living systems their unique character.
>
> Today, systems thinking is needed more than ever because we are becoming overwhelmed by complexity...All around us are examples of "systemic breakdowns" ..by seeing wholes we learn how to foster health.
> (My italics)

This quote appears in a chapter entitled 'A Shift of Mind', and subtitled, 'Seeing the world anew'. All this begs critical examination. For example:

- if systems thinking is as important as Senge and others say it is, why is it? On what grounds? And why now, at this stage of our cultural evolution?
- what does it mean? Is there one form of systems thinking, or is this a catch-all term for a number of different, perhaps very different, approaches?
- what is the cultural significance of systems thinking? What does it imply about other forms and more dominant forms of thinking - are these still valid from a systems thinking point of view?
- if non-systemic and linear forms of thinking are defining characteristics of our culture, how deep do these go? How possible is a shift of mind, assuming that it is necessary or desirable?
- what evidence is there for a shift of mind in Western culture? How would we know when we saw it?
- how does a systems approach to thinking help lead us towards a systems approach to thinking?

None of these questions can be simply answered, but they are explored in some depth in the Thesis. At this point, it will be helpful to introduce a conceptual framework which represents three critical aspects of systems thinking which I have identified, and which are represented by the phrases I have italicized in the Senge quote above.

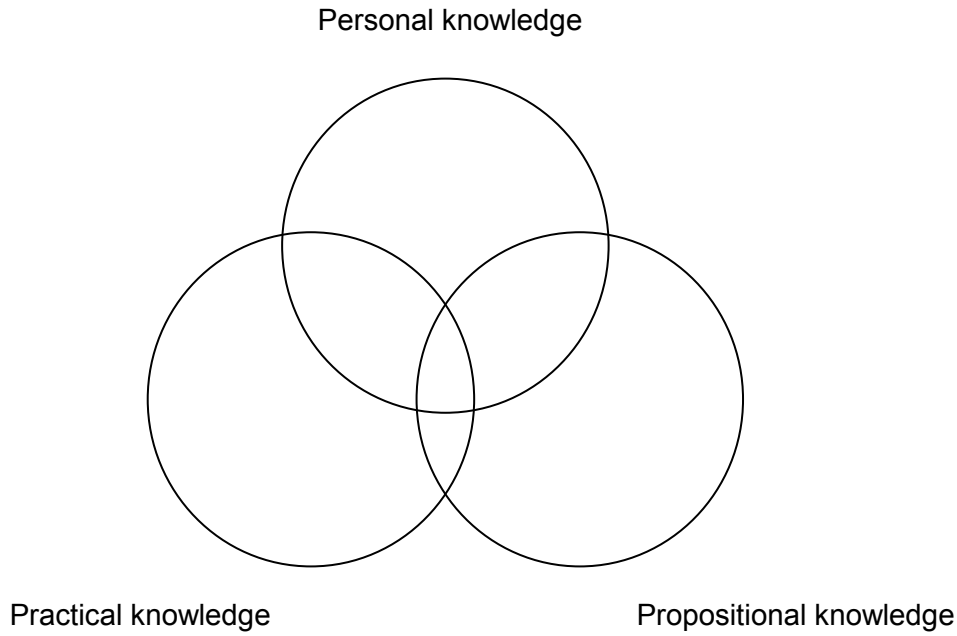
The first is the *personal knowledge* aspect, which relates to perception, awareness, intuition and values. (This corresponds to Senge's 'sensibility'.)

The second is the *propositional knowledge* aspect, which relates to theoretical constructs and concepts. (This corresponds to Senge's 'general principles'.)

The third is the *practical knowledge* aspect, which relates to methodology, methods, tools and skills. (This corresponds to Senge's 'tools and techniques'.)

These dimensions apply both to a personal or a shared social context and may be viewed from either perspective.

Diagram A.5: Three dimensions of systems thinking



The Venn representation indicates that a whole systems approach to systems thinking recognises the importance of all three dimensions. This schema is consistent with the triadic model of paradigm, knowing and cognition introduced above.

In brief, systems thinking is: relational rather than non-relational; systemic and connective rather than linear and fragmentary; concerned more with process rather than substance, with complex dynamics rather than limited cause-effect, with pattern rather than detail, with wholes rather than parts. Common descriptors are integrative, holistic, contextual, relational, qualitative, dynamic, and, in its emergent form which is discussed here (whole systems thinking), ethical and epistemic. Its essential quality is that of *relation*: it seeks to understand in Bateson's seminal phrase, “the pattern that connects” (1980, 7), and in doing so, the thinker sees him/herself as a participant in the perception of that pattern. All this, as Senge (1990,78) and others suggest similarly, represents “a profound shift of awareness”. However, there a difference between an ontological and an epistemological view of systems, and the former is less challenging to the dominant paradigm.

The *ontological bias* is based on the idea that systems literally ‘exist out there’. This is characteristic of ‘hard systems’ methodologies, and for contained problem-solving applications this can be a useful approach. In the systems movement however, there is significiant tension between the ontological bias on the one hand, and the view that

primarily systemicity lies in the perception of the observer. This latter *epistemological bias* is essentially metaphorical. It holds that we cannot know whether ‘systems’ as such exist, that a ‘system’ is essentially a human construct which can be used to help understand a complex world. Yet it also holds that a systemic epistemology or lens appears more adequate than a non-systemic epistemology as it *appears* that we inhabit a systemic reality. An endemic problem is the systems movement is the frequent lack of conscious distinction between these two views of ‘system’ (Checkland, 2002).

System is defined (Capra 1993) as “an integrated whole whose properties cannot be reduced to smaller parts, because they arise from the interaction of the parts. These properties are destroyed when the system is taken apart analytically or physically”. Donella Meadows defines a system (1989,16) as “an interconnected set of elements that is coherently organised around some purpose. That is, a system consists of three kinds of things: elements, interconnections, and a purpose”. Capra's definition usefully and importantly adds the idea of *emergent properties* to these three characteristics. 'Purpose' in systems terminology means it exhibits behaviour like adaptation, or self-organisation. While in living systems these behaviours are a product of cognition (Capra 1996), ‘purpose’ does not necessarily imply teleology or consciousness.

As noted earlier, becoming a systems thinker implies for most people a change of consciousness, at least to some degree. Systems thinkers argue that a ‘shift of mind’ (Senge 1990, 68) is needed to enable humanity to live more harmoniously in what might be termed a 'systemic world' i.e. one characterised by a high degree of connection, or what Mulgan (1997) calls 'connexity' in ecological and human systems. But systems thinking goes beyond just awareness of this state of interconnection, or its rational description. As living is a participative act for all living systems (Goodwin 1999, Heron 1996) such thinkers argue, then humanity needs to recognise and develop a 'participative consciousness' which is aware of and works creatively as part of this dialogic reality (Berman 1981). The gradual emergence of a more systemic, ecological worldview in some parts of society in the last few decades may be interpreted as evidence of a systemic learning process, that is, a difference in outlook arising from awareness of the anomalies within and inadequacies of the dominant worldview.

To clarify a complex argument, I will use a crude analogy. Let us say the world is represented by a disk, with a circular hole in it its middle. Let's say the dominant way of seeing the world in Western culture is represented by a square peg. The anomalies

and problems caused by forcing a 'square peg in to a round hole' gives rise to difficulty, to some squaring of the hole, but also to learning. Some 'square peg people', a minority at first, move through such learning towards a 'round peg consciousness', a view which harmonises rather better with the way the world is, or appears to be. What also follows from this analogy, is the argument put by systems thinkers that the human predicament largely stems from the consequences of imposing a 'square peg worldview' onto a much more complex 'round' reality. For example, Bohm (1980, 16) states:

> …it is not an accident that our fragmentary form of thought is leading to such a wide range of crises, social, political, economic, psychological, etc. in the individual and in society as a whole. Such a mode of thought implies unending development of chaotic and meaningless conflict.

Similarly, Korten (1995, 11) in his critique of the dysfunctional effects of economic globalisation states:

> When we limit ourselves to fragmented approaches to dealing with systemic problems, it is not surprising that our solutions prove inadequate. If our species is to survive the predicaments we have created for ourselves, we must develop a capacity for whole-systems thought and action.

Thus a systems view emphasises a more holistic epistemology, ontology, and form of action, and coherent relation between them. The need for this is reflected in the Bateson quote at the head of this Thesis, which encapsulates the dialectic between worldview and reality. Thus, Bateson warns of the ‘self-validating power of ideas: that the world “partly becomes - comes to be - how it is imagined” (1980, 223). In other words, what you ‘see’ becomes - over time - what you get because of the recursive relationship between our inner and outer worlds. Commentators argue therefore (see Ho 1998, Korten 1999, for example) that a mechanistic view of the world, that is, interpreting the world from the basis of a world-as-machine metaphor, together with a fragmentary epistemology, leads to the manifestation of mechanistic patterns of thought in the environment, for example in landscape, architecture, or biotechnology. (Ho’s work in this respect concerns the issue of genetic engineering.)

‘Square peg’ thinking then, sees, projects, and reifies squareness. Or put more strongly, a dis-integrated worldview brings forth a dis-integrated world, and arguably, dis-integrated people in a mutual systemic cycle of affect. This mutuality is argued by Bohm: “If science is carried out with an amoral attitude, the world will ultimately respond to science in a destructive way” (1994, 350). As noted above, Bateson goes

further by arguing that our belief in the separateness of our individual and collective mind from that "in which it is immanent" such as human relationship, society or the ecosystem, is the fundamental "epistemological error" (1972, 461).

Elsewhere, Bateson states that:

> (This) is the sort of world we live in – a world of circuit structures – and love can survive only if wisdom (i.e. a sense of recognition of the fact of circuitry) has an effective voice.
> (Bateson, 1967 - in Berman 1981)

This I believe is a plea for whole systems thinking, which embraces non-verbal, affective aspects - what Bateson termed 'analogue knowledge' - as well as 'digital knowledge' which is rational and abstract. In the same passage, Bateson criticises a limited rationality "unaided by such phenomena as art, religion, dream and the like", one which is "necessarily pathogenic and destructive of life". There is a key argument here to do with rigour *and* imagination *and* wisdom, to which I shall return. What is implied here is more than systems as discipline, as it has evolved over the last half century or so. Systems thinking as a *discipline* is not, nor can it be, the sole basis of an ecological worldview, yet the ecological worldview is essentially systemic.

- Key point: Systems thinking is necessary but not sufficient to realising an ecological worldview.

This needs further explanation. The broad range of thought that gives expression to the emerging ecological worldview is termed 'ecological', whether it concerns philosophy or practice. It is reflected, for example, in the pages of *Resurgence* and in the themes of the courses at Schumacher College at Dartington. This worldview is systemic, that is, it is fundamentally based on the perceived primacy of relation. However, ecological thinking *does not* necessarily recognise the potential of 'systems as discipline' to clarify and advance ecological thought and practice. Indeed, people subscribing to this view are not necessarily aware of systems as discipline. On the other hand, systems thinking within 'systems as discipline', is not *necessarily* ecological.

- Key point: Ecological thinking is a form of systemic thinking that often largely ignores systems as discipline; while systems as discipline often ignores ecology in the broad sense.

What I term in this Thesis ‘whole systems thinking’ is an attempt to look beyond ‘systems as discipline’ and locate it into a broader ecological framework. This might rejuvenate systems thinking and help it achieve its long promised but little realised potential (see Flood 1999 quote above). At the same time, such a marriage would help render the ecological worldview more intelligible, dynamic and operational.

I suggest below that the conceptual framework of whole systems thinking derives from historical antecedents and current movements, all of which may be said to exhibit in some way manifestations of a systems view of life and the world. The four areas are not exhaustive - undoubtedly there are other areas which would be fruitful to explore, but I consider these areas key. They are listed in chronological order of emergence below, and are discussed in greater detail in **Appendix I,** Section 1.

1. perennial wisdom and indigenous worldviews
2. the organicist tradition in Western science and philosophy
3. the development of systems thinking and systems science, from the early 20th century onwards
4. holistic science, and particularly complexity theory

Whole systems thinking is discussed in more detail in Part B. In addition, in **Appendix I**, I further elaborate the nature of whole systems thinking and its implications in relation to sustainability from the basis of the historical development of systems thinking, and using the three-part model outlined above (Diagram A.4). The reader interested in more detail is referred there.

To summarise, in simple terms, a key part of the argument is that (what appears to be) a fundamentally systemic reality requires an ecological epistemology and ontology which resonates with rather than conflicts with real world systemicity. This is the ‘round peg consciousness’ metaphor, which implies a ‘paradigm shift’ at individual and cultural levels.

3.4 Paradigm change

The power of the idea of 'paradigm' is that it indicates that a worldview is indeed a model, a system of knowing, rather than reality itself: a 'map rather than the territory' (a well-known metaphor which Bateson 1980, 30, ascribes to Korzybski, a Whiteheadian philosopher who influenced Bateson’s thinking). I shall use the idea of paradigm as a model to enable me to describe cultural change.

While Thomas Kuhn (1962) is credited with popularising the idea of paradigm, the idea preceded him as this quote from Whitehead (an early systemic thinker and eminent science philosopher) shows:

> Each profession makes progress, but it is progress in its own groove. Now to be mentally in a groove is to live in contemplating a given set of abstractions. The groove prevents straying across country, and the abstraction abstracts from something to which no further attention is paid, but there is no groove of abstractions which is adequate for the comprehension of human life. (Whitehead 1927, 245)

Whitehead's first point shows that it is perfectly possible to have different 'subparadigms' (or grooves) within an overarching cultural worldview, and indeed at personal level an individual frame of reference is unavoidable. From a systems point of view, this can be seen as a subsystem.

This brings me to an important point, and source of confusion.

- Keypoint: It is vital to recognise that both ‘worldview’ and ‘paradigm’ are commonly used to denote *different systemic levels* of ideas (which might be better expressed as metaparadigm / paradigm / subparadigm).

Users of these terms often do not make clear to which systemic level they are referring. So the use of ‘worldview’ in one context may not be equivalent with its use in another context. This is a confusing and critical problem which, to some degree, is clarified by interpretation of Bateson’s learning levels theory. It should be noted that, when I use the term ‘paradigm’ or ‘worldview’, in most cases I am referring to the overarching cultural Western worldview, rather than a subset of it.

Another source of confusion is this debate is the nature of the fundamental shift involved. A number of writers focus on and suggest there are fundamentally *two* archetypal and fundamental Western cultural worldviews in tension (Pirsig 1974, Berman 1981, Cotgrove 1982, Milbrath 1989, Capra 1996, Elgin 1997, Woodhouse 1999), being essentially the mechanistic and ecological, (or reductionist and holistic). For example, Milbrath (1989) distinguishes what he calls the Dominant Social Paradigm (DSP), and the New Environmental Paradigm (NEP). The DSP can be

equated with what I've termed 'square peg' thinking, above, or in real world terms, mechanism and modernism.

While the two-part DSP/NEP model is useful, Milbrath's presentation of them as oppositional is an oversimplification. Indeed, this is a problem with 'new paradigm' thinking and writing: that it presents oppositional lists whilst arguing against dualism. There are two issues here: firstly, two-part models of paradigm change tend to ignore the influence and contribution of the 'second moment' of postmodern deconstructionism, Whilst in the Thesis, I mostly focus on the necessary shift from mechanism towards an ecological view, I also recognise the second moment of postmodernism and deconstructionism as a necessary but insufficient part of this learning journey. The second issue is that two-part models of paradigm change tend to present a Kuhnian view of discontinuous change. By contrast, my own view is represented by Diagram A.1 which suggests that elements of the mechanistic worldview continue into and are subsumed by the postmodern worldview; and in turn, this second moment of postmodern deconstructionism is - at least potentially - subsumed by the emergent postmodern ecological worldview.

This difference - between viewing seeing contesting paradigms as incommensurable on the one hand (a Kuhnian view), and seeing evolutionary change, transcendence and subsumation on the other (a Wilberian view) - is a very important one, and is returned to in Part B. The evolutionary change model, which I favour, has greater implications for learning and education.

This discussion raises questions about the nature of paradigm and paradigm change, which in turn also invokes the need to consider the role of individual and social learning in relation to such change.

3.5 Levels of learning

These problems are clarified by consideration of levels of learning. Bateson's views of individual and social learning are further outlined here, and returned to detail in B.1.3. Bateson made a distinction, based on Bertrand Russell's theory of logical types, between what he termed four 'levels of learning', from 'zero learning' to higher order learning.

I have re-interpreted these levels in terms of cultural paradigm, so that Learning I equates to *learning within paradigm*, and according to unexamined values and norms,

that is, choosing within the 'set of alternatives' that Bateson mentions (1972). In systems terminology, this equates to first order learning. Learning II involves a degree of reflexivity, and a realisation of the possibility of alternative sets of values and norms - "a corrective change in the set of alternatives from which choice is made…" (Bateson 1972, 293). I understand this to mean a *perception of the operation and nature of the dominant paradigm and associated questioning of paradigm*, and the consequent *possibility of the adoption of alternative values and norms*. In systems terms, this equates to second order learning. Importantly, however, Bateson (1972, 302) notes that:

> there might be replacement of premises at the level of Learning II without the achievement of any Learning III…it is therefore necessary to discriminate between mere replacement without Learning III and that facilitation of replacement which would be truly Learning III.

Learning III then, is a full realisation of the 'context of contexts'. Bateson made it clear that he felt that Learning III was "likely to be difficult and rare in human beings" (301) He adds (304):

> To the degree that a man achieves Learning III, and learns to perceive and act in terms of the context of contexts, his 'self' will take on a sort of irrelevance.

Further, he suggests "personal identity merges into all the processes of relationship in some vast ecology or aesthetics of cosmic interaction" (306). If Learning III equates in some way to a kind of transparadigmatic state of enlightenment, a state of deep reflexivity to which persons might gain temporary access, then we can at least suggest that Learning III would lead to 'the facilitation of replacement' of paradigm at lower nested learning levels. I suggest, as above, that this 'replacement' would be a more integrative, systemic, ecological worldview operative at these levels.

This touches on *three key problems* with the interpretation of learning levels (which are introduced here, and discussed further in B.1.3). The first relates to Learning III. This level can be interpreted as a state beyond the constraints of paradigm, which seems to correspond with an enlightened state of awareness as Bateson suggests - in which case little can more can be said as this is "difficult and rare" (1972, 272). Or, alternatively, we can take a more pragmatic and attainable view of Learning III, and this a view which has been reflected by Hawkins (1991), and by Bawden and Packham (1993) in their view of epistemic learning. This latter view is the one that I have followed in my arguments on learning and educational change.

A second problem is that various writers' use of learning levels does not necessarily imply change of cultural paradigm, but applies to situated and contextualised change (for example, organisational change) rather than a cultural shift of consciousness. I argue in Part B.1.3 that this confusion can be addressed by regarding the use of the learning levels model to understand a *situated context* (for example changing a medical paradigm), as a subset of the use of the learning levels model in a *cultural worldview context*. Thus, change in a situated context will not necessarily lead to a change in a cultural worldview, but change in a culltural worldview is likely to lead to change in a situated context.

This second problem in interpretation of learning levels also indicates a third. Discussion tends not to distinguish between a 'learning journey towards higher order learning' as a *continual cyde* of learning, and as a '*once only'* experience. Evidence suggests that learning levels applied in a situated context are likely to be experienced as learning cycles over time, whereas significant shifts in consciousness associated with cultural worldview change are more likely to be much fewer.

The question considered in the Thesis is whether an emerging form of systems thinking that itself reaches beyond the dominant paradigm experienced in Learning I can help people learn towards an alternative, more ecological operative paradigm.
My premise, and it will be elaborated in discussion, is that dominant modes of discourse associated with the dominant paradigm are largely 'imprisoned' within or confined to first-order learning and that we have little choice but to 'learn our way out'. If this is so, then mainstream discourse on education, operating within the dominant social paradigm, takes place within certain parameters of validity: that is, within Learning I, and is also largely 'imprisoned'. However, environmental education and some other expressions of education for social change appear to relate *in part* to a contesting holistic tradition and the emerging postmodern ecological paradigm, because they challenge - at least to some extent - dominant epistemology. In Whiteheadian terms, these educational movements may be regarded as 'partly in and partly out of the main groove'. Therefore, environmental education discourse reflects tensions resulting from its having roots both within and outside dominant thinking, although these tensions are not often voiced in these terms. Much of the discourse in the so-called 'paradigm wars' has tended to be, at least until recently, still largely about differences between what I would rather call sub-paradigms mostly occupying territory within, or heavily influenced by, the operative paradigm. Similarly, schools of systems

thinking themselves have aspects and roots both within and reaching beyond the dominant paradigm, as implied for example by first order and second order cybernetics.

In terms of encouraging paradigm change, the characteristic of systems thinking (and to a lesser extent, environmental education) being partly in/partly out of the dominant worldview might be seen as a strength, because systems approaches in education and learning should be able to act as a bridge or leader towards attaining and influencing the new ecological paradigm, through helping people move through a spectrum of change that corresponds to learning levels of change. This idea will be discussed further in theoretical terms below, but would clearly be an important line of subsequent empirical research.

Hence, this Thesis is not about specifically about introducing systems ideas and techniques into environmental education practice. I have an active, practical and strong interest in this (Sterling, Irvine, Maiteny and Salter, in press), and it is an important area for more work (and would be very much simpler as a doctoral research topic). However, I see it as only a first step on a longer, more difficult, road. Alone, I doubt that this focus would help change thinking and action sufficiently to meet the challenge posited by Einstein (above), to 'see the world anew', or translated at a more specific level, to see education anew. There is an important difference then between looking at how systems methods and concepts can be used within environmental education practice, and how a whole systems approach across education as a whole might resonate with and contribute to an emerging worldview, as reflected in the main research question.

3.6 The educational context

Discourse on education and learning, perhaps unsurprisingly, reflects the social context in which it takes place. The nesting systems model, visited earlier, whereby education is seen as a subsystem of society, clarifies this relationship. At the opening of the 21st century, this relationship is in a state of change which, in Britain and other Western countries such as the USA, Australia and New Zealand at least, can be traced back to the rise of the New Right from around the mid-eighties, when traditional models of education began to be challenged through political ideology translated into educational policy.

The neoclassical and liberal models of education that informed thinking and practice for the best part of the 20th century have been challenged by politically inspired neo-

conservative and neo-liberal views, supporting late modernist and also postmodern ideas, within a socio-economic context deeply affected by globalisation, and a technological context increasingly dominated by the nature of Net-based communications. At the same time, there is a sense behind these changing circumstances that the 19th century model of education that we are perhaps most familiar with as a kind of lingering archetype cannot suffice for the very different conditions and challenges of the 21st century (Banathy 1991). This sense is a powerful force for change, but the direction that educational thinking and practice is heading in the longer term is yet unclear.

There appears to be a tension between those forces that in effect are working to control and 'modernise' education within a globalising economic context, as part of the project of modernism, and those of postmodernity exhibiting the diversity, plurality and yet lack of coherence and equality of opportunity that might be associated with this movement. Yet these forces can be seen as two sides of the same coin, neither offering the prospect of an appropriate education for our times. In positing the postmodern ecological paradigm, I want to explore the degree to which it offers a desirable but also practicable alternative to both these models, and both these futures. If education has a shaping and transformative role in society, then articulation of this alternative would appear to be an important, perhaps vital, task - particularly as the role of education as an agent of change towards a more sustainable world (UNCED 1992) is largely still unrealised (UNESCO 2002).

Moreover, the now dominant model of instrumentalism based on market ideas has become a powerful force for change across westernised educational systems globally. Education is seen in a managerialist light, where the language and strategies of business are translated into the thinking and practice of teaching, learning and institutional management.

> One of the major tenets of the "new managerialism" is that, as there is nothing distinctive of education, it can be conceptualized and managed like any other service or institution, and the "offerings" of institutions commodified like any other item on a supermarket shelf. Part of the "success" of the globalized "new managerialism" lies precisely in its claims for these generic aspects: its applicability to all spheres of administration and its homogenization of all technical and institutional problems as management problems.
> (Marshall and Peters 1999, xxviii)

The effects of this change are not all negative, however, and some changes could be said to be partly resonant with those that are suggested by a more holistic or systemic model of education, for example the emphases on flexible learning patterns, life-long learning, and the self-management of institutions. On the one hand, this can undoubtedly be seen as part of the influence of economic rationalisation, complementary to flexible working patterns and shifting capital, and designed to ensure a supply of adaptable human capital. Yet on the other, the shift away from the 19th century model of didactic teaching and passive learning (so pervasive in the 20th) that can at least be discerned here perhaps provides an opportunity to move towards more participative and sustainable forms of education and learning. But this in turn requires that a robust 'sustainable education' paradigm emerges, which can do more than occupy the margins of educational thought, policy and practice, and both effectively critique and transcend the currently dominant model.

In other ways, the market model has been destructive and narrowing, as is examined in section B.3.2. It appears that earlier models of educational purpose and focus, such as social equality and democracy, or newer ones such as environment and development are insufficient in themselves to critique the managerial model and offer a credible and healthier alternative. What is needed it seems, is more sufficient, adequate and whole models and philosophies that can perform this role.

What I want to explore here is whether - for environmental education and all educational movements which pursue education for relevance and transformation - the ecological paradigm investigated in this Thesis provides an emergent and unifying grounding, one which transcends and transforms elements of earlier educational paradigms into a greater and qualitatively different whole, rather than simply replaces them. Such a paradigm would go beyond positivistic, hermeneutic, critical and post-structural models. It might be described as *participative, co-evolutionary, collaborative, reflexive, process-oriented, dialogic, systemic, synergetic, transformative, and epistemic,* and its meaning and grounding is a key theme of this Thesis.

3.7 Summary of research field

To recap: addressing the research question, requires the mapping out of a large conceptual area relating to personal, cultural, and educational change. This is because I intend - as far as is reasonable and manageable - to take a 'whole systems' view of the apparent need for 'whole systems thinking', and its role in paradigm change. The Thesis therefore explores, to a greater or lesser extent a broad area of concern,

including 'the crisis of modernity and post-modernity', complexity, sustainability, thinking and worldview, root metaphors, the evolution of environmental and sustainability education, as well as the development and nature of systemic thinking, its expression in 'new paradigm' movements, the potential of whole systems thinking regarding the philosophy and practice of environmental and sustainability education, and a systems view of learning and its implications for the learning organisation, paradigm change and the ecological design of education.

4 THE BASIC PROPOSITIONS

The following thirty-one propositions summarise the basic argument that is explored in this Thesis. Some of these propositions were assumptions that were made at the outset of the research and were explored during its course: others arose as the research proceeded. Whilst there are many points (and details) that could be added here, these propositions may be read as the basic research findings - that:

1. ‘Environmental education’ may be usefully seen as a subsystem of education as a whole, and that education (as a whole) as a subsystem of society and its culture.
2. The values and practices of *education as a whole* are influenced by the larger *socio-cultural paradigm*; and that the values and practices of environmental education are influenced and constrained by these two suprasystems.
3. The prevailing cultural paradigm is *fundamentally* mechanistic, dualist, rationalist, objectivist and reductionist.
4. In recent years, this has been overlain by a strongly instrumental and managerialist orientation in the domain of education as well as other spheres, which is largely inimical to holistic approaches.
5. Environmental and sustainability education is partly grounded in an alternative holistic paradigm, and partly in the dominant paradigm, and this accounts for some of the tensions in the field.
6. Holistic and radical approaches to ‘education for sustainable development’ or ‘environmental education’ tend to be accommodated or marginalised by the mainstream which seeks to maintain its own paradigmatic coherence.
7. There is incoherence between this dominant paradigm and our experience of increasing complexity, interdependence, and systems breakdown in our lives and the world - in terms of helping us perceive the world clearly, describe it adequately, or act wisely.
8. The prevailing worldview is founded upon a dualistic ‘epistemological error’ or inadequacy which remains deeply influential in our individual and collective thinking.

9. Western societies are experiencing the emergence of what can be termed a revisionary postmodern ecological paradigm, a fragile quality of 'third order change' or learning which offers a direction beyond the destructive tendencies of modernism, and the relativist tendencies of deconstructive postmodernism.
10. This ecological paradigm is an expression of holistic and systemic thinking, but systemic thinking is largely implicit rather than explicit in this paradigm.
11. There is no guarantee that the ecological paradigm will prevail.
12. 'Systems thinking', as it has evolved as a discipline in the last 50 or so years, is influenced and constrained by the dominant cultural and academic paradigms or contexts within which it has developed, although it seeks to offer an holistic alternative.
13. This 'systems as discipline' has until recently been largely isolated from the postmodern ecological paradigm, from sustainability ideas and practice, and from most educational thinking and practice.
14. Systems as discipline is 'necessary but not sufficient' to further articulate and develop the ecological worldview and realise more sustainable living.
15. The potential and emergence that might arise from the integrative interaction of *systems as discipline*, of *education and learning for change*, of *sustainability ideas and practice,* and *ecological thought,* is necessary for the future of each area, and the transition towards a more fully human and sustainable society.
16. The integrative approach that can bring these together can be termed 'whole systems thinking'.
17. Whole systems thinking *extends, connects* and *integrates* the three aspects of paradigm: *ethos, eidos*, and *praxis* to reflect wholeness in (respectively) purpose, description, and action.
18. Whole systems thinking therefore brings together an epistemology based on an ecological worldview, a co-evolutionary ontology, and a methodology based on systemic and integrative approaches.
19. The antecedents and informing bases of whole systems thinking may be seen as fourfold:
    - 'perennial wisdom' and indigenous worldviews
    - the organicist tradition in Western science and philosophy
    - the development of systems thinking and systems science, from early 20th century onwards
    - holistic science, particularly complexity theory

20. The articulation of whole systems thinking makes the postmodern ecological worldview more intelligible, more communicable and more practically operational.
21. The nature of whole systems thinking is emergent and dynamic.
22. The articulation of whole systems thinking gives the postmodern ecological worldview greater ability to challenge, transcend, incorporate, and go beyond the prevailing mechanistic paradigm in education and wider society, and the relativist tendencies of deconstructivism.
23. The challenge of unsustainability and opportunities of sustainability require a deep learning response, which may be termed transformative or epistemic learning.
24. Most learning shaped by the prevailing educational paradigm is transmissive rather than transformative, and may be seen as first order change.
25. Paradigm change is itself a learning process, and that an evolutionary rather than 'incommensurability' view of paradigm change is a more adequate and helpful model.
26. Systemic thinking offers a model of staged learning that clarifies the nature of transformative learning, based on Bateson's three learning levels.
27. Whole systems thinking indicates a philosophical basis for an ecological educational paradigm, and in turn, a basis for a more ecological environmental and sustainability education subparadigm.
28. This ecologically based educational paradigm might be termed 'sustainable education'.
29. Sustainable education recognises the partial validity of both realism and constructivism, and integrates these pole positions into a more whole participative paradigm.
30. The realisation and implementation of a sustainable education paradigm requires *vision, image, design,* and action - at all levels - from all concerned with achieving healthy societies and ecologically sustainable lifestyles.
31. Realisation of a sustainable education paradigm requires an intentional co-evolutionary alliance with manifestations of the postmodern ecological worldview in wider society as a process of intentioned social learning.

This concludes Part A. The next Part is an examination of change in Western worldviews, looking particularly at the roles and place of ecological thinking and systems thinking in this change, and the influence of shifting worldviews on how education is perceived and practised.

PART B - WORLDVIEWS IN CHANGE

Purpose: to explore the nature of the current flux and tensions in Western worldviews, the nature and emergence of the postmodern ecological worldview and associated tensions and change in systems thinking, in education, and in environmental education.

Introduction

In section 1 of Part B I look in more depth at the notion of worldview, and at learning levels and paradigm change. I then examine how far it is possible to identify a coherent postmodern ecological worldview in the context of modernism, postmodernism and evolutionary change in culture. I acknowledge the contribution of postmodern thought to cultural evolution, but argue that, given the state of the planet, it is necessary to articulate a revisonary ecological postmodernism that can both subsume and transcend deconstructionism and evoke an appropriate sense of purpose and basis for action that can support the sustainability transition. The essential concepts underlying an ecological worldview are suggested and outlined. Against this context, I then look at flux, debate and change in systems thinking (in section 2), in education (section 3), and in environmental education (section 4) - with particular reference to the challenge of sustainability, and the degree to which a postmodern ecological worldview is - and might be - reflected in these three areas.

1 THE EMERGENCE OF THE POSTMODERN ECOLOGICAL WORLDVIEW

According to Carolyn Merchant, Western culture is moving from the Enlightenment ethic of the domination of nature fostered by a mechanistic and reductionist science, towards a “postmodern ecological worldview based on interconnectedness, process and open systems” (1994, 17). Section 1 of Part B examines how far this movement appears to be taking place, its nature, and the nature of the learning process that it implies.

1.1 Examining the concepts of worldview and paradigm

Within the environment/development/sustainability debate, there have been repeated calls over more than two decades for a fundamental change in the way people value, think and act. Partly, this is borne of frustration that issues do not seem amenable to resolution through conventional approaches. CH Waddington (1977, xi) for example, in a classic book on systemic thinking, pointed to this conundrum earlier:

> I doubt if there ever has been a period in history when a greater proportion of people have found themselves frankly puzzled by the way the world reacts to their best efforts to change it, if possible for the better...recently things seem to have been going wrong so often, and in so many different contexts, that many people are beginning to feel that they must be thinking in some wrong way about how the world works. I believe this suspicion is probably correct.

Since Waddington's time, the call for rethinking has gone deeper. My reading - in 1982 - of the ecophilosopher Skolimowski's claim (1981,vii) that our problems arose fundamentally from a "deficient code for reading nature" and that we needed to know differently, raised some profound questions for me - how could it be that the sum of human knowledge about the environment still amounted to a 'deficient code'? Despite long-held 'green beliefs', my scientific assumption that in principle nature/reality was knowable was severely challenged. It began a personal inquiry that still continues, but my position is summarised by Clayton and Radcliffe's view (1996, 47) that, "As a general principle, all theories in natural and social science are approximations to reality". Claims similar to those of Waddington and Skolimowski are quite common in environmental literature. Thus Brown (1993, 20), commenting in one of the yearly Worldwatch reports on 'The State of the World' (in relation to sustainability) states, "The overriding need is for a new view of the world".

A common theme amongst critics is that the problems 'out there' are intimately linked to 'inner problems' concerning our collective perception and thought processes, including a lack of awareness of our 'in here' condition. Thus, for example, Laszlo, an eminent systems thinker, notes that our concerns regarding global problems are commonly all seen as 'outer limits' - fossil fuel reserves, food producing capacity, climatic stability, population carrying capacity, and so on. The blame is shifted onto nature, and we try to redesign that, rather than look at our thinking - of which the problems are outward manifestations. Laszlo (1989, 25) adds, it is "only by redesigning our thinking and acting, not the world around us", that we can solve the problems. Similarly, Meadows, another key systems thinker and modeller, believes that (as noted above in A.3.2) in order to live within the earth's physical limits, humanity needs to "start transcending self-imposed and unnecessary limits in human institutions, mindsets, beliefs and ethics" (1992, xvii), or in other words, free up our thinking in order to deal with physical constraints. Varela, one of the key thinkers in what has been termed 'the new biology' (which has, incidentally, deeply influenced Capra's work),

states (1987,49), “the chance of surviving with dignity on this planet hinges on the acquisition of a new mind. This new mind must be wrought, among other things, from a radically different epistemology which will inform relevant actions”. Arguably, however, Bateson was the first to suggest that Western culture suffered from a fundamental ‘epistemological error’, in his classic text *Steps to an Ecology of Mind* (1972). Some three decades later, Mary Catherine Bateson (2000, xii), writing a foreword in her father’s reprinted 1972 work notes, “Ecological health continues to elude us - and perhaps indeed depends upon the reconstruction of patterns of thought”.

Such appeals, to a greater or lesser extent, rest on the premise that dominant views of the world are flawed, inadequate, or dysfunctional - that the predominant way we know, think and value is therefore also similarly defective. As I have stated elsewhere:

> Put simply, the case against the dominant Western worldview is that it no longer constitutes an adequate model of reality - particularly ecological reality. The map is wrong, and moreover, we commonly confuse the map (worldview) for the territory (reality).
> (Sterling 1993, 72)

What I would add to this now, is that the map is ‘right’ as far as it goes, but it is its inadequacy that makes it ‘wrong’ or dysfunctional. (In taking this line, I am in step with Wilber 1997 whose methodology assumes that no mind can be 100 per cent wrong, and therefore seeks to integrate partial truths - rather than rely on negation and disproval.) The ‘world problematique’ is ultimately then, as noted above in A.1.1 and B.2.2, a crisis of perception. To understand, that is, ‘stand under’ the problematique and delve deeper, it is necessary - in Cotgrove’s words (1982, 33) - to “grasp the implicit cultural meanings” which underlie debate. In other words, it is first necessary to grasp the meaning, and significance, of the *idea* of worldview or paradigm, and second, understand the nature of the fundamental cultural paradigm that informs current thought.

Paradigm derives from the Greek *paradeigma* meaning pattern or model. Thomas Kuhn’s use of the idea of ‘paradigm’ to explain large-scale change in scientific outlook and culture in his book *The Structure of Scientific Revolutions* (1962) has since given rise to extensive use of the term in discussion of change, to the extent that some commentators now see it as rather meaningless. Hence Button, in his *Dictionary of Green Ideas* remarks: “paradigm can mean a model, a world view, a cultural context, a

consensus, a set of attitudes - almost whatever you want it to mean," while he regards 'paradigm shift' as "the ultimate in green-tinted jargon, to be avoided whenever possible" (1988, 329).

While this may have an element of truth and wisdom, 'paradigm' is nevertheless a very useful and perhaps irreplaceable concept. Henderson (1993 x), the futurist and 'alternative' economist, for example states:

> In spite of Thomas Kuhn's many cautions to me not to over-generalize or to use his definition of paradigm in a social context, I believe a paradigm is a pair of different spectacles which can reveal a new view of reality, allowing us to re-conceive our situation, re-frame old problems and find new pathways for evolutionary change.

The worldview, or paradigm, is a story about the way the world works (Milbrath 1989). I find Capra's definition of paradigm helpful:

> A constellation of concepts, values, perceptions and practices shared by a community, which forms a particular vision of reality that is the basis of the way the community organises itself.
> (Capra 1986, 11)

Thus, I do not find it particularly useful to make a distinction between the concept of worldview, or *Weltanschauung* (which translates literally as worldview but is sometimes used in preference in English), and paradigm, except that - as Capra (1986,11) points out, a paradigm is necessarily a collective term whilst a worldview can be held by a single person.

The worldview, either at individual or collective level appears to be a necessary part of culture. As noted earlier (Fromm 1976), the worldview/paradigm/frame of reference is an inextricable part of culture and of being human. Thus culture and paradigm/worldview are closely related and co-defining. Vickers, a key systems thinker, sees these as systems of meaning which he terms 'appreciative systems' (1968). Marglin (1990, 24) describes cultures as "knowledge systems" which are defined in terms of four characteristics: epistemology, transmission, innovation and power:

> Each system has its own theory of knowledge (or epistemology), its own rules for sharing knowledge, its own distinctive ways for changing the content of what counts as knowledge, and finally, its own political rules for governing

> relationships both among insiders to any particular knowledge system and between insiders and outsiders.

This helps theorise why and how different paradigms / worldviews / cultures / knowledge systems conflict and how they change. Cotgrove's (1982, 33) study of why sets of protagonists in environmental issues tended to "talk past" each other led him to conclude that:

> Paradigms are not only beliefs about what the world is like and guides to action; they also serve the purpose of legitimating or justifying courses of action. That is to say, they function as ideologies. Hence, conflicts over what constitutes the paradigm by which action should be guided and judged to be reasonable is itself a part of the political process.

Therefore, in order to understand thought, opinion and conflict, Cotgrove suggests, we need to grasp the implicit cultural meanings which underlie dialogue. Pepper similarly, in his history of environmentalism, states that those who wish to influence others' thinking "will have to study the history of how their thinking came to be as it is" (Pepper 1984, 2). Implicit in the notion of paradigm is a state of relative unawareness of deep assumptions. Ideas become shared axioms from which other ideas and actions follow:

> A paradigm is the set of preconceptions we bring from the past to each new situation that we have to deal with. The paradigm is...the lens through which we look at the world and it therefore determines what we perceive. A paradigm is a set of beliefs or assumptions we make about the world, normally beneath the level of awareness and therefore mostly never questioned.
> (Stacey 1996a, 257)

This is echoed by Patton (1990, 37) who notes that paradigms have a normative aspect - they tell people what is important, legitimate and reasonable. According to Patton, herein lies the strength and the weakness of paradigms: "their strength in that they make action possible, and their weakness in that the very reason for action is hidden in the unquestioned assumption of the paradigm".

As noted in Part A, Berman make an important and helpful distinction between between two components of paradigm, the *ethos*, which refers to the affective level and norms, and the *eidos,* which refers to the cognitive or intellectual paradigm. Of these components, it is the ethos - he suggests - which is most hidden from people's awareness. In discussion about 'paradigm shifts', we must wonder how deeply the

influence of the mechanistic ethos reaches in our psyche, and whether intellectual discussion about 'ecological paradigms' and 'holism' actually touches this deeper operational level of thought. As noted in A.1.1 above, Heron (1996), a transpersonal psychologist, whose work has been important to my research, comments on the difference between *understanding* intellectually the world in a more systemic way, but still *perceiving* it in a Cartesian way. He suggests a 'significant minority' is in this transitional state of cultural change.

If, as I shall argue in B.1.5 below, postmodernity is essentially 'double-coded', it seems that many of us (but perhaps only Heron's 'significant minority') reflect and manifest two partly complementary, partly contesting paradigms. This, perhaps, is the cause of much confusion, frustrated dialogue, and contradiction in many fields of endeavour, not least education and environmental education. For the 'significant minority' who are trying to explore and articulate the meaning and implications of the new paradigm, as I am seeking to do in this Thesis, this tension is a constant source of tension and difficulty, as well as inspiration.

The modelling of the two key paradigms - *mechanistic* and *ecological* - is an important step in clarifying the situation, but it is not sufficient in itself if we are to avoid only tinkering with the *eidos.* Another implication is that any education for systemic awareness or wisdom will be superficial if it only addresses the realm of cognition, and that it also needs to engage how we perceive and feel. At this point however, I want to now look further at the role of thought in maintaining and in transcending any paradigm.

1.2 Modes of thinking and thought as a system

Inseparable from worldview is *thought,* both in the noun sense of 'body of belief, opinion and ideas' and the active sense, as in 'the process of thinking'. This being the case, it is important to distinguish between a mechanistic view of thought and an ecological view of thought. As noted above, this Thesis is part founded upon the assumption that current world problems partly stem from a flawed view of reality, one which is no longer adequate.

Following the Einstein and Bateson quotations that head this Thesis, it seems that 'trying to solve problems with the same consciousness that created them' is doomed to lead to repetition, and frustration. The implication of the quotes by these writers -and others referenced here, Laszlo, Meadows, Capra *etc*. - is that a dis-*integrated* worldview will lead to a dis-*integrating* world, and that, because of systemic reality, the

dis-integrating world 'plays back' to us whereupon we tend to apply further dis-integrated thinking to try to fix the dis-integration brought about earlier. In systems terms, this is a positive feedback loop – where the elements in the system are mutually reinforcing . However, for many people, at some point, the dysfunction and contradictions that dis-integrated thinking is manifesting in the world precipitates significant learning through which the presence and nature of their paradigm is realised and questioned, and for others, a further step which involves realising the possibility and nature of a different paradigm. In other words, the problems force realisation of anomalies in the worldview and hence change through learning takes place. For the majority however, the paradigm is self-referential and contains it own circularity, the nature of which is described by Bohm (1992, 3):

> The reason we don't see the source of our problem is that the means by which we try to solve them are the source.

Systems theorist Stafford Beer (1985, xiii) has a similar line:

> One of the main reasons why so many problems are intractable, is that they are formulated in such a way as to defeat any solution. We go on trying the solutions that have always failed in the past.

And, as Bateson said much earlier (1972, 456):

> Epistemological error is often reinforced and therefore self-validating.

Critical to this argument is the dualistic nature of the Western thought system which operates on the basis of negation as regards the relation of binary opposites. Something 'is', therefore something else 'is not', or vice-versa. Thus as Marglin (1990, 103) illustrates, according to this 'system of thought':

> Irrationality is what is *not* rational. Nature is what is *not* culture. Health is the absence of illness, and so forth. Oppositions such as subject/object, nature/culture, and mind/body are fundamental in the dominant currents of Western thought. They underlie and frame the very possibility of discourse; they ground thinking in the very reality of things.

This structure also underlies notions of power and control - in terms of you/me; them/us; cause/ effect. The emerging systems view of the world suggests that this *logocentric* (a term coined by Derrida) system of thought is no longer sufficient, and therefore is becoming destructive. Norgaard (1994, 28) for example, traces this effect and the circularity involved in the dominant worldview in his study of development:

> While a consensus is emerging that modernity is a shambles, most of the designs for its reconstruction rely on many of the same materials, the beliefs of modernism.

To address this problem in a radical way, it appears that we should in some way step outside or go beyond the dominant paradigm, as it affects individual and social levels of thinking. An inclusive and systems view of thinking, according to Bohm, is essential. He therefore sees thinking itself as a system, as a field of connectivity. According to Nichol (1992), Bohm's view is that body, emotion, intellect, reflex and artifact (that is, the physically manifested product of thought, everything from 'knife' to 'city' for example), should be seen *"as one unbroken field of mutually informing thought"* (my italics). These elements interpenetrate to such an extent that we should see thought as a system - concrete as well as abstract, active as well as passive, collective as well as individual (Nichol 1992, xi).

However, according to Bohm, this system displays a systemic fault as much thinking often is not cognisant of what it is doing, of how phenomena result from it, and yet then struggles against these results. Thinking is not fully aware of its own powerfully creative (or destructive) participatory nature – rather, conventional "thinking about thought" is based on a belief of objectivity, a belief that thought reports and describes (what is believed to be, and appears to be) an independent external reality. Rather, says Bohm, *thought co-creates reality*; thought has systemic consequences. This non-recognition of the nature and role of thinking itself, is a systemic fault:

> Now, I say that this system has a fault in it - a *systemic fault*...that is all throughout the system...You may say "I see a problem here, so I will bring my thought to bear on this problem". But "my" thought is part of the system. It has the same fault as the fault I'm trying to look at, or a similar fault...in dealing with it, we use the same kind of fragmentary thought that produced the problem. (Bohm 1992, 18-20. His italics)

This is a critical argument in this Thesis. In systems thinking terms, this state is known as a 'trap' (a term which was used by British systems thinking pioneer Sir Geoffrey Vickers 1972). This trap can only be transcended by an awareness of our thinking, at least 'thinking about thinking', and preferably by 'thinking about thinking about thinking' which relates to Bateson's state of Learning III. Thus, Bohm calls for what he calls '*proprioception'*, meaning self-perception - a state of open learning through which

thinking based on accumulated reflexes may be reordered in favour of the generation of insight, both at individual and collective levels.

> Thought should be able to perceive its own movement, be aware of its own movement. In the process of thought there should be awareness of that movement, of the intention to think and of the result which that thinking produces. By being more attentive, we can be aware of how thought produces a result outside ourselves. And then maybe, we can be aware of how thought produces a result within ourselves.
> (Bohm 1992, 123)

By using a systems view himself then, Bohm is describing - I believe - the need for a thought system to self-reflect and learn in order to be a healthy system. Clearly, a second-order systems view of systems, what Mead (1968, quoted in DiSalvo 1989) terms “a way of pointing to the observer’s inclusion and participation in the system” invokes a logical paradox of self-reference. While in a formal sense there is no logical escape from this paradox, it appears to me that Bohm (and indeed Buddhist and other traditions of awareness) show us we can be aware of our thinking. Whilst he does not use the word ‘emancipate’, Bohm wants people to liberate themselves from conditioned responses and thinking (he uses the terms ‘reflex thinking’, which invokes the notion of reflexivity).

The problem with the mechanistic worldview is that it gives rise to a view of reality which is both self-referent and exclusive. Like the prisoners in Plato’s famous allegory of the cave, those held in the dominant paradigm tend to be unaware of any other reality. As Merchant says:

> So deeply does this way of thinking become that it is presumed to be reality by mainstream society. So powerful is the mystique of reason as instrument in the control of nature and human bodies that it banishes other modes of participating in the world to the periphery of society.
> (Merchant 1994, 4)

To recognise this state and go beyond, we need to reperceive perception, to think about thought, to pay attention to the thought system. We need to see thought and its manifestation, including the body/mind, and society, and perhaps human-related environmental change, as essentially one system. These propositions, which might be seen as revolutionary in the West - and indeed are so as part of the new paradigm - resonate with ancient traditions in Eastern philosophies such as Taoism and Buddhism,

where daily practice seeks to heighten consciousness, partly through observation of ordinary states of awareness, thinking and feeling. Such practice of what is commonly termed ‘mindfulness’ allows insight into how we ordinarily create our own reality in a relatively non-aware way. It allows us to move outside our ordinary thought system. Such practice is a daily reality for millions of individual people, but changing the collective consciousness and culture appears to be a challenge at a different level.

Elgin (1994, 247) points out that the full name for the human species is *homo sapiens sapiens*, sapient meaning wise. Hence, we have the potential to be doubly-wise. Elgin suggests that “our highest potential as a species is our ability to achieve full self-reflective consciousness, or ‘knowing that we know’ ”. This links with the quotations (given in A.2.1 above) from Laszlo (1997) regarding the need for “new ways of perceiving and visioning oursleves, others, nature and the world around us”, and O”Riordan and Voisey”s (1998) suggestion that the sustainability transition requires “new ways of knowing”.

The critical question, if the above argument is valid, is how individually, institutionally and culturally we might become more self-aware and move towards a more complete, more healthy, participatory worldview. This echoes the comments made in A.2.1 above about social learning and the need for conscious acceleration towards sustainability. The next subsection takes this further by looking in more detail at Bateson’s theory of learning levels (introduced in Part A), which appears particularly relevant and promising in helping understand the nature of paradigmatic levels and change.

However, I first want to mention briefly the phenomenon of *non-learning* through fear or denial, at both individual and collective levels. This pertains both to the non-recognition of problems and of ‘incoherence’ in the worldview, and suppression of the ‘dark’ side of personality, which is commonly worked on in psychotherapy. According to Bohm, the non-recognition of the evidence of incoherence is itself evidence of incoherence. This is an area which the growing study of ecopsychology (Roszak *et al.* 1995) has given attention. Despite its very clear importance, I feel this area lies outside the scope of this already wide-ranging study (although I touch on it in B.1.4 below). What I will say is that learning is critical and fundamental to systems health in any living system, and this includes our own thought system. What is at issue, in relation to sustainability, is the nature of the learning that is required and the *level* at which such learning takes place. This is the next topic.

1.3 The nature of paradigm change and Bateson's learning levels

The theory of logical types and of associated learning levels, is very useful in helping understand change, as outlined in Part A.3.5. Much, if not most, discussion of change and learning - including the education for sustainability debate - does not differentiate between levels or qualities of change, and this seems to be a major weakness in progressing debate and practice. This is where Batesonian theory can make a major contribution, but it is little recognised as yet in sustainability education debate.

I am concerned here with deep change both for individuals and wider society (and by implication also institutions, and organisations in society including educational institutions). As we have seen, paradigm change is essentially about *learning* - if there is no learning, there can be no paradigm change. But at the same time, it is clear that perception of paradigm - seeing *through* rather than *with* paradigm and questioning basic assumptions and beliefs - must involve a particular quality of learning. Day to day learning, that goes on within and outside learning institutions, is not of this type. A good deal of learning - for example, how to fix a car, operate a computer, cook a meal, or even pass most exams - does not require examination of personal or societal belief systems. This is 'functional' learning, 'basic' or 'simple' learning, or 'informational' learning - these are all terms describing the nature of learning at this level.

Therefore, we need models which help us understand levels and qualities of learning. Let us first look at some definitions of learning. Curiously, many books and papers that I've consulted often do not attempt to define learning in any depth, but are concerned with how to make 'whatever it is' more effective. As Bateson (1972, 253) suggests, "The word 'learning' undoubtedly denotes *change* of some kind. To say *what kind* of change is a delicate matter". Jarvis, Holford and Griffin (1998, vii) state:

> Learning is as crucial as breathing. Learning is the process through which we become the human beings we are, the process by which we internalize the external world and through which we construct our experiences of that world.

This may be a useful description, but the sort of learning described here might still be conformative rather than transformative. By contrast, Senge (1990, 13-14) suggests the possibility of deeper change in his definition:

> Learning involves…a movement of mind. Real learning gets to the heart of what it means to be human. Through learning we re-create ourselves. Through learning we become able to do something we never were able to do. Through

> learning we reperceive the world and our relationship to it. Through learning we extend our capacity to create, to be part of the generative process of life.

My own definition, based on Batesonian thinking, is that learning may be defined as a 'difference in the learner as a response to difference'. Or to use other words, a change of meaning and a 'correction', as a response to change (or novelty). Without some discernment of difference, there can be no learning (the fish unaware of its watery environment is sometimes given as an example of this idea). This learning is not linear, but a systemic process involving feedback loops between the learner and the environment. If we take Senge's idea that learning is a *movement of mind* - and this seems an apt metaphor from a neuroscience point of view - any learning may result in a smaller or larger movement, involving both *meaning-making* and *correction.* As noted above, much everyday learning does not result in too much 'movement', nor does it need to - such functional learning does not require us to re-examine our beliefs, and everyday life would become impossible if it did.

As stated in Part A, it is possible to discern a number of *levels* or staged orders of learning which help us understand the nature of learning that is associated with paradigm change. Bateson was the first to distinguish these learning levels, which are explained in his 1972 *Steps to an Ecology of Mind,* but were initially suggested in a paper 'The Logical Categories of Learning and Communication' written in 1964 and presented to a 'Conference on Worldviews' in 1968. Interestingly, Bateson did not include 'Learning III' in his theory until 1972, seven years after he had written his first paper on the theory of learning levels. The theory was based on his understanding of Russell and Whitehead's theory of logical types as exemplified in their work *Principia Mathematica* of 1913. This theory states that no *class* of objects can be a *member* of itself. Thus, the class of 'chair', or 'dog', for example, is different from an specific *example* of the class, an actual dog, or chair. This, interestingly, is a distinction that toddlers quickly grasp, yet confusion of logical levels in discourse is common. As Watzlawick, Weakland and Fisch state (1980, 49):

> In all our pursuits, but especially in research, we are constantly faced with the hierarchy of logical levels, so the dangers of level confusions and their puzzling consequences are ubiquitous.

Not least, this applies to discussion of paradigm and paradigm change, where *levels of paradigm* can be (and are) confused.

Applying the theory of logical types to learning, Bateson suggests that, beyond what he terms ‘zero learning’, there are three learning levels.

Learning I

“deals with the narrow fact or action” (Bateson 1980, 168), and “is a correction of errors of choice within a set of alternatives” (Bateson 1972, 293). In Learning I, “the organism is changed without an alteration in learning capacity” (Bateson and Bateson 1988, 168). I interpret this as learning within a given set of alternatives, that is, within paradigm.

Learning II

“deals with contexts and classes of context” (Bateson 1988, 163). It is “a change in the set of alternatives from which choice is made” (Bateson 1972, 298). This is learning the context of Learning I. Berman (whose 1981 book is largely informed by Bateson), suggests Learning II is:

> Understanding the nature of the context in which the problems posed in Learning I exist; learning the rules of the game. Equivalent to paradigm formation.
> (Berman 1981, 346)

So this is a change in the set of alternatives, which I interpret as paradigm change because a new paradigm presents a new set of alternatives. However, Bateson distinguishes between ‘mere replacement’ of premises and ‘facilitation of replacement’ (1972, 302), the latter equating to Learning III. I take ‘mere replacement’ to mean that it is possible to adopt an alternative paradigm without fully understanding it, or its relation to that which it replaces.

Learning III

is “a corrective change in the system of sets of alternatives from which choice is made” (Bateson 1972, 293). This is the ‘context of contexts’, a transparadigmatic state which represents a mastery of paradigm. Berman (1981, 232) suggests it ‘is learning *about* Learning II, about your own character and worldview’. As noted above in A.3.5, Bateson thought that attainment of this level of learning was unlikely for most people.

However, some commentators appear to interpret Learning III as being a little less unattainable than Bateson himself suggested. For example, Reason suggests (citing Skolimowski 1994) that Learning III “implies an experience of self much more fully in

transaction with others and with the environment, a participatory self or participatory mind" (Reason 1995, 3). From my reading of interpretations of Learning III, there appear to be two versions. One is the transpersonal or spiritual (which Bateson himself implies) which appears to be equivalent to the Eastern notion of enlightenment, or the 'Western' peak experience. In Senge's terms, this represents a very significant movement of mind, a *metanoia,* which, as Senge points out (1990, 13), means *meta* - above, or beyond, nous - *mind*. The other interpretation is more pragmatic. This involves *conscious choice* of paradigm, in full recognition of the existence of alternatives. Hawkins (1991) elaborates this important distinction. He recognises that one way of interpreting Learning III is to follow Bateson - that such learning is a state of enlightenment attained by only a few, for example, Zen masters. But he adds:

> The other more useful way of viewing this level is that it provides temporary access to a higher logical level of awareness, where we have the space to become free of our normal perspectives and paradigm and constraints to see through them rather than with them, and thus create the space to change them. (Hawkins 1991, 172)

- Keypoint: The implication here is that Learning III brings us to a full awareness, which (perhaps inevitably) leads us towards a critically aware, systemic, participatory paradigm which reflects 'down' and is made operative *back across* the nesting learning levels of II and I.

To paraphrase Varela, this is a 'new mind', expressing a different epistemology which in turn informs new actions (Varela 1987, 49). In this way, learning and being as a whole is transformed.

It is important to underline that, if we follow the transpersonal interpretation of Learning III, there is some conflict between this interpretation and the logic of other three-level models of learning which see the third level as equating with realisation of and change of epistemology. The conflict arises because Bateson viewed Learning III as rare, while other three-level models view epistemic learning as more practicable and attainable - if still difficult. For this reason, I tend towards a pragmatic view of Learning III which more nearly equates with the models of epistemic learning and educational change that I employ in the Thesis (drawing particularly on Bawden's work). At the same time, I in no way deny the reality of deep spiritual experience which seems to me to be a related but different kind of higher order learning. Roger Packham, previously a colleague of Bawden's at Hawkesbury College, notes that both interpretations of Learning III

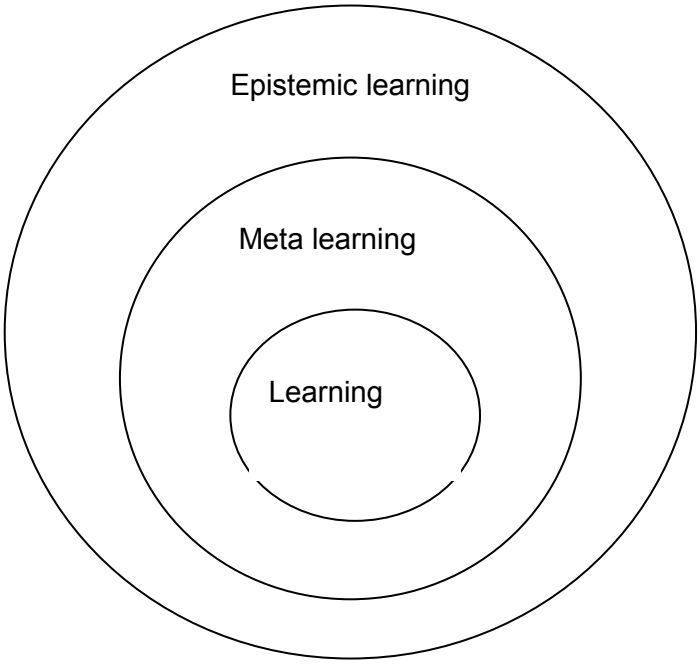
"require the learner to experience the relativity and temporariness of all mindsets" (Packham 1998, 3). I would suggest that experience of Learning III as Bateson saw it would certainly involve a change of epistemology (as he himself stated), but in contrast, Hawkins' pragmatic Learning III involving epistemic change would not *necessarily* lead to the spiritual experience that Bateson implied (though it might).

It is important to state that Bateson's distinction of learning levels was seminal in the development of similar models that later followed. Thus for example, Argyris and Schon (1980) acknowledge the origin of their distinction between single-loop and double-loop learning in Bateson's work on learning levels. Similarly, the staff of the Centre for Systemic Development which was at Hawkesbury, in Sydney, acknowledge that they found Bateson's framework a powerful model for their "understanding of learning and its link to systemic thinking and the ecology of minds" (Bawden and Packham 1993, 6). The Hawkesbury model was also based on the work of cognitive psychologists Kitchener (1983) and Salner (1986) which distinguishes between three levels of cognition - being cognition, metacognition, and epistemic cognition. Bawden and Packham describe these levels thus:

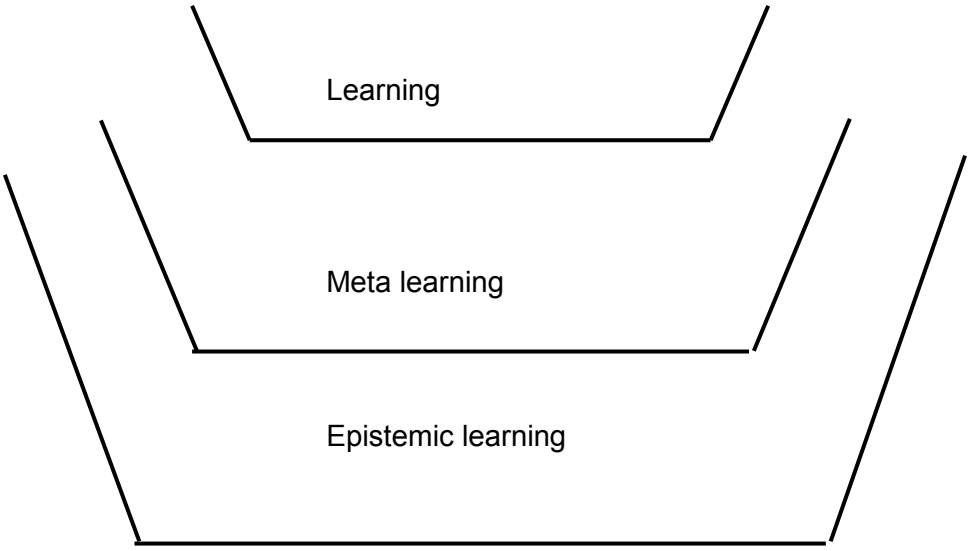
- Level 1 *learning* or cognition. Basic information processing (perceiving, reading, speaking, computing, memorising etc).
- Level 2 *meta-learning* or meta-cognition. This is learning about learning, or knowing about knowing. This is "about the process of learning and what that reveals about what we are learning about the matter to hand at level one" (Bawden 1997a, 27). It is self-reflective evaluation and correction (Packam 1998, 4).
- Level 3 *epistemic learning*, or 'learning about learning about learning'. This involves "thinking about and evaluating the foundations of thought itself" (Bawden and Packham 1993, 6), and is about the "frameworks or worldviews which provide the context or perspective through which we are both learning about learning, and learning about the matter to hand" (Bawden 1997a, 27), that is, at the 'lower' levels. Epistemic learning, they say, "is a crucial proposition with extremely important connotations for education" (Bawden and Packham 1993, 6).

Importantly, the Hawkesbury team do not see these levels as a simple linear progression (as in a ladder where the rung below is 'left behind'), but as nesting systems whereby the higher level subsumes and incorporates the level below, and influences the level below (see Diagram B.1).

Diagram B.1: Learning levels



Alternatively, these levels can be shown as “nests”.



We can now elaborate the learning levels again, by using sets of linked phrases:

Learning I	learning	learning	thinking	knowing
Learning II	meta-learning	learning *about* learning	thinking *about* thinking	knowing *about* knowing
Learning III	epistemic learning	learning *about* learning *about* learning	thinking *about* thinking *about* thinking	knowing *about* knowing *about* knowing

An analogy derived from the common saying that one 'can't see the wood for the trees' perhaps provides a useful metaphor: Learning I might be only 'seeing the trees', or working within the paradigmatic 'wood' (subparadigm level) the existence of which is itself unperceived. Learning II might be stepping out and seeing the wood as a whole, recognising its existence for the first time, and having some idea of the possibility of an alternative wood (paradigm level); Learning III might be the helicopter view, seeing fully that a number of alternative woods or paradigms exist and may be chosen between (metaparadigm level). To continue the analogy, one cannot stay in a helicopter forever, and therefore we need to 'come down' from temporary access to the metaparadigm level to practice at the paradigm and subparadigm level. What these models clearly suggest is that 'lower levels' of learning are less difficult and more everyday in nature. Indeed, theorists make a distinction between basic learning and 'higher order' learning levels. The argument, to which I shall return, is that:

- Keypoint: sustainability requires epistemic or higher order learning in order to transcend the trap of unexamined assumptions that have lead towards or exacerbated conditions of unsustainability.

I will now examine learning levels in more detail, drawing parallels between different writers' interpretations to enrich the discussion. As noted, Argyris and Schon's (1978, 1980) concepts of *single-loop* learning, and *double-loop* learning derive from Bateson's earlier work and use of these terms. Learning I and II also correspond with Schon's idea (1987) of *reflection in action* and *reflection on action* respectively, and with the ideas of *simple (or adaptive) learning* and *generative learning* (O'Connor and

McDermott 1997). Thus, a number of writers/researchers echo Bateson's view of levels of learning, and all differentiate between basic learning and higher order learning.

Bateson also used another terminology, making a distinction between 'first order' learning or change, and 'second order' learning or change, and these concepts also tie in directly with the learning levels. Ison and Russell (2000, 229) define these terms as follows:

> Second-order change is change that is so fundamental that the system itself is changed. In order to achieve (this) it is necessary to step outside the usual frame of reference and take a meta-perspective. First-order change is change within the system, or more of the same.

Thus, first order learning and change is akin to what Clark (1989, 236) calls "change within changelessness", and is often geared towards effectiveness and efficiency - 'doing things better', rather than 'doing better things' (and rather than, at a deeper level still, 'seeing things differently'). Watzlawick, Weakland and Fisch (1980, 50), make the distinction thus: "there are two different types of change: one that occurs within a given system which itself remains unchanged, and one whose occurrence changes the system itself". Clearly then, learning can serve either to keep a system stable or enable it to change to a new state in relation to its environment. While these ideas are often used to describe organisational change, they apply equally to worldview/paradigm change where the worldview is itself seen as a system of thought.

Single-loop learning/adaptive learning/first order learning tends towards stability and maintenance - in fact 'maintenance learning' is another term for this order of learning. This learning does not affect the individuals' or an organisation's or a culture's worldview. For example, in their description of single-loop learning in the context of an organization, Argyris and Schon suggest this learning occurs when members of the organization respond to changes in the internal or external environment by "detecting errors which they then correct so as to maintain the central features of organizational theory-in-use". Strategies and assumptions may be modified but "organizational norms...remain unchanged" (1978, 132). Here the word 'error' means "a match or mismatch of outcome to expectation which confirms or disconfirms organizational theory-in-use". So this is maintenance learning - adjustments or adaptations are made to keep things stable in the face of change. In most cases, this is not a 'bad thing' but a necessary learning response to ensure stability. Bell and Morse (1999, 102) use Maturana and Varela's notion of *autopoesis* in living systems (an important idea of self-

renewal and self-organisation, which I revisit in **Appendix I**) to explain how organisations, or belief systems can act as relatively closed systems in relation to a changing environment. But this becomes a 'bad' thing, or a maladaptation, when a first order change is neither appropriate nor an adequate response to significant change in the environment.

O'Connor and McDermott (1997, 122/123) use simpler language and explain that Level I learning is everyday learning:

> Most of the time we act on feedback. We see whether our decisions and actions have taken us any nearer our goal. If not, we do something else. If so, we do the same again. This all happens in an instant; it takes far longer to describe than do…Single loop learning is a balancing feedback loop and tends towards adaptation and stability. In organizations, it tends towards procedures, institutions, 'the system' of doing things.

So learning which serves stability tends to be characterised by negative feedback loops, which dampen change. Double-loop learning/second-order change, by contrast, is deeper learning where change tends to be characterised by positive feedback loops between the system and its environment, whereby both attain a new state (Banathy, 1992).

The theory of levels of learning is a generic theory that has broad application, in the same way as the theory of logical types from which it derives. It is important then, to state that learning levels can be used to understand *situated learning* - such as 'problem-solving' situations in everyday life, to organisational and group learning, or to change in professional paradigms - which *do not necessarily involve change in cultural worldview.* For example, Watzlawick *et al.* (1980, 49) suggest that psychologists largely talk about first order change, that is change from one behaviour to another within a given way of behaving, whilst psychiatrists are predominantly concerned with second order change, that is, the change from one way of behaving to another. Watzlawick *et al.* add that these professions are not often aware that they are concerned with different levels of change, and that confusions and controversies could be avoided if they were.

My interest here is the use of learning level theory to understand change in individual and shared cultural worldview. So for example, in environmentalism, those who look for solutions within a set of 'light-green' behavioural change responses, such as recycling,

using more public transport and so on might be seen as working at the level of first order change. It has value but the options do not threaten the bases of the existing structural systems or belief systems. Second order change however, questions assumptions and seeks deeper ecological solutions which involve structural change and valuative change. The counter movements associated with anti-globalisation/localisation and the World Social Forum (whose slogan is 'another world is possible') perhaps represents this deeper analysis. This is a distinction between a simple environmentalism and a deeper 'second order' 'ecologism" (Dobson 1990) which is examined further in **Appendix I.**

Learning levels may be seen as a set of nesting systems where "each provides a context for the other levels nested within it" (Brown and Packham, 1999, 10). As noted above, learning involves change. In systems parlance, learning is seen as 'self-correction in response to feedback'. Brown and Packham suggest Bateson's learning levels are "a hierarchic classification of the types of error which are to be corrected in the various learning processes" (1999, 10).

From this view, we can see that progress through the learning levels is a function of learning or correction, when and where a particular level is no longer adequate to meet challenges or problems faced. Yet, as we have also seen, learning can also serve to stabilise or maintain the learner, the group, or belief system. This model illumines the problem with social learning for sustainability. Faced with interrelated problems of immense complexity (such as the 'world problematique' reviewed above), arguably society is doubly constrained - first, with most attention and debate focussed within lower order learning levels and second, within an inadequate cultural paradigm. Current paradigmatic turmoil associated with postmodernism may be seen as a possible precursor of constructive change - that is, corresponding with a second order stepping out and evaluation of the modernist paradigm. But society as a whole has not yet achieved the breakthrough towards an ecological alternative necessary to self-correction - despite the mounting feedback of social, economic and environmental dysfunction revealed in such reports as annual Worldwatch *State of the World* reports, WWF's *Living Planet Index*, or UNEP reports such as the *Global Environmental Outlook* series, and as revealed in our daily newspapers. Indeed, there seems to be a worrying degree of denial or non-learning.

- In sum, where the whole cultural paradigm is at stake, my understanding is that Learning II is a realisation of the limits of a dominant paradigm, and a move

> towards an alternative, even where the basis for that alternative may not be fully understood. This is, I believe, what is happening with the emergence of an ecological worldview. Learning III however, may be seen as mastery of the *class* of paradigms, the 'context of contexts' whereby the sets of alternatives are apparent. It affords an understanding of the choice of paradigm that then might be consciously made at the Learning II level of operative paradigm, which in turn would influence the nature of learning and choices at Learning I levels. This more adequate operative paradigm, as far as we can see or know, appears to be the ecological worldview.

At this point, I want to include a lengthy quote from Watzlawick *et al.* (54, 1980)

> …it is our experience that second-order change appears unpredictable, abrupt, illogical etc only in terms of first-order change, that is, from within the system. Indeed, this must be so, because second-order change is introduced into the system from outside and therefore is not… understandable in terms of the vicissitudes of first-order change…But seen from outside the system, it merely amounts to a change of the premises governing the system *as a whole*…..Any change of *these* premises would then have to be introduced from a yet higher level (i.e. one that is *meta-meta* to the original system and *meta* to the premises governing that system as a whole). However - and this is an eminently practical and crucial point - to effect change within the original system it is sufficient to go only as far as the meta-level.

This has a number of implications:

1. that higher level change cannot be understood from the vantage point of lower levels, (Bateson notes that "no amount of rigorous discourse of a given logical type can 'explain' phenomena of a higher type" 1972, 265),
2. that those experienced at higher levels of change understand change at the levels below and are more likely to be able to induce next level change in a system,
3. that it is not possible (probably) to jump a learning level i.e. from first order to third order change, and it is necessary to experience second order change to achieve third order change. (This *can* be a rapid process however.)

There is another critical point here too. If the emergence of the ecological paradigm is largely a Learning II 'metacognition' phenomenon, then it can be argued that its emergence can only be accelerated (a need articulated by Clark 1989, Brown 2001,

Gardner 2001) if sufficient members of society experience Learning III - at least in 'epistemic terms', if not in 'enlightenment terms'. Hawkins (1991, 178) (in the context of organisational change) puts it like this:

> It is not possible fully to understand a level of learning from within that level… we need some people in organisations to be concerned with and involved in Learning III before we can possibly improve Learning II functioning. An organisation needs not only its doers and operatives (Learning I); its strategists and thinkers (Learning II); but also its men and women of wisdom (Learning III).

Using this model, I would suggest that:

- Keypoint: the ecological worldview is emerging at *both* Learning II level and Learning III levels.

Using Bateson's terms 'replacement' and 'facilitation': at Learning II, it is a partly understood replacement of modernism and mechanism with ecological thinking; at Learning III, it involves a radical reappraisal and evaluation of the influence of dominant paradigms on our thinking and the facilitation and conscious choice of ecological bases as an alternative epistemology, then made operative at the paradigm and subparadigm levels 'below'.

Hawkins (1991, 178) suggests that double-loop/second order/Learning II alone is insufficient. Although it helps us move from 'efficiency thinking' at Learning I level, towards 'effectiveness thinking' at Learning II, "it fails to address the fundamental question: effective for what, or to what end"? Without Learning III, he suggests, there is a danger of creating double-loop learning organisations that "are more effective against short-term economic indicators, but whose very success is disastrous for the planet" (179).

- Keypoint: Learning III, says Hawkins, shifts our attention to the context of planetary survival, and the evolutionary need - a condition of (what he calls, borrowed from Torbert) 'integrative awareness'. Hence, Learning III is associated with epistemological and perceptual change and a transpersonal/transorganisational ethical and participative sensibility.

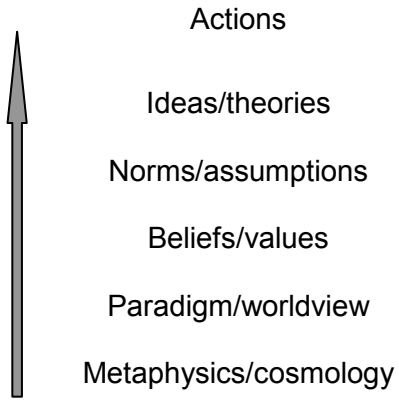
I am aware that such a rationalistic description fails to capture the quality of experience that Learning III appears to entail, the 'recursive vision' and 'aesthetic space' beyond cognition that Harries-Jones (1995, 4) - following Bateson - suggests "is necessary to any ecological perspective and hence to our own survival".

Another implication of the learning levels model, is that those steeped in the mechanistic paradigm at Learning I and II are unlikely to fully understand the ecological critique or alternative. Similarly, reductionists have more trouble understanding holists, than holistic thinkers have understanding and using reductionism where appropriate. This is certainly my experience, and also seems reflected in environmental debate (Cotgrove 1982). Consistent with the theory of learning levels, is the idea of *systemic levels of knowing,* and this is outlined in Box B.1 below.

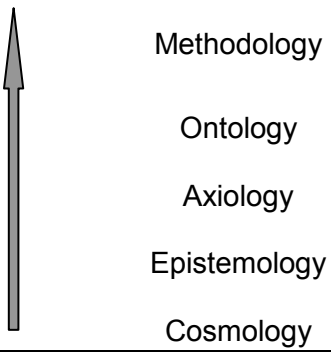
Box B.1: Systemic levels of knowing

This is another use of the nesting systems model which suggests an interrelated hierarchy. I have not found this idea written down simply quite in this way, but have seen it endorsed by the ecophilosopher Henryk Skolimowski in a lecture at Schumacher College held in July 1993. Similar hierarchical models however, include:

- Slaughter's (1995, 151) 'hierarchy of knowledge' (Wisdom, Knowledge, Information, Data)
- Heron's (1992, 20) idea of four modes of the psyche (Affective, Imaginal, Conceptual, Practical) and
- Banathy's hierarchy of learning (Wisdom, Understanding, Knowledge, Information, Data) 1991, 77).



Alternatively, another way of stating this relationship might be:



It is not important and probably not possible to say with certainty that these 'layers' exist in human thinking and in this order. But nevertheless, the model is a very useful way of thinking about how deeper perceptions and conceptions inform everyday thoughts and actions, even when their influence is not recognised. Skolimowski's point was that each level towards the top of this 'iceberg' (my analogy, not his) was a manifestation of the levels below. (To give an illustration: Lawton (1989, 3) suggests, "Every statement that a teacher makes in a classroom is value-laden, connected with ideas about the purpose of education, probably connected with more general values and beliefs, and maybe with the purpose of life. So it is with educational planners and curriculum developers, whether they realise it or not.")

Thus, the more immediate, practical, visible end of knowing is informed - whether we realise it or not - by our deeper individual and shared orientations. The implication is that the reconstruction of Western thinking arguably has to, as far as possible, include the *whole system* of knowing: in other words, epistemic change is necessary.

This model - like the learning levels model above - helps clarify reasons for confusion in debate between parties. To illustrate: not only might two groups of people find it difficult to communicate through speaking from different paradigmatic bases (this is Cotgrove's finding, reported above), but the focus of their consciousness might be at different levels of knowing. For example, there is often a gap in communication between those interested in 'practicalities' and those interested in theory and ideas. Another implication is that the higher up the model, the more divergences exist - rather like the many twigs and branches arising from a common trunk. This means that:

- Keypoint: those who hold different arguments, perspectives and interests at the 'top end' *can still share fundamental beliefs and epistemological and metaphysical premises nearer the foundational end of the system of knowing* (Norgaard 1994).

Thus, it is not uncommon for politicians, for example, to argue over policies yet share beliefs and assumptions at a more fundamental but unarticulated level. Further, they may argue for 'radical change', but a deeper level, such change is still founded on unaltered premises. Similarly, research paradigms in social science or in environmental education may appear in contestation at one level, yet share the same bases at a more fundamental level: this is an important issue I return to in Part C.

In sum, learning level theory provides an extremely helpful insight on different qualities of learning experience which is applicable to the problem of worldview change. It is important to state that I am not suggesting that everybody needs to attain Learning III. Certainly - following Bateson's explanation of this level - such attainment would be impossible. But I am suggesting that significant numbers, particularly in the education community (which is ostensibly responsible for learning policy and provision), need to experience some degree of epistemic learning - through which paradigm change at the operative level of Learning II would be made more effective and widespread.

The next subsection looks briefly at how the dominant epistemology came to be.

1.4 The bases of the Western worldview

Many writers, writing from a broadly ecological perspective (Koestler 1959, Berman 1981, Capra 1982, Ponting 1991, Marshall 1992, Tarnas 1991, Spretnak 1997, to name a few), have critically traced the development of the modernist Western worldview, rooting it in Greek thought or earlier, but seeing its flowering mainly occurring in the Scientific Revolution of - mainly - the 17th century. Others, for example, Eisler (1990) see the current dominant worldview and its alternative having a lineage that goes back to Western prehistory. Eisler's study distinguishes between what she terms 'dominator' and 'partnership' models of social organisation, and suggests that "the original direction in the mainstream of our cultural evolution was toward partnership but that, following a period of chaos and almost total cultural disruption, there occurred a fundamental social shift….to a dominator model" and, at that time in prehistory, "the cultural evolution of societies that worshipped the life-generating and nurturing powers of the universe - in our time still symbolised by the ancient chalice or grail - was interrupted." In Eisler's view, technologies "designed to destroy and dominate" and symbolised by the Blade, replaced those designed "to sustain and enhance life" and it is this continuation of the dominance of the Blade form of technologies up to the present "rather than technology per se, that today threatens all life on our globe" (1990, xvii/xx).

Other writers view the changes wrought by the Scientific Revolution as key to understanding the current crises of late modernity or postmodernity. This history is well documented and there is no need to elaborate it here, other than try to elucidate its epistemological aspects. In essence, a fundamental shift in worldview took place between around 1500 and 1700 away from the relatively ordered world of medieval Christendom, to the new post-Renaissance age of (what historians later called) the

Scientific Revolution. The word ‘revolution’ is appropriate because there was an almost complete change in ontology and epistemology. While it is important to acknowledge the complexity involved in the history of paradigmatic change, which is reflected in a study by Koestler (1959), Koestler is nevertheless able to write:

> If one had to sum up the history of scientific ideas about the universe in a single sentence, one could only say that up to the seventeenth century our vision was Aristotelian, after that Newtonian.
> (1959, 497)

A series of developments in thinking and discoveries had a cumulative and synergistic effect over a period of around two centuries, undermining the old order and building the platform of ideas, beliefs, values and assumptions on which the modern age was built. The geocentric view of Ptolemy and the Bible, was displaced by the astronomy and physics of Copernicus, Galileo and later, Isaac Newton (1643-1727). Science became revisioned particularly through the work of Francis Bacon (1595-1626) in developing empiricism and inductive reasoning, and the analytic reasoning propounded by Rene Descartes (1595-1650). According to Berman, whilst Bacon never performed a single experiment, his legacy was the rethinking of science as experiment, of science as utility, and “the questioning of nature under duress” (Berman 1981, 31). Descartes made the seminal distinction between the mind - *res cognitans* ‘the thinking thing’ and matter - *res extensa* ‘the extended thing’. This separation between mind and body, subject and object, observer and observed, people and nature, ushered in the dualism and binary thinking that consequently became perhaps the most fundamental characteristic of the modern worldview. Descartes may be seen as the father of reductive thinking, of atomism, where a seemingly mechanical world was understood by mechanical reasoning, whereby problems were broken down into component parts: the whole was no more than the sum of its parts.

Whilst there was some tension between the empiricism of Bacon and the rationalism of Descartes, the two approaches complemented each other as tools in the functioning of a new emergent worldview based on separation and the primary reality of the material world. At the same time, the dominant metaphor of the world and universe changed from a theocentric organic whole where God made order, to the machine, where God was outside from the system he created, rather than seen as immanent within it.

While Newton subsequently disproved many of Descartes’ theories about the natural world, his work endorsed and validated the ‘world as machine’ metaphor. The sense of

dis-enchantment, of separation, combined with powerful new tools of investigation, that resulted from this period were essential to the great flowering of scientific enquiry that followed from the seventeenth century. And it also enabled utility, the use and control of science and nature, through the employment of instrumental rationality. Thus the scientific revolution overcame the continuity of the worldview stretching from Aristotle through Thomas Aquinas upto the medieval view that equated truth and goodness: in the Cartesian view, fact and value are unrelated.

Thus the cultural inheritance of the Scientific Revolution was an ontology which emphasised a mechanistic cosmology, which was primarily determinist, and materialist; and an epistemology that was objectivist, positivist, reductivist, and dualist. It spawned a mutually informing nexus of ideas, assumptions, and methodologies that became the expressions of the modern cultural paradigm. Social Darwinism in economic and social patterns, behaviourism in the social sciences, logical positivism in philosophy and ethics, scientism in policy debate, materialism in popular culture - all were, and largely, still are in perhaps more sophisticated forms - parts of the architecture of the modernist paradigm and the myth of progress. The mutually reinforcing nature of these aspects of the paradigm discourages awareness and questioning of the paradigm itself, because reality and norms are defined and constantly reiterated (not least by the media). Thus as Norgaard comments with respect to the promise of progress and development for all in the 20th century:

> Modernism betrayed progress by leading us into, preventing us from seeing and keeping us from addressing interwoven environmental, organisational,and cultural problems.
> (Norgaard 1994, 2)

Norgaard (1994, 63) acknowledges the underpinning beliefs of the modernist Western paradigm have been “extremely productive for both Western science and other institutions” but they are “embedded in our public discourse to the exclusion of other metaphysical and epistemological premises which are more appropriate for understanding the complexities of environmental systems and which are more supportive of cultural pluralism”.

Arguably, the essence of the modern worldview was (and still is) the perception of ‘discontinuities’ between subject/object, mind/body, people/nature and other poles. In other words, the Western mind shifted from some sense of identity with ‘the Other’ in pre 1500 worldviews to a profound sense of, as well as intellectual belief in,

separateness. Here then, seems to be the origin of what Bateson later described as our 'epistemological error'.

For Berman, modernity is a distortion which contains the seeds of its own demise. He argues that the modern epoch contained 'an inherent instability' that meant it could not last for a more than a few centuries. He argues (1981, 23) that this relates to the denial or suppression of parts of reality, and the separation of humans and nature:

> For more than 99 percent of human history, the world was enchanted and man saw himself as an integral part of it. The complete reversal of this perception in a mere four hundred years or so has destroyed the continuity of the human experience and the integrity of the human psyche. It has very nearly wrecked the planet as well.

This is echoed in the novel *The Chymical Wedding* where a character says*:*

> Materialism has freed us to do many ingenious things, but now the bill is presented. Apart from the manifold horrors we perpetrate upon ourselves, forests die, even the seas are fouled, we can no longer trust the air....By its careful inventory of the multiplicity of things it has succeeded only in creating a schizophrenic world, powerful but fissive. It should be no surprise therefore that - unless we wake up - its most characteristic achievement may soon tear the planet apart in a final clash of unreconciled opposites.
> (Clarke 1989, 173)

Or - according to Berman:

> Western life seems to be drifting toward increasing entropy, economic and technological chaos, ecological disaster, and ultimately, psychic dismemberment and disintegration.
> (Berman 1981, 15)

Whether this is 'true' or not is less an issue here, as to whether the dis-integrative qualities of our shared worldview are the main agent of our contemporary crises. Berman's ontological argument centres on loss of connection and meaning. It appears that, in a sort of double-bind, separation has rendered us less able to see the consequences of separation. The relationship with nature changed from one of co-definition, co-arising, co-evolution, to alienation. To borrow the distinction made (in 1937) by Buber, we have moved from an 'I/Thou' relation of relative dynamic harmony,

to a ‘I/It’ relation that is not only one of separation, but inevitably involves devaluation of Other.

This separation is characteristic of our external relationships with people and nature, but also our ‘internal relationships’ as evidenced in the field of psychotherapy (Laing 1965). Seen systemically, dysfunctions in our internal and external worlds are intimately related. Thus Heron (1992, 12) points to the separation of “intellect from affect” from the ancient Greeks onwards, leading to an “internal psychological abuse” which he says, leads to myriad forms of exploitation in the external world. As many writers have pointed out, separation - whether internal, or people from nature and from each other - allows domination and exploitation, through lack of any sense of identification.

According to Metzner (1995, 65) separation is reinforced through our institutions:

> Individuals feel unable to respond to the natural world appropriately, because the political, economic, and educational institutions in which we are all involved all have this dissociation built into them. Dissociative alienation has been a feature of Western culture for centuries.

Similarly, Wilber makes an important distinction between ‘differentiation’ and ‘dissociation’. As he suggests, it is one thing to *differentiate* between culture and nature, for example, but quite another to *dissociate* them: “One of the most prevalent forms of evolutionary pathology occurs when differentiation goes too far into dissociation” (Wilber 1997, 73). Yet, dissociation appears to be endemic - one might say systemically endemic - in Western society, worldview, epistemology, language and thought.

The triadic model that I have outlined in the Thesis, suggests that we can represent three dimensions of *human experience/knowing* as epistemology, ontology and methodology, mutually informed by parallel components of paradigm which I have referred to as *ethos, eidos* and *praxis.* My view is that this ‘whole systems model’ allows us to summarise and represent the ecological critique of Western culture, of Western ways of seeing/knowing/doing, as well as indicating an integrative ecological alternative.

For example, Marglin (1990, 24) reflects a common view in critical literature thus:

> The distinguishing and pathological feature of Western knowledge systems is the subordination of the personal to the impersonal.

In other words, Marglin is pointing to the imbalance between the first and second dimensions of knowing within the Western 'knowledge system' (his phrase). So the perceptual/personal/intuitive knowing dimension is undervalued (as 'subjective') and underecognised, as against the cognitive/impersonal/theoretical dimension. Similarly, Heron suggests that:

> the intellect exploits and abuses its affective base by controlling, and not acknowledging its origin in, affect; by denigrating and misrepresenting the nature of affect; by inflating its separatist power by leaching the formidable energy of affect while denying the fact.
> (Heron, 1992, 12)

Similarly, as Bawden (2000, 7) points out, by virtue of its own epistemological, ontological and axiological foundations, the dominant paradigm 'cannot be self-critical'. While this has profound costs in itself, the cultural dominance of the Western knowledge system imposes costs on other ways of knowing - often more integrative ways which bring together the three dimensions of knowing and experience. So Marglin (1990, 24) goes on to describe the exclusive character of Western scientific management, typified:

> not only by impersonality, by its insistence on logical deduction from self-evident axioms as the only basis for knowledge, but also by its emphasis on analysis, its claim that knowledge must be articulate in order to exist, its pretence to universality, its cerebral nature, its orientation to theory and empirical verification of theory, and its…hierarchical superiority *vis-à-vis* outsiders.

This said, it is important to acknowledge that Western thought is of course in a state of evolutionary change, and the current historic state appears to be one of late modernity, or postmodernity. This has been accompanied by challenge to modernist thinking both by postmodern deconstructionism and by ecological thought. The significance of such movement is that it provides evidence of reflexivity and social learning which to a degree transcends the trap of self-reference that characterises the dominant worldview.

- Key point. Both postmodern theory and much ecological thought may be seen as second-order thinking which goes beyond the first order thinking of the dominant modernist worldview.

At this point, I will look at these currents of thought in more detail.

1.5 The postmodern condition, deconstructionism and revisionary postmodernism

An increasing number of writers over recent years have held that we are moving into a postmodern society characterised by fragmentation, pluralism and individualism, and by a postmodern culture. Cultural change and associated thought is described as 'postmodernism' while the age is one of 'postmodernity'. Examination of these writers reveals much difference in intepretation and meaning attached to these terms, while some writers dispute the terms' usefulness and relevance given this lack of consensus. Others argue that we live not in a postmodern age, but one of late modernity, while also pointing to the fact that modernisation is still very much alive in the Second and Third Worlds. Thus Kumar (1997,109) suggests that, "the main drama on the world stage is still modernity, and it is destined to hold its place for as long as we can see". Others, however, see our current conditon as a state of transition. Jencks (1992, 11) gives an insightful analysis which clarifies without simplification the state of postmodernism:

> Postmodernism means the end of a single world view and, by extension, 'a war on totality', a resistance to single explanations, a respect for difference and a celebration of the regional, local and particular. Yet in its suffix 'modern', it still carries the burden of a process which is international and in some senses universal. In this sense, it has a permanent tension and is always hybrid, mixed, ambiguous, or what I have called 'doubly-coded'. Post-*Modernism* means the continuation of Modernism *and* its transcendence, a double activity that acknowledges our complex relationship to the preceding paradigm and worldview.

Jencks sees postmodernism not as a total rejection of the modern paradigm, but as a "restructuring of modernist assumptions with something larger, fuller, more true". Modernist theories are not so much overturned or abandoned as "transformed into parts of a larger framework where they still keep their identity" (1992,11). This is a critical point (first mentioned in the Preamble and A.3.1 above), and involves a loosening of the Kuhnian sense of incommensurable paradigms, in favour of evolutionary change whereby the earlier worldview is incorporated and transformed by the new.

Jencks argues against the production of bi-polar oppositional lists of characteristics with columns headed ‘ modern’ and ‘postmodern’ on the grounds that this represents the binary thinking associated with the modernist view. The postmodern view instead is associated with pattern and fuzziness, and so although Jencks finds himself necessarily drawing up two columns, he insists that it should be read as a hybridisation, a double coding: the important thing is the pattern, not the individual items.

According to *this view* of postmodernism then, it does not entail a total rejection of modernist assumptions and theories, but their incorporation, transformation and transcendence. But this view is what Griffin (1992), Spretnak (1997), and Jencks have called *revisionary* or ‘constructive’, or ‘ecological’ postmodernism, and it is important to distinguish this from the *deconstructive* postmodernism normally meant when the word ‘postmodernism’ is used.

Revisionary postmodernism seeks to transcend the modern worldview - going beyond questioning the validity of its assumptions and concepts (which is an essential aspect of the deconstructionist project) by *re-visioning* them. Yet, because deconstructive postmodernism denies the possibility of revisionary postmodernism and of an ecological worldview, it is important to examine this debate further, not least to help defend the validity claims of the Thesis as a whole. Yet I will also argue that deconstructionism is, or has been, an important if ultimately limited step in progressing paradigmatic change beyond the confines of modernism; further that revisionary postmodernism is only possible because of the contribution of the deconstructionists.

The recent birth of poststructural theory and postmodern deconstructionism is associated with French thinkers such as Foucault, Derrida, Lyotard and Baudrillard although arguably, there were antecedent currents of thought in the work of Nietzsche, Heidegger, and Wittgenstein on which the French philosophers drew. It is arguable how far this theoretical field has coherence as it includes many diverse strands in accordance with its emphasis on plurality, yet it has had a major influence on Western intellectual thought since around the mid-twentieth century. In essence, deconstructionism questions the certainties of modernism, of its associated science and philosophy and claims to universality, and its myth of progress. There is an emphasis, particularly through the work of Foucault and Derrida, on the centrality of language and text both in the construction of meaning and as the proper locus of any attempt to understand meaning and validity. Foucault pointed to power as a key

ingredient of all conceptions of knowledge and truth, introducing the dyadic term ‘power/knowledge’ (1980) to show that each is implicated in the other, and thus exposing the claims of rationalist and scientific knowledge to universal validity and neutrality, and undermining the possibility of any tenable ‘grand narrative’ - such as the Enlightenment or Marxist analysis - through what Lyotard (1984, xxiv) termed ‘incredulity towards metanarratives’. Through the work of deconstructionists we are enabled to perceive the myth of disinterested knowledge and question the modernist search for objectivist knowledge. Rather, deeper questions concerning ‘whose knowledge?’ and ‘for what purposes?’ become the central concern. Similarly, feminist epistemology has questioned the supposed value-neutrality and objectivity of mainstream epistemologies, suggesting that behind this mask lies a “complex power structure of vested interest, dominance and subjugation” (Dancy and Sosa 1993). Deconstructionism builds on the ‘language turn’ which was manifest in the social sciences in the latter half of the twentieth century, challenging the foundational certainties, objectivist epistemologies and methodologies, and particularly the materialist ontology of the positivist and empirical paradigm hitherto dominant. Essentially, the ‘language turn’ in the social sciences - the origin of which is often attributed to Wittgenstein and the ensuing schools of analytical and linguistic philosophy (Skolimowski 1981) - disputes the view of language as *representation* of an objective reality giving rise to objective knowledge, and instead stresses the role of language as *interpretation,* and moreover, its critical and unavoidable role in our *construction* of reality. The language turn then, represents a significant shift of ontology from realism towards idealism. Deconstructionism takes this constructivist argument another step. If there is no way of knowing reality behind or beyond language and discourse - if ‘all is text’ - then there can be no appeal or approximation to truth other than through deconstruction of our assumptions. Reality as text is subject to multiple interpretations and readings, and these can have no universal validity.

In sum, postmodern deconstructionists has effected a valuable and significant shift in thinking, a ‘second order’ challenge to the unexamined assumptions of modernism. From this perspective, it is clear that perception and values are inextricably bound up with knowledge-making and the use of knowledge. Further, that there is inevitably, a ‘politics of knowledge’, whereby the forms, control of, and uses of knowledge are contested as expressions of power. Hence discourse and politics, knowledge and power are ‘indissoluble’ (Apple 1991, vii), and this has been pursued through extensive work on analyses of dominant hegemonies from oppositional gender, class and race orientations. Applied to the worldview argument pursued in the Thesis,

deconstructionism helps us to both be critically aware of and analyse the assumptions, the use of language, and the forms and control of knowledge characterised within the modernist paradigm and legitimated by the powerful and by established institutions in society.

Clearly the critical discourse of deconstructionism has been liberating: it has shed scales from modernist eyes, and borrowing Hawkins' term (1991), has, at least to some degree, allowed us to see 'through' rather than 'with' the modernist perspective. Further, by undercutting the notion of one truth, it has arguably 'set us free' to explore new and alternative paths. But this new freedom comes at a price - according to deconstructionism, there can be no direction, no truth, and no grounding for action. It leaves a vacuum as regards purpose, direction and ethics. Further, as the critical realist Huckle states, "the grounds for common agreement together with the emancipatory power of social criticism and critical pedagogy are undermined" (Huckle, in press). Further, deconstructionist thought is very anthropocentric.

- Key point: Paradoxically, and from an ecological point of view, deconstructionism has taken us forward by opening up the space for an ecological worldview, but at the same time, it holds us back by denying its possibility.

The postmodern deconstructivist stance is often accused of ontological and moral relativism: because belief, truth or assertion is seen as relative to the social and cultural environment and there is no objective knowledge independent of the knower, then there cannot be any basis for evaluating between truth claims. Rorty (1999) addresses the accusation of relativism by questioning the distinction that allows the accusation to be made. As a pragmatist, he hopes to "replace the reality-appearance distinction with distinction between the more useful and the less useful" (1999, xxii). I see this as a helpful first step towards the kind of integrative thought that revisonary postmodernism seeks to articulate. Yet there are problems with Rorty's pragmatism. Not least, as Stables (another pragmatist) suggests in relation to Rorty's work, human responsibility must extend beyond the narrowly human concerns exhibited in the political and educational philosophies that have dominated modernity (2003, 9). Further, Rorty does not seem aware of the "epistemological error" argument underlying much ecological thought and indeed invokes Maturana's work on the biology of cognition to suggest that "no organism, human or non-human, is ever more or less in touch with reality than any other" (1999, xxiii) an argument that may work on the cognitive level that Maturana described, but seems to omit the affective domain altogether. An understanding of a

participative, co-evolutionary world seems absent. Rorty suggests, “the question ‘are we describing it as it really is’? is one we need never ask. All we need to know is whether some competing description might be more useful for some of our purposes” (xxvi, 1999). In relation to the environment, Rorty states, “our task is to master it, or to adapt ourselves to it, rather than to represent or correspond to it” (1999, 269). If we accept Batesons’ view that the ecological crisis is causally linked to an inadequate reading of reality, Rorty’s position seems self-limiting, even accepting that there will always be limits to our knowing.

With regard to the realism-idealism issue, I find critical realism a more convincing position than Rorty’s pragmatism, and one that in some ways brings us closer to the ecological worldview. Before continuing discussion on deconstructive and revisionary postmodernism, I will look at critical realism below.

Critical realism, a position which was first set out by R.W. Sellars in his *Critical Realism* of 1916, rejects naive realism (which suggests our perception of the material world to be immediate or direct) and also, according to Flew (1979) is the historical successor to idealism. As Parker (2001, 91) states, “critical realism asserts the reality of structures in the world but the *critical* dimension recognises that all structures can only be known under some socially mediated and hence historically contingent form of description”. Therefore, in common with the ecological, participatory worldview, it maintains the ontological assumption of a material world, but acknowledges that this can only be known through the mediation of perception, language and thought. Further, criticial realism echoes systemic thought as, according to Parker, it opposes reductive materialism in recognising emergence and complexity and can “facilitate a holism that can still welcome analysis” (2001, 105). Huckle and Martin suggest that critical realism represents an approach to knowledge that lies between modernity and postmodernity, in upholding that there can still be criteria for deciding what is true or right, that there can still be general theories whilst accepting plurality, and that a “realistic utopianism” is still worth upholding (2001, 39). To this extent, there is clearly much common ground between critical realism and the postmodern ecological worldview. The differences lie elsewhere. Critical realism appears an essentially rationalist philosophy, whereas ecological thought attempts to weave a broader integrative framework which attempts to go beyond the limits of rationalism and dualism. Critical realism may illuminate some of the ground leading towards a fully developed ecological framework, but does not itself constitute alternative paradigm to the mainstream.

Yet the postmodern turn leaves a hiatus which urgently requires such an alternative. As Reason and Bradbury (2001, 6) point out, “while postmodern / poststructuralist perspectives help us immensely in seeing through the myth of the modernist world, they do not help us move beyond the problems it has created”. At this time of planetary crisis, there is no constructive alternative offered or indeed, possible. According to Griffin, a major writer on revisionary thought, (1992, ii), deconstructionism seeks to overcome the modern worldview through an ‘anti-worldview’ which:

> Deconstructs or eliminates the ingredients necessary for a worldview, such as God, self, purpose, meaning, a real world and truth as correspondence

The problem, according to Spretnak is that deconstructionism is not as *post* modern as it believes itself to be. According to Griffin (1992), it can be seen as ‘ultramodernism’ because it carries modern premises to their logical conclusions. It is popular with intellectuals and academics, Spretnak says (1997, 66) because:

> It stays comfortably within the essential parameters of the modern worldview by failing to challenge the core discontinuities imposed, or intensified by that worldview: between humans and nature, body and mind, and the self and the rest of the world.

She suggests that deconstructionists have been educated in the “scientistic-humanist worldview” and are therefore still influenced by its assumptions. If we were alienated from the world and each other by Cartesian dualism, then we are even more adrift in the relativist sea that deconstructionism presents. Reason and Bradbury are concerned that, at a time of ecological crisis, deconstructionism does not help us in the area of ‘knowledge in action’: they suggest that it may make worse rather than heal the modern crisis of rootlessness and meaninglessness (2001, 6). We are left rudderless with what Spretnak terms the “ideology of denial” (1997, 69).Yet deconstructionist ideas have had wide influence. Spretnak suggests that even people who would not identify with this label, nevertheless hold that:

> Human interaction with nature is a one-way projection, and that beliefs and values are merely relative and have no validity other than their own invention. (1997, 69)

The problem is not with the useful and perfectly valid idea that conceptualisations are culturally constructed, says Spretnak (1991, 5), but with the leap that is then taken that there is “*nothing but* cultural construction in human experience”(her italics). This is a

key point. Spretnak's case, outlined in her *Resurgence of the Real* (1997), is that deconstructionism ignores the common human experience of "the Real" being, *body, nature* and *place.* (She illustrates this by recounting a discussion with a young 'deconstructionist' about whether all life needed water irrespective of what discourse about water might be invented (1991)). The problem is, she says, deconstructionism does not accord with everyday human experience of 'the real'.

Reason and Bradbury echo a further common criticism of deconstructionism – that for all its critique of metanarratives, it too - inevitably - reflects a worldview, and one based on the metaphor of 'world as text'. Instead, they argue - as I also do here - that what is needed instead is a metaphor that respects the truth of cultural construction but also the truth of "deeper structures of reality" and suggest that a "creative and constructive worldview can be based on the metaphor of participation" (2001, 6).

Wilber's criticism of deconstructionism adds another dimension, and turns on the systemic idea of holons. (This key idea is explicated below in B.1.6.) While, Wilber says, deconstructionists are foes of any systematic theory or 'grand narrative' and therefore might be expected to object to a theory of holons, their own work is:

> …driven precisely by a conception of holons within holons within holons, of texts within texts within texts, (or contexts within contexts within contexts) and it is this sliding play of texts within texts that forms the 'foundationless' platform from which they launch their attacks.
> (Wilber 1997, 100)

Wilber agrees with the deconstructionists (1997, 102) that "meaning is context bound, but context is boundless", but goes on to state that this does *not* mean there is no meaning anywhere (his italics):

> That the system is sliding does not mean that meaning can't be established, that truth doesn't exist, or that contexts won't hold still long enough to make a simple point.

Wilber turns the deconstructionists' position on its head (he uses the analogy of a photographic negative), saying that reality consists not of "nested deceptions" but "nested truths".

Does this mean the revisionary movement contradicts Lyotard's premise of deconstructive postmodernism, that there can be no 'grand narrative', no total

explanation? The emerging 'ecological paradigm' appears to be an alternative and oppositional view which in some ways makes big claims, yet it also carries with it a large measure of uncertainty, of questioning and searching, not least as it is still in the making. Thus, Spretnak (1997, 223) refers to it in the future, rather than the present tense:

> A truly postmodern alternative would counter the modern ideological flight from body, nature, and place. It would be a grounded, deeply ecological, and spiritual postmodernism.

Flood adds that systemic thinking, which I argue here is intrinsic in some form to revisionary postmodernism, takes issue with grand narratives, because it accepts that we will always have a restricted understanding of what is going on around us (1999, 2). From ecological point of view, the critical struggle is to surmount and transcend both modernism *and* deconstructive postmodernism, through the emergence of a postmodern ecological paradigm, that recognises the achievements and limits of both. As noted in A.2.3 above, the not infrequent representation and perception of the ecological paradigm as the simple antithesis of the modern paradigm, or of deconstructionism, is a dualistic oversimplification. Whilst useful and easily understood, it gives the false impression that the 'new' is appearing in some conceptual vacuum, and that it is in some sense complete by virtue of being the antithesis of the 'old', rather than emerging from the old as a 'messy' cultural and historic process. By contrast, my understanding is that emerging postmodern ecological paradigm is:

- partly *reaffirmative* (of earlier alternative ideas and philosophies both in ancient and modern times).
- partly *oppositional* and critical (where modernist or deconstructionist ideas appear destructive, dangerous, or 'wrong'),
- partly *hybridising* or transforming (where modernist or deconstructionist ideas are still useful or appropriate but inadequate),
- partly *alternative*, (where modernist or deconstructionist ideas are no longer appropriate)
- partly *innovative* (where modernist or deconstructionist ideas have little or nothing to say).

In terms of the realist/idealist schism and debate, the ecological worldview acknowledges and brings both positions into relationship, a third position I call *relationalism*. Here again, we can invoke the model of learning levels to make an

important point. I am suggesting that this relationalism equates to third order learning and change, which builds from and acknowledges the 'first moment' of positivism and realism as first order thinking, and the 'second moment' of constructivism and idealism as second order thinking. The importance of this point is that second order argument alone, whether expressed in deconstructionism or second order systems thinking, has an inherent danger of underplaying material reality, as a reaction to objectivism and positivism. The flaw in this position - as important as it is in emphasising our inevitably constructive epistemology - is that can allow environmental degradation and associated crises to worsen by default, through failing to recognise our fundamental embeddness in the wider ecology.

- Keypoint: Taking the 'whole sytems' inclusive logic of the learning levels model, *there can be no second order thinking without a first order reality, and indeed, no third order thinking without second order thinking.*

Wilbers' view on the development of worldviews is insightful here (1996, 67):

> As the higher stages in consciousness emerge and develop, they themselves include the basic components of the earlier worldview, then add their own new and more differentiated perceptions. They transcend and include. Because they are more inclusive, they are more adequate.
>
> So it's not that the earlier worldview is totally wrong and the new worldview is totally right. The old one was adequate, the new one is more adequate.

This persuasive idea is also echoed by Tarnas (1991, 438) who says "we can see why the same paradigm…is perceived as a liberation at one time and then a constriction, a prison, at another". But there is a further dimension here too, which Wilber's insight does not fully capture either, and that is the tension throughout the period of modern history between organicist and non-organicist traditions within Western culture and also between Western and non-Western cultures. At the end of his extensive review of 'the ideas that have shaped our worldview' from the Greeks onwards, Tarnas notes (1991, 433) that the organicist alternative tradition, founded upon "the fundamental conviction that the relation of the human mind to the world was ultimately not dualistic but participatory". This he suggests, did not "oppose the Kantian epistemology but rather went beyond it, subsuming it in a larger and subtler understanding of human knowledge". This organicist tradition is reviewed further in **Appendix I**, section 1.3. Ultimately, ecological thinking does no more than claim to be 'more adequate' and is

more interested in integrating partial truths rather than picking one and ‘disproving’ others - an integrative methodology which (as noted above) Wilber claims to follow in his writing.

The postmodern ecological worldview, does not offer a final ‘grand narrative’ but an emerging nexus of thinking across a number of fields including natural sciences, psychology, ethics and philosophy. It stresses such ideas as the participative universe and ‘participative consciousness’ which throw deeply into question ideas of the knowable and determinist world, and yet which affirm the reality of a given and more-than-human but ever-changing and creative cosmos.

In a paper on the ecological worldview, Cobb notes that the materialist-mechanistic worldview has always been accompanied by oppositional, alternative and counter movements. He cites the Romantic movement, vitalism in biology, existentialists and counterculturalists, and occultism. Yet he suggests these ‘reactions’ functioned chiefly ‘negatively’ and were “accepting the modern worldview for the most part”. By contrast Cobb suggests, ecological thinking is qualitatively different. “It is not a mistake” he says, “to single out the ecological movement as of particular importance in helping break the hold of the modern worldview on scientific thinking and common sense” as it has “the essential ingredients for a postmodern worldview” (Cobb 1988, 104).

Postmodernism - of both kinds - has partly arisen from a growing critique of modernist assumptions, but revisionary postmodernism has emerged from a realisation of the inadequacy of deconstructionism in accounting for or addressing increasingly evident social, environmental, and economic, and spiritual problems. Thus, dis-illusion with, or *from*, modernist assumptions and deconstructionist ideas has arisen partly from the recognition of connectivity - of links and patterns between seemingly disparate and disassociated issues and phenomena. It has also arisen from an awareness that we live in paradoxical times: despite the pluralistic ideas of postmodernism, economic and cultural globalisation is leading to ‘global homogenisation with local fragmentation’ rather than ‘global diversity with local cultural coherence’, and that this unsustainable dynamic requires an intellectual as well as a practical response.

In the next section, I begin to look more closely at the nature of the ecological worldview that is at the heart of revisionary postmodernism. It is difficult to capture the essence of something that is ‘in the air’ - an ecological *zeitgeist* - and attempts to do so probably reduce the complexity and richness of what it is or may be. This follows

because it is emergent or arising, and may not be adequately understood until seen from a retrospective viewpoint much later in the century. However, it is possible to map out some of the ground.

1.6 The postmodern ecological worldview - looking at essential ideas

In this subsection I attempt to lay out some of the key ideas and perspectives which, taken together, weave a 'theory of relationship' which underpins the postmodern ecological worldview. In **Appendix I**, some of the intellectual and philosophic foundations which support these ideas are elaborated.

Recognising the Other

According to Berman (1981, 23) we neither can - nor probably would we want to - return to the organicist views of alchemy or animism, but nor do we have to follow the logical outcome of increasing separation and engineering offered by the technocentric and technocratic worldview. There is then, a need to articulate more deeply and clearly, the nature of the ecological worldview which promises a constructive alternative to these directions, whilst acknowledging the simultaneous impulses that - the Western psyche at least - appears to experiencing, of both separateness *and* belonging, both division *and* unity (Colegrave 1979). As I have noted, *relationship* is key here. Buber's model of the 'I-Thou' relationship is one useful way of articulating this essence.

By contrast with the prevailing 'I-It' relation of objectification, the ecological paradigm emphasises an I-Thou relationship, where reality for both is seen as a co-creation of both. Heron comments, "reality, presentness, wholeness exist only in so far as this relation of meeting exists - (Buber) thus stresses *the primacy of relation for attuning to the real*" (Heron 1992, 35, my italics). Similarly, the noted ecophilospher Arne Naess (1995) expounds the notion of 'the ecological self', which involves a broadening and deepening of the self, or self-realisation through identification. (Naess' lecture was given in 1986.) This emphasis on relation, and the *quality* of relation, is at the heart of new paradigm thinking - and is reflected in calls for an education which acknowledges, reflects and gives primacy to the importance of relation (Orr 1992, Smith 1992). This what Laura and Cotton (1999) term 'empathetic education', Eisler (2000) calls 'partnership education', and what I have called 'sustainable education' (Sterling 2001).

I-Thou is a third way, a median way between alienation on the one extreme and union on the other. The dominant relational mode, I-It, is one of separation and alienation, both from each other and from the environment. In extreme, it is *non*relational. This

dualistic separation is reflected even in the structure of the English language, which separates subject and object. In contrast, union means complete identification with the Other, so that consciousness of separate self no longer exists. This is no longer I-Thou, but One, and is exemplified by the 'peak experience' that some people have, or by the extreme identification with prey practised by some indigenous hunters, and by Buddhist philosophy which sees self as ultimately illusory. Heron argues against the Buddhist perspective, saying there is a difference between 'distinctness of being', which he upholds, and an egotistical 'separateness of being' which Buddhism seeks to dissolve.

Heron then, views reality as the One and the Many, the many being differentiated but not separate. This view is increasingly echoed by holistic science, which notes the dynamic connection at physical and non-physical levels between differentiated systems. For example, Macy (both a systems and Buddhist scholar) (1995, 254) talks of life forms as 'patterns' in the flow of energy, matter and information:

> Sustained by these currents, open systems evolve in complexity and responsiveness to their environment. Interacting, they weave relationships that shape the environment itself. Every system, be it a cell, a tree, or a mind, is like a transformer, changing the very stuff that flows through it. Flows of matter and energy create physical bodies, flows of information make minds. Both kinds of flow generate interdependencies weaving each into the larger ecology, the web of life.

Interestingly, Macy appears not to be recognising interrelation between mind and matter, and it may be too simplistic to suppose that ‘just’ flows of information make minds (see “Panexperientialism’ heading below). This reveals, to some extent, a problem with language and our thinking (or language/thinking for these are also intimately connected) which tend as we have seen to reify dissociation. Let's take an important phrase from Briggs and Peat’s (1985) book on holistic science (which otherwise echoes Macy's point). Quoting Bohm’s views on the ‘mind-body’ problem, and the ‘observer and the observed’ relationship, Briggs and Peat (1985, 138) state they ,*“are neither separate, nor the same”*. This statement ‘jumped from the page’ when I first read it. It is a perception that defies logocentric, that is, binary 'either/or' logic - which insists that things are *either* separate, *or* the same, and thereby interferes with understanding dynamic relation. Kidner, similarly, invokes the idea of ‘resonance’ which “respects and recognises the structure of the other”, and he suggests that ‘resonance’ is “an alternative way of envisioning our superficially paradoxical separateness-from and relatedness-to nature” (Kidner 2001, 294, 295). To understand

that organisms, or for that matter people and nature, are 'neither separate nor the same', takes a *gestalt* switch of thinking to appreciate - as opposed to reductive thought which finds it difficult to accommodate. The following tale is illustrative here.

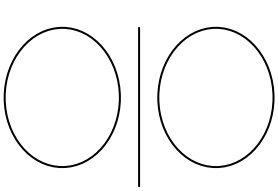
Box B.2: 'Not One, Not Two'
This illustration comes from De Mello's 'One Minute Wisdom' (Dych 1999, 73)

'How does one seek union with God?'
'The harder you seek, the more distance you create between Him and you.'
'So what does one do about the distance?'
'Understand it isn't there.'
'Does that mean that God and I are one?'
'Not one. Not two.'
'How is that possible?'
'The sun and its light, the ocean and the wave, the singer and his song – not one. Not two.'

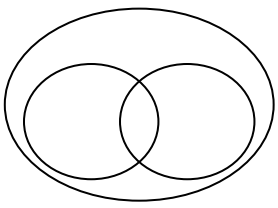
Systems thinking can sometimes facilitate such a gestalt switch, from separation to interrelation and recursion - and this in itself can be a 'paradigm change', a re-cognition. As Meadows suggests (1997, 84), sometimes, "all it takes is click in the mind, a new way of seeing".

The following diagram is a representation of the difference between 'I-It' and 'I-Thou' perceptions of relation.

Diagram B.2: Representing 'I-It' and 'I-Thou' relationships



I-It : decontextual separation



I-Thou: co-creation in context

Thus, I-Thou is much more than *valuing* the Other, the case for which has been the stuff of environmental ethicist's efforts for some years. While valuing is very important, arguments for say, environmental protection, tend to turn on axiological argument

which rather ignore the qualitative dynamics of relation. Ethics of value tend to turn on notions of duty, of 'ought' - a dualistic view - rather than arising from awareness of co-creation or co-evolution. Something of the deeper quality of I-Thou is reflected in Illich's observations which suggest that the Other is always more than we bring to it.

> The I-Thou relationship is always surprising because that which is real, strong, beautiful and good in my discovery of you is not what I could foresee.
> (Illich 1995, 15)

Illich suggests that by seeing more, we in turn are enriched by the Other. To no small degree we are constituted and defined by experience of the Other, in mutually participative, co-creative, interpenetrating relation. As Gibson (1979, 25) has said, "To perceive the world is to co-perceive oneself". Even the words 'I-Thou' then may imply a static distinction which is not really tenable. (These ideas are taken further in **Appendix I** section 3.1 below, on perception.)

From a systems view, an assertion of I-Thou relationship and the total system that the relationship forms, requires a form of thinking that recognises, affirms, and works with this mutuality. It suggests a more whole sensibility, and therefore the additional employment of 'other ways of knowing'. It implies the rediscovery and cultivation of what Bateson called 'analogue' knowledge which includes all affective communication and perception such as art, fantasy, body language, rather than only 'digital' knowledge which is verbal-rational and abstract (Berman, 1981, 341). In contrast, the prevalent I-It relation is almost inevitably one of domination, based on a belief in separateness: I win because you lose, you lose because I win. The alternative, according to Bateson and Bateson (in the last book that Gregory Bateson would write, with his daughter) requires:

> a shift of our ways of seeing that would affirm the complexities and mutual integration of *both* sides of any interface.....What will it take to react to interfaces in more complex ways? At the very least, it requires ways of seeing that affirm our own complexity and the systemic complexity of the other and that propose the possibility that they might together constitute an inclusive system...
> (Bateson and Bateson 1988, 176)

It is this inclusive thinking that lies in at the root of appeals, for example, for what are termed 'win-win' strategies, designs and scenarios (for example, as advocated by radical ecological economist Hazel Henderson 1996), and in the emerging field of ecological design. Further, it is at the heart of ecological ethics and a moral sense

which lies “in a deep appreciation of, and profound respect for, one’s relations with others” (Bawden 2002a, 10).

From ‘holism’ to ‘Holism’

The 'bothness' of this view, is I believe an essential characteristic of systemic and ecological thinking, and a step towards systemic wisdom. However, it is frequently misconstrued. The ancient Chinese Taoist philosophy of yin-yang polar principles (Colegrave 1979), which I take to be entirely consistent with the Batesons’ view above, is illustrative here. A strong and vital part of the ecological worldview movement seeks to assert the suppressed or oppressed 'Other' whether it is women, nature, spirituality or other manifestation of 'softer' values. Those opposing the self-assertive excesses of a 'yang' culture, stress the need for 'yin' integrative tendencies to restore balance (Capra 1996). For example, ecofeminists assert feminine values and intuition in the face of patriarchy and rationalism. Deep ecologists assert nature in the face of domination by mankind. New Agers tend to assert the spirit and consciousness in the face of a strongly material consumerist culture. In yin-yang terms, the reassertion of soft 'yin' values to balance hard dominant 'yang' values appears strongly necessary. But, at the same time, those who assert yin qualities by seeking to *deny* or *suppress* yang qualities altogether tend to fall into the trap of advocating an alternative one-sidedness, albeit perhaps a preferable dualistic imbalance to the present one. In trying to assert a worldview - even a systemic one - that transcends the old, there is a danger noted by Wilber (1996, 67), it “might not just transcend and include, it might transcend and repress, exclude, alienate, dissociate”. In other words, the old dualistic see-saw of competing or negating opposites remains, even if the balance has changed.

The same problem arises in discussion of holism, when attention to 'the whole' can mean devaluation of 'the part' (for example concern to protect ecosystems rather than individual organisms), rather than seeing 'parts' as 'wholes within wholes'. The trap here is one of ‘reductionistic holism’. Arguably, the 'true holists' are those who recognise the need for reassertion of yin qualities within the interplay of a large number of presently distorted polarities, but also recognise that ultimately harmony lies in their co-definitional and recursive relation. This distinction, between what might be called 'holism' (re-assertion of 'soft' poles) and 'Holism' (integration and balance of polarities), perhaps clarifies some of the tensions within the new paradigm. Such Holism is not a dissolution of duality into a homogenous monism, but what Heron (1992, 186) has usefully called a 'dipolar unity' or 'non-separatist dualism', a duality as opposed to the separatist dualism of Cartesian thought. Or, as Watts (1975, 26) (a prolific interpreter of

Eastern philosophy) notes, “the yin-yang principle is not what we would ordinarily call a dualism, but rather an explicit duality expressing an implicit unity”. This is a dialectic which encourages us to “continuously re-connect dismembered dualisms” (Ison and Russell 2000, 25) - a shift (in Diagram B.2 above) from the I-It figure to the I-Thou figure.

In practical terms, it is not a matter of looking either for consensus, “or trade-offs between apparently politicised positions, but an analysis of the patterns that emerge when the reasons for the distinctions between them are explored as if they were different faces of the same reality” (Bawden, 1991, 2366). This is a profoundly different approach, and (though I don’t particularly like the term), different ‘mindset’ than is the norm. Mechanism proceeds from an assumption of fragmentation and dissociation (to use Wilber’s term); ecological systemisism proceeds from an assumption of essential unity and connectivity.

- Keypoint: The former position gives rise to the deep-seated belief that the wellbeing of the isolated part is won in struggle against other parts: the latter position gives rise to the conviction that the well being of the part depends on the wellbeing of the whole, and vice-versa.

The above discussion, reflected in Chinese model of interplay between yin-yang forces, is also echoed in the important systems notion of interplay between towards autonomic and integrative tendencies. This, I believe, is a further essential concept at the heart of ecological thinking. But while a number of writers make reference to this dynamic (Capra 1982, Heron 1992) it is rarely developed. In my view, this apparently simple model affords great potential insight into system behaviour, social relations, 'environmental problems', ecodesign, sustainability, and also, importantly, affords a sense of 'transpersonal' ethics. It is perhaps also a keystone concept of systemic thinking.

Autonomy and integration

The idea of the autonomy/integration dynamic, arose from the development of holistic thinking, and particularly Koestler’s proposition regarding the ‘holon’. Koestler coined the term ‘holon’ (1989) following on from Jan Smuts (1926) original work on holism (although Koestler's book - first published in 1967 - does not acknowledge Smuts). The 'Holism' which I have described above, which transcends the 'reductionism'/'holism' divide and debate, might better be called 'holonism' though I am not aware that this

term has been used elsewhere. In inventing the neologism 'holon', Koestler comments (1989, 49) “it is worth the risk, because it fills a genuine need.”

The need is communicating a sense of 'bothness' rather than 'either/or' to our sense of parts and wholes. The latter sense is what Koestler calls the “two-term part-whole paradigm which is deeply engrained in our unconscious habits of thought”. As Koestler correctly states, “parts and wholes in an absolute sense do not exist in the domain of life” (341) - reminding us perhaps, that words themselves are limited conceptual models, and that identifcation of ‘a system’ depends on the identifier. Thus, Feibleman, in his 1954 paper on a ‘theory of integrative levels’, notes that the question of ‘which are parts’ and ‘which are wholes’ depends on the level looked at by the observer “for there is some level at which every organisation is a part of some whole and another level at which it is a whole to its parts” (Feibleman 1954, 59).

Koestler suggests the concept of holon “to reconcile the atomistic and holistic approaches”. The holonic model suggests that all biological and social systems exhibit both self-assertive and integrative tendencies. This applies to all living systems - organisms, ecosystems, and social systems. But, according to Wilber (1996) it can also apply to symbols, ideas and parts of language. Koestler (1989, 56) explains the dynamic thus:

> the self-assertive tendency is the dynamic expression of the holon's wholeness, the integrative tendency, the dynamic expression of its partness.
> (Koestler 1989, 56)

In healthy systems, states Capra (1982, 27), whether an individual, a society, or an ecosystem, “there is balance between integration and self-assertion. This balance is not static but consists of a dynamic interplay between the complementary tendencies, which makes the whole system flexible and open to change”. Similarly, Heron (1992, 15) - referring to persons - talks of the basic polarity between individuating and participatory tendencies.

While the balance between these tendencies is always in a state of flux, as in the yin-yang model, disorder arises when the subsystem is able to exert *too much* autonomy, meaning that the meta-system is disturbed, or when the meta-system exerts *too much* integration on the sub-system, meaning that the homeostasis and identity of the subsystem is impaired or diminished. (This becomes clearer when one thinks of a family, or classroom, or organisation.) Thus the health, nature, and state of being of

any system then is partly the product of the dynamic balance between these tendencies at all levels (subsystems and metasystems) of the system.

It is important to state that systems appear to nest hierarchically. Koestler invented the alternative term 'holarchy' to describe the relation of holons. As Wilber (1996, 28) says, this is:

> simply an order of increasing wholeness, such as: particles to atoms to cells to organisms, or letters to words to sentences to paragraphs. The whole of one level becomes a part of the whole of the next.

Thus, holarchy is a way of describing what appears to be the fundamental pattern of relation. But a confusion arises when people muddle what Wilber terms 'normal hierarchy' with 'pathological or dominator hierarchy'. He argues that some ecofeminists and ecophilosophers, who see themselves as representative of new paradigm thinking, are mistaken when they identify *all* notion of hierarchy and order with the 'old paradigm' or patriarchal worldview. For example, Kirkpatrick Sale, who is one of the leaders of the bioregional movement, in a bipolar diagram comparing the 'industrial scientific paradigm' with the 'bioregional paradigm' puts 'hierarchy' in the first column, and 'complementarity' in the second (Sale 1991, 50). Similarly, Capra dislikes the use of the word ‘hierarchy’ in connection with biological systems stating that hierarchy “…is a human projection. In nature, there is no ‘above’, nor ‘below’, and there are no hierarchies. There are only networks nestling within other networks” (1996, 35) (as if, I would suggest, ‘network’ is not another human projection). Others prefer use of the term ‘heterarchy’.

Wilber suggests such labels avoid the ‘reality’ of holarchy - rather he says, we need to “tease apart *normal* holarchies from *pathological* or *dominator* holarchies” (1996, 29). While Capra is right to remind us that any model is just that - a model - the idea of holarchy permits the articulation of a generic pattern that seems to apply to both human and non-human aspects of reality. For example, Wilber gives some extreme examples of pathological holarchies, including a cancerous cell invading the body, a fascist dictator dominating the social system, or a repressive ego dominating the organism. For Koestler, too much self-assertion in a holon (in the social sphere) leads to aggressiveness “whether the holon is an individual, or a social class, or a whole nation” (1989, 57). On the other hand, too much integration leads to overdependence at a ‘lower’ level on ‘higher’ holonic levels and loss of autonomy and identity at the lower

level. Here, an example might be the decline of local economies and local economic cycles as economic globalisation proceeds.

Wilber (1996, 29) suggests that pathological or dominator holarchies result when holons “want to be only a whole, and not also a part”. Degeneration of 'normal' holarchies to 'dominator holarchies' leads to “illness, pathology, disease - whether physical, emotional, social, cultural, or spiritual”. Given this model, there is a pattern of dysfunction that can be discerned in dominator holarchies, most notably perhaps - in relation to sustainability - the failure of the human economic system to fit within the larger biospheric metasystem (Meadows 1992, Daly 1996, Brown 2001). According to Wilber (1996, 30), we need to attack these dysfunctional patterns, not to get rid of hierarchies, but to “allow the normal or natural hierarchy to emerge in its place and continue its healthy growth and development”. So for me, the notions of holon and holarchy allow us to think about ‘systems health’ and sustainability.

- Keypoint: the ideas of balance between autonomic and integrative tendencies in systems allow us to consider the conditions that encourage healthy holarchies.

Whole system models

The ideas of balance between autonomy and integration are not enough in themselves to help us appreciate and maintain healthy relationships and holarchies. What is also needed are whole systems models which allow some understanding of the relationship between holonic levels. According to Wilber (1996, 72), most of the ‘maps’ of reality that have been offered from ancient to modern times are holarchic “for the simple reason that holarchies and holons are impossible to avoid”. Wilber offers his own ‘four quadrants’ model which attempts to map what he sees as the four essential and interrelated holarchies of the world, being the intentional, behavioural, social and cultural (his terms). These can be restated as the perceptional, material/objective/individual, social organisation, and collective worldview aspects or systems. Whilst I find Wilber’s model very rich, it is almost too overarching to make it usable or easily comprehensible. On these criteria, I prefer Daly’s ‘means-ends spectrum’ first published in 1977, or Wilden’s similar ‘dependent hierarchy of nature-culture relations’ model (1990) (I am grateful to Paul Maiteny for bringing this to my attention.)

Daly’s model maps a ‘total ecology’ including physical and non-physical aspects. It situates the human economy within a hierarchy/holarchy resting on a basis of nature or

natural resources, seen as '*ultimate means'*, and reaching to the top which is the location of '*ultimate ends'*. Daly's model may be found in the **Appendix II** Part B.1.6, labelled Diagram B.3. The ultimate means is *natural capital*, "on which all life and all economic transactions are built and sustained…(including)…the matter of the planet, the sun's energy, the biogeochemical cycles, the ecosystems and the genetic information they bear and the human being as an organism" (Meadows 1999b, 367). Technology transforms these materials to '*intermediate means'* which are *built capital, human capital* and raw material, which are valued, distributed, maintained through the political economy. These are the means by which governments and economies can deliver '*intermediate ends*' - goods, health, wealth, education, transport, communications etc. Everybody wants these things but they are not sufficient in themselves, as there is a higher level, that of 'ultimate ends' relating to well-being, fulfilment, peace, identity, individuation and so on (in this regard, Daly's model echoes Maslow's hierarchy of needs). Whilst the model has weaknesses (Meadow's chapter discusses anthropocentrism, and the difficulty of being clear about 'ultimate ends'), it nevertheless is a powerful whole system representation which inspires some key insights. Not least it affords a much fuller picture than a good deal of environmentalism which tends to focus on the bottom part of the spectrum.

For Clark, (commenting on Daly's model), by concentrating on the central regions of the entire spectrum of human concerns, "the Western worldview endangers both the environment, the ultimate means that supports and nurtures us, and our own spiritual need for meaning, the ultimate end of conscious existence" (1989, 326). For Meadows (1999, 368), the significance of the model is that it shows that the realisation of human ends depends on "healthy, functioning natural and economic and social systems" in other words, systems health at any level depends on systems health at sub- and supra-system levels.

The important point then, is the relationship between the nesting levels. As Feibleman (1954, 59) says, in such a relationship, "the higher level depends upon its continuance upon the lower levels", and this bears out as a general rule in systems thinking. Wilden's model, which echoes Daly's, makes a similar point: society and economy depend on nature and cannot survive its extinction. But if society and economy extinguish themselves then nature will continue. This of course, is one of the critical implications of Lovelock's Gaia theory. At the other end of the Daly's spectrum, if we make ourselves extinct, we substantially weaken if not destroy Teilhard de Chardin's 'noosphere' and in some sense, perhaps slow up evolution. Ecological or whole

systems thinking then, encompasses and is concerned with the 'ecology' of the whole system represented by Daly's model.

These powerful ideas of holonic and systemic relation suggest a dynamic and organismic order against which notions of pathological hierarchic order, domination and dependency (based on mechanistic, dualistic and social Darwinist ideas), appear simplistic, unjust and dysfunctional. In my view, these holonic ideas are deeply radical, empowering and liberating, but not in any absolute or prescriptive sense. The ideas of healthy holarchy are, of course, no more than another model, but my argument is that they comprise an insightul way of seeing the world, and help us us construct a more fully developed ecological paradigm.

Co-evolution

Another complementary part of the conceptual framework of the ecological worldview is the theory of *co-evolution,* an idea developed by Jantsch drawing on Prigogine's dissipative structures theory and von Bertalanffy's systems theory. It was popularised by Brand (a student of Bateson's) in his *CoEvolution Quarterly,* and notably developed as a theory by Norgaard (1994). According to Darwinian theory, the organism and its environment are fundamentally separate entities, and the organism adapts to changes in its environment, especially through the mechanisms of its genetic makeup and of natural selection. In the co-evolutionary view, organisms and their environment affect each other and change together in systemic relationship. According to Harman (1994, 385), organisms as complex adaptive systems "both make and are made by the environment and are thus actors in their own evolutionary history". Lovelock's Gaia theory has been particularly influential in expressing and advancing co-evolutionary theory.

Co-evolutionary thinking underlines the notion of the world as a systemic, participatory place and refutes separateness and simple causality. Briggs and Peat (1985, 207) note that the co-evolutionary view makes no distinction between micro and macro-evolution: "They cause each other simultaneously. In effect there are no levels at all", while later they state, "Co-evolution is a description of holistic unfolding, not an interaction of separate parts". If we see things from such whole systems perspectives, as Bateson hoped, then in a real sense there is no 'outside intervention', *but a change in the whole in which we are a part*. As Jackson (1991,152) notes:

> The dialectical or ecological approach acknowledges that our every act is involved in creating the world. It is inescapable for us to operate in our daily lives and not create the world that everyone must live in.

This raises the important issue of how far the concept of 'the environment' is valid. Whilst it may be useful in an everyday context, it reinforces the dualistic notion of people-environment; of our essential separateness.

- Keypoint: a simple environmentalism perpetuates the idea of an external, manageable and controllable 'thing' rather, whilst the postmodern ecological worldview subscribes to a more process-based, co-evolutionary ontology whereby we are embedded in a wider ecology.

This is an important difference of view which I discuss further in **Appendix I** (subsection 1.3), while co-evolution is discussed in relation to complexity theory in Appendix I (subsection 1.4)**.**

There is an important corollary here, and that is the shift from certainty and determinism that ecological thinking suggests. Conventional mechanistic science believed that in principle everything was knowable, and predictable; a stance which reflected a belief in a kind of omniscience and prescience, and resulting in a universalism in approaches to and the use of knowledge. Holistic science and systems thinking tells us something quite different: that not only do we know little, but there are limits to what we can know, particularly as regards prediction. This brings us back to the argument that we have to replace the illusion of absolute knowledge and control with the possibility of what Flood (1999) calls knowing and "learning within the unknowable" - and the reality of participative knowing.

Panexperientialism

Closely associated with the theory of co-evolution is panexperientialism (or 'panpsychism'), the ontological position that matter and consciousness are not separate, as Cartesian dualism suggests, but profoundly complementary and co-arising. This view, which echoes pre-modern animistic views of nature, is notably associated in modern times with the process philosophy of AN Whitehead and CH Waddington, and was further developed by Bateson in his extensive work on an ecology of mind (1972, 1980). The panexperientialist position addresses the Cartesian mind-body problem that has dogged Western philosophy and thinking into the present. Thus, Griffin suggests that the difference between the ontological positions of materialism and dualism is more apparent than real inasmuch as materialism accepts

the Cartesian dualistic analysis of the meaning of ‘physical’ and ‘mental’ (1998, 77). Further, almost all authors, says Griffin, write as if materialism and dualism are the only realistic options, and therefore perpetuate the problem (1998, 79). Through panexperientialism, we attribute “the two basic features that we associate with mind - experience and spontaniety - to all units of nature” (Griffin, 1998, 78). This philosophical position has been endorsed by cognitive science, and particularly by Maturana and Varela’s theory of cognition (1987). According to this theory, mind or more accurately mental activity is immanent in matter at all levels of life, whether or not a brain or nervous system is present (Capra 2003, 30). Mind and matter should not be seen as separate things as in Cartesianism, but as “complementary aspects of the phenomenon of life - process and structure” (Capra 2003, 33). This ‘biology of cognition’ has endorsed Bateson’s view that mind is immanent in nature, and in so doing, helps address the issue of the ‘epistemological error’ that he identified. In other words, panexperiential ontology - underpinned by cognitive science - gives grounding for the relational, participative, ecological epistemology that Bateson believed necessary.

Further, this view affords a sense of the numinous and sacred, where ‘man is not the measure of all things’, but part of a greater ineffable whole. It supports an empathetic and transpersonal ethical sensibility, and a sense of compassion.

A summary - thinking and knowing differently

These key ideas imply a necessary shift of consciousness. Put simply, it is from one whereby:

- we believe that in principle everything can be known (and therefore controlled)
- we think we know - through observation and measurement
- we don’t know that we ‘don’t know’

to one whereby:

- we know that everything can’t be known (and therefore ‘appreciation’ is vital)
- we know our knowing, being participative, is inevitably limited
- we know that we ‘don’t know’.

This shift, from certainty to uncertainty or approximation, from control to participation, has been underway for a long time - and can be traced through the influence of von Bertalanffy’s work, of quantum physics and Heisenberg at the micro scale, and now the ‘new science’ of chaos and complexity. But this awareness, beyond science and in the

realms of cultural worldview, in social and economic policy and in what constitutes 'progress' has, as we have seen, been much slower to take hold. Meadows, co-author of the influential *Limits to Growth* study of 1972, wrote after working for ten years with global modelling:

> We know very much less than we think we know. I mean this profoundly....we have learned the severe limitations of the human mind to understand the behavior of any system with more than three species in it, or more than two interacting economic markets, or more than one renewable resource. In short, our minds are unable to simulate any systems we are really interested in. And the computer, while it can help, can still not encompass the full complexity of the real world.
> (Meadows 1982b, 4)

Brundtland (1987,139), the former chairman of the World Commission on Environment and Development, has characterised the four dominant beliefs of the industrialised West which now "must be called into question":

> that people dominate the earth; that they are masters of their destiny; that the world is vast and unlimited; and that history is a process of advancement with every problem solvable.

In short, there appears to be a slow but growing realisation of the need for deep change in our beliefs, attitudes and thinking, and this is the topic of the subsection (1.7) below.

We can now summarise some of the key ideas and beliefs underpinning the postmodern ecological worldview. These include change:

- of *perception* from 'I-it' to 'I-thou' relationships
- of *assumption* from the separateness of mind and matter, to a panexperientialist view of their co-evolutionary relationship
- of *conception* of an essentially dead and inert world, to an animate, dynamic and ultimately sacred world
- of *idea* of separate material 'environment', to a view of our embeddedness in a wider ecology which is both physical and non-material
- of *focus* from external physical world, to the relation between our inner and outer worlds and the acceptance of multiple realities
- of *models of order* from pathological hierarchy to healthy holarchy

- of *disposition* from control to participation
- of *agency* from outside intervenor to co-creator of reality and environment
- of *belief* in certainty and intervention to uncertainty and appreciation
- of *view of evolution* from mechanism to co-evolution
- of *view of knowledge* from a mono-universalism to diversity and contextualism.

Such ideas and beliefs imply and are expressed through a changed set of *thinking assumptions or habits* - a shift away from reductionism, dualism, determinism *et cetera,* towards whole systems thinking. Such changes are introduced and discussed below in section B.2.2. The ideas above also give rise to or affirm a set of *values* which reflect a sense of mutuality, of belonging and meaning in life, and may be seen as underpinning sustainability. Such values are suggested below (Box B.3).

Box B.3: Ecological values

- Sufficiency
- Conservation
- Equity / justice
- Community
- Respect for and appreciation of the Other
- Diversity
- Inclusion
- Democracy
- Subsidiarity
- Self-reliance
- Self-organisation and autonomy-in-relation
- Participation
- Futurity and trusteeship
- Resilience and durability
- System health and viability

I summarise the necessary qualities of change that underpin the emergence of the postmodern ecological worldview by employing the triadic model of paradigm, knowing and experience introduced earlier. These qualities can be identified as:

- *re-perception* - achieved by ‘extension’ in the Seeing domain
- *re-cognition* - achieved by ‘connection’ in the Knowing domain
- *realisation* - achieved by ‘integration’ in the Doing domain.

The nature of this shift is discussed in detail in **Appendix I** section 2. Meanwhile, an explanatory summary of this change follows (Box B.4)

Box B.4: Fundamental shifts towards an ecological paradigm

Seeing domain - Extension: the ethical need to widen and deepen our boundaries of concern, and recognise broader contexts in time and space. In an age of individualism and materialism, we are not encouraged to consider 'the Other' in our thinking and experience, whether this be the neighbour or community, let alone distant environments, peoples, and non-human species, or 'the needs of future generations'. So this is an inclusive rather than exclusive view, which recognises that all systems (and people) are in some way co-dependent and co-determining. As well as the outer dimension of extension, this empathetic disposition also suggest an inner 'deepening' process, which values all aspects of personhood, particularly intuitive knowing, and becomes aware of our individual and shared needs and worldviews. In systems terminology, the concern here is with context, meaning, and value, and shift in boundaries. The key quality here is greater 'compassion' or empathy which hinges on the 'quality of our assumptions' and involves *re-perception.*

Knowing domain - Connection*:* the disposition and ability to recognise and understand links and patterns of behaviour and influence between often seemingly disparate factors in all areas of life, to recognise systemic consequences of actions, and to value different insights and ways of knowing brought by others. The intellectual ability to know the world in a more ecological or relational way is more likely to give rise to respect in understanding and wisdom in action. In systems terms, the concern here is with dynamics and interrelationships, recognising and thinking in terms of flows and pattern rather than distinct entities . The key quality here is better 'understanding' which hinges on the 'quality of our distinctions' and involves *re-cognition.*

Doing domain - Integration: a purposeful disposition and capability to seek healthy relationships between parts and wholes, recognising that the whole is greater than the sum of the parts; to seek positive synergies and anticipate the systemic consequence of actions. Emergent properties in any system may always surprise us, but they are more likely to do so in positive rather than negative ways if we think, design, and act integratively and inclusively. In systems terms, the concern here is with self-organisation, systemic coherence, integrity and healthy emergence. The key quality

here is greater ‘wisdom’, which hinges on the ‘quality of our intentions/actions’ and leads to *realisation.*

In summary, I argue that

- extension/compassion,
- connection/understanding and
- integration/wisdom

are - respectively - needed to heal the *narrowness of perception*, *disconnective thinking,* and *dis-integrative practice* so often manifested both in education and society, and that this model summarises the essence of the ecological worldview.

1.7 Evidence of the postmodern ecological worldview in cultural change

In this subsection, I review evidence as to whether some form of ecological worldview is indeed arising - that is, whether the kind of ideas outlined above have any grounding and resonance in real change in society and culture.

As discussed above, the essence of the ecological worldview is *connection,* that is, concern with the meaning and implication of relation, and the quality of relation. This theme is central to virtually all writing which seeks to explicate aspects of this view, and it always concerns an expanded and deepened perception of connection than that which the writers deem to be generally prevalent in society. For example, this worldview, says Spretnak (1991, 19) “encourages us to expand the gestalt, our perception of the whole, in every situation so that we no longer collaborate in the modern project of fragmentation”.

This idea is also reflected in popular environmental culture. Much of the rhetoric of the environmental and New Age movements, abounds with phrases like ‘one world’, ‘we are all interconnected’, ‘only connect’ (a phrase which originated with EM Forster), ‘we need to think holistically’, and so on. These phrases indicate a popular feeling, as evidenced by the worldwide take up of Chief Seattle’s ‘All things are connected’ speech (which was later shown to be largely the work of a screenwriter in 1970). However, whilst perhaps reflecting an intuitive sense of relation, their popular expression do not give much guidance on how discourse and action can proceed. Superficially interpreted, and emphasising value change rather than structural change, they can lead to a rosy complacency which ignores suffering and injustice. Thus David Pepper, an ecosocialist, writes (1996, 300), “The problem about the whole approach is that in

its enthusiasm for value changes through mysticism and spiritualism it can largely ignore the material dimension of environmental problems".

Further, the New Age emphasis on the integration of 'mind, body and spirit', has often been interpreted on a highly individualistic basis which is blind to the needs of wider society. Satish Kumar, editor of a leading journal on ecological perspectives, *Resurgence,* responded to critics who equated (wrongly, is his view) his periodical with New Age-ism, by suggesting a new - more inclusive - trinity being 'Soil, Soul and Society'. Kumar's reponse reflects evidence that ecological thought is taking hold in some sections of society. Willis Harman, writing in 1988, states that evidence from survey data, social movements, book sales, Green political parties, "and numerous other social indicators" suggest what he terms a "*reperception*" which he believes "has been spreading around the world for at least the past twenty years" (1988, 118). He summarises its characteristics thus: "a search for wholeness, search for community and relationship, search for identity, search for meaning, and a sense of empowerment". Similarly, Milbrath reported - on the basis of survey - that a significant minority in the United States subscribed to values and beliefs that he termed the "New Environmental Paradigm" (Milbrath 1989).

A recent Worldwatch Report (Brown 2001) describes a further American study by Ray and Anderson published in 2000, which reports that some 26 per cent of Americans have adopted a new worldview in the past 40 years that is largely consistent with the values of sustainability. Gardner (in Brown 2001, 194) says that these people are characterized by:

> a concern for the environment, desire for meaningful personal relationships, commitment to spirituality and psychological development, disaffection with the large institutions of life, and rejection of materialism and status….and are likely to be active in their communities, to choose work consistent with their values, and to value healthy living.

Elgin (1997) quotes an earlier study by Ray which in 1995 numbers these so-called 'cultural creatives' (those seeking to create a new culture) at about 24 per cent of the US population. Thus, there has been roughly a 2 per cent increase in around four years. Elgin also quotes a large-scale 'World Values Survey' conducted in 1990-91, which represented almost 70 per cent of the world's population. In some dozen developed countries of the forty-three countries surveyed, the report concluded that a

shift towards postmodern values seems to be taking place. This includes loss of confidence in hierarchical institutions including government, and in science and technology to solve problems, more trust in own judgement, more interest in subjective wellbeing, purpose, and meaningful work, and greater tolerance for differences. At the same time, Elgin (1997, 14) recognises that there are powerful "countervailing trends":

> As postmodern values are emerging in the world, they are coming up against the stark reality of economic inequities, violence against women, and gender and racial discrimination.

This poses, says Elgin, "a major test of our emotional and evolutionary intelligence". Whether such trends can be said to indicate with certainty the emergence of a coherent ecologiical worldview is a matter of interpretation, but there is at least a discernable pattern here which indicates a break from the individualistic and material values associated with modernity.

In the sphere of intellectual discourse, Spretnak (1997, 223) remarks that in the recent past, those advancing the ideas of revisionary postmodernism "were vastly outnumbered by the deconstructionists", but detects a loss of adherents to the latter position in the 1990s as its limits became apparent - not least to those seeking to advance social justice or environmental quality. Thus she detects a growing shift of attention debate towards the revisionary intellectual landscape. To some extent, this is borne out by current research paradigm discourse, and this is explored in more detail in Part C.

I now want to look at the deeper patterns of evolutionary change in culture that might be occurring. Elgin (1994) suggests that two views - *'materialism'* and '*transcendentalism'* are currently dominant, but that an emerging *'co-evolutionary'* view integrates both. The first equates with the dominant paradigm, where material reality is considered prime, and evolutionary progress is seen in terms of material achievement - for example in science, technology, living standards and so on. Material growth, power and status are valued. In the 'transcendentalist' view - which New Age followers tend to espouse - matter is believed to arise from consciousness, so this is seen as the prime reality and evolutionary progress is seen as journey from the material world to the spiritual world. As noted above, Pepper (1996, 300) has pointed out that this transcendentalist stance can lead to over concern with 'self-knowledge', with little attention to the social context and the real-world environmental problems.

In the third position, the co-evolutionary view, “reality is seen as being comprised equally of matter and consciousness” which in turn (according to Elgin) are generated by “an infinitely deep life-force”. This integrative paradigm, Elgin suggests (1994, 246), “fosters a sustainable, planetary civilisation and a global wisdom culture” that brings together the “consciousness” approach of the Eastern traditions, and the “material” approach of the Western traditions and achieves a balancing and creative synergy. This integrative view logically implies, as I have suggested in several places above, that some characteristics of the dominant view are not entirely abandoned in the new ecological paradigm, but are (or would be) transformed through integration.

Both Elgin and Capra, as writers interested in current cultural change towards an ecological worldview, attempt to view things from a larger system level to gauge the pattern of long-term cultural change. As Capra (1982, 7) remarks:

> To understand our multifaceted cultural crisis, we need to adopt an extremely broad view, and see our situation in the context of human cultural evolution.

Both writers follow the earlier work of Toynbee on cultural change and the rise and fall of civilizations. Elgin suggests a pattern of cultural development beginning with hunter-gatherers some 35,000 years ago and projecting into the future. He suggests that humanity has come through three “beginning stages of awakening” wherein we separated ourselves from nature, developed our sense of autonomy, and discovered our abilities to rebuild the world in accordance with our designs. In the stages to come, he suggests, we will “re-integrate ourselves with nature, explore our deep bonding with one another and the cosmos, and develop our capacity to act in conscious harmony with the universe” (Elgin 1994, 239). This is equivalent to what Thomas Berry (2000) calls the ‘Ecozoic’ era. While Elgin is hopeful that this will come about in the longer-term future of humanity, he admits that “realism demands acknowledgement of the great uncertainty about the decades just ahead”. He foresees in this more immediate time-scale three alternative scenarios. These are summarised below:

1. *Collapse and rebuild from a devastated base.* This is based on an inability to respond to the current challenges such as ozone depletion, climate change, population growth, and others, perhaps leading to increased conflicts over resources, civil unrest and economic breakdown.
2. *Dynamic stagnation.* This is a stressful scenario based on making adjustments which would keep existing systems just about working, but with little or no overall system improvement.

3. *Mutually assured development.* Based on increased communication, learning, and cooperation leading to a restoration of ecoystems, a narrowing of the gap between rich and poor, and respect for diversity.

Which scenario is likely to prevail, Elgin says, depends on the choices made in the next few decades. But such choices depend in part, as many of the 'ecological' writers already referred to maintain, on the ability to envision alternatives. Elgin again (1994, 243):

> We cannot build a future consciously that we have not first imagined. Many people can visualize a future of worsening crisis - with ecological destruction, famines, civil unrest, and material limitation - but few have a positive vision of the world.

Capra (1982) believes that many of the negative social indicators that characterise current society such as increases in alienation, mental illness, and crime are part of the pattern of crisis and eventual transformation that characterises societies and cultures that are in the midst of profound change. Yet, as noted above, there is a strong case for *accelerating* our cultural evolution - to consciously try to attain something like Elgin's third scenario, before severe damage is done to natural and indeed human systems. This is the clear message of global environmental reports such as WWF's annual *The Living Planet Index (*Loh 2002*),* or of UNEP/UNDP/World Bank/World Resources Institute's report *World Resources 2000-2001: People and ecosystems, the fraying web of life*, (2000), or of the Worldwatch Institute's annual reports on the State of the Planet. In particular, the 2001 issue of the Worldwatch report, cited above, states that, "the most difficult challenge the world faces is how to build an environmentally sustainable economy before we do permanent damage to the natural systems that support our global civilisation (Brown 2001, jacket)".

A critical point here is that the visioning and imaging that this requires needs to occur, as far as possible, at *all systemic levels of knowing* (see Box B.1 above). Calls such as O'Riordan and Voisey's (1998, 3) for 'new ways of knowing' and Laszlo's (1989, 29) for 'redesigning our thinking' imply that technical or material 'solutions' can only ever be *part* of the answer. This is not to belittle them: the ideas of, for example, *Factor Four* (Weizsäcker, Lovins and Lovins, 1997) which seek to double wealth on half the resources through *efficiency* gains are extremely important in the struggle to realise sustainability, but they apply primarily at the material, visible, practical end of the systems hierarchy of knowing. They do not extend to fundamentally re-thinking the

beliefs which have brought about the sustainability crisis in the first place. For example, little is said by those advocating technological sustainability about *sufficiency* or *equity*.

My argument here is that, taking a whole systems view of human knowing, we need to envision the meaning and implications of ecological thinking at *all* levels, from metaphysical to practical manifestation, from deep to everyday. This indeed is what an increasing number of 'ecological' writers/thinkers have been attempting in the last twenty or so years. To indicate this ground and further exemplify thinking about the postmodern ecological worldview, I have included ten various paradigm tables that have been presented by different authors, and these can be found in the **Appendix II,** under Part B.1.7 and labelled 'Tables B.1 to B.10'.

With the *systemic levels of knowing* model in mind, I have ordered these tables into three groups (1-3, 4-6, 7-10) from the deeper levels (at the bottom of the list e.g. Skolimowski) towards the more immediate and practical (at the top e.g. Korten). This is a rough ordering, because some writers attempt to span different system levels. The authors are as follows:

1 Van der Ryn and Cowan (1996) - ecological design
2 Costanza, Daly and Bartholomew (1991) - ecological economics
3 Korten (1993) - competing development visions

4 Harman (1994) - a science of wholeness
5 Elgin (1997) - contrasting (cultural) paradigms
6 Slaughter (1995) - ideas in decline, resurgent ideas

7 Spretnak (1997) - modern, postmodern and ecological descriptors
8 Norgaard (1994) - development premises
9 Berman, after Bateson (1981) - Cartesian and Batesonian worldviews
10 Skolimowski (1981) - present and eco-philosophy

There are a number of points to be made about these tables:

- that the tables are all written from an ecological point of view, and therefore are arguably skewed towards a sympathetic, and perhaps uncritical, view of the ecological paradigm but a critical view of the modernist worldview.

- that the presentation of two-column models is inevitably simplistic. No doubt the writers would want the tables to be read in the context of the books from which they are taken.
- that the notion that the ecological worldview incorporates and subsumes aspects of modernity, rather than rejects/replaces them, is not always evident in these tables - although this might be part of the weakness of the structure of two column models.

As noted several times in this Thesis, much discussion of paradigms tends to present them as necessarily oppositional, and incommensurable in the Kuhnian sense, leaving little sense of how the much debated 'paradigm shift', can be understood in terms of dynamic cultural change. The familiar bi-polar model of opposing paradigms - as presented by these writers tends to oversimplify median positions, and subparadigms: this is a criticism made by Routley (1983). Yet as a model, I find these tables to be very helpful tools for thought, as long as we bear in mind that the actuality is less simple than the bi-polar model presents. For example, I have suggested a set of six possible relationships between 'the old' and 'the new' (oppositional, alternative, hybridising etc.) in subsection B.1.5 above.

As regards consistency between the models, what matters here - I believe - is not the differences between the versions of ecological thinking presented, but the commonalities between them and progression shown between the systemic levels of knowledge. In other words, the question is whether there is overall systemic coherence here within and between the versions shown. Whether this is the case or not, is in the end a matter of judgement. My view is that ecological thinking is showing an increasing level of systemic coherence which helps validate its paradigmatic claims.

The next subsection looks at how far such thinking is apparent in the sustainability debate - how far integrative thinking is beginning to challenge mainstream fragmentary thinking in the social and institutional response to the sustainability question.

1.8 The manifestation of the postmodern ecological worldview in the sustainability debate

We can at the outset note that the whole sustainable development debate has turned - at least *in part* - on the growing realisation that thinking and action needs to be more *integrative* than that which has normally characterised the past. This has been an increasing trend, and is one of the main themes and findings of a recent survey of the

politics of sustainable development in nine developed countries (plus the European Union) (Lafferty and Meadowcroft 2000).

These authors review a number of accounts of sustainable development both before and after the Earth Summit conference of 1992 and the associated discourse, and conclude that, while allowing for a "conceptual-political" range of views:

> sustainable development indicates an interdependent concern with: promoting human welfare; satisfying basic needs; protecting the environment; considering the fate of future generations; achieving equity between rich and poor; and participating on a broad basis in development decision making.
> (2000,19)

Further, they point out that the concept has provided a framework whereby ideas and interests which were hitherto seen as *separate* or oppositional might be reconciled, and they list 'economy and environment', 'conservation and progress', 'efficiency and equity', and the pre-occupations of North and South.

Going back some thirty years, an integrative view was strongly advanced by the influential *Limits to Growth* study (Meadows, Meadows and Randers 1972), which recognised the reality of what was later termed by the Club of Rome "the world problematique" (Peccei 1982, King and Schneider 1992). This 'problematique' is the set of closely interconnected problems - political, economic, social, cultural, psychological, technological and environmental - that characterise the modern age and which, because of their systemic nature, fail to respond to non-systemic approaches. The Limits to Growth study was essentially based on a systems view of the world and has been influential in subsequent work that has linked systems approaches and sustainability.

Going back some twenty-plus years, an integrative view was also reflected by the World Conservation Strategy (IUCN, UNEP, WWF 1980) which considered together 'conservation' and 'development'. Instead of being seen as implacably opposed forces, the Strategy was the first internationally endorsed document to argue that they were interdependent. The Strategy had considerable influence on debate and thinking about environment and development, and one might argue that this was due to its bold challenge to conventional assumptions. Hence, it required all those involved in development to recognise environmental imperatives and factors, and all those involved in conservation to consider people and the need for economic activity and

development. Thus, in the eighties, in the evolution of environmental thought, a transition took place between a general perception of separate and relatively contained environmental issues, towards a more integrated view of environment and development, emerging - most notably and influentially in the Brundtland Report (WCED 1987) - as ‘sustainable development’.

Sustainable development was not a new theme; the British philosopher John Stuart Mill had alluded to it many years earlier, and it also was the key theme of *The Ecologist* influential study *Blueprint for Survival* of 1972. In 1981, Lester Brown of the Worldwatch Institute published an influential study *Building a Sustainable Society* which set out the issues and pathways to a more sustainable society. In 1987, the Brundtland Report tried to take an holistic view of environment and development issues and also implied that some of the problem lay in our use of language, (which in turn relates to Western epistemology and perception):

> Until recently, the planet was a large world in which human activities and their effects were neatly compartmentalised within nations, within sectors (energy, agriculture, trade), and within broad areas of concern (environmental, social). These compartments have begun to dissolve. This applies in particular to the various global “crises” that have seized public concern...These are not separate crises: an environmental crisis, a development crisis, an energy crisis. They are all one.
> (WCED, 1987, 4)

While on the next page we read, “Ecology and economy are becoming ever more interwoven - locally, regionally, nationally, and globally - into a seamless net of causes and effects”. It can be said then that the Brundtland report took a relatively holistic and systemic view of environment and development issues. Yet, *only to a point.* The ecological economist Daly for example, points out the ‘glaring contradiction’ of a world economy growing by a factor of 5 or 10 whilst purportedly respecting ecological limits (quoted in Skirbekk 1994, 49).

The concept of sustainable development launched upon the world by the report (and subsequently reaffirmed by the consequent United Nations Conference on Environment and Development, UNCED), was at first quickly taken up with equal enthusiasm by all groups, including non-governmental organisations, academics, governments and industry. As David Orr noted (1992, 23), “the word ‘sustainable’ pacifies environmentalists, while ‘development’ has a similar effect on businessmen

and bankers". However, in the ensuing debate, large cracks in the consensus began to appear. By the time of the Rio UNCED conference in 1992, the debate had moved on. The basic division was between those advocating growth-centered 'technological sustainability' (sustainable growth), and those advocating people/environment centered 'ecological sustainability' (sustainable development) - complicated by the fact that those using the term 'sustainable development' often meant 'sustainable growth'. Orr (1992, 24) sums up the situation thus:

> These two perspectives are partly complementary, but their practitioners tend to have very different views about the extent of our plight, technology, centralised power, economics and economic growth, social change and how it occurs, the role of public participation, the importance of value changes, and ultimately very different visions of a sustainable society.

The sustainability debate then, is characterised by a basic rift, which can be seen as rooted in different paradigms. This suggests the situation is a simple contestation between two, perhaps equally valid, views. But this would be understating the complexity of the situation. Lafferty and Meadowcroft state that on the ground, their research suggested the situation is "fluid, contradictory, chaotic, and fragmentary" and that there are, "many orientations, priorities, and visions of the future jostling for influence" (2000, 453/454). But in their concluding remarks, they ask how far governments are taking sustainable development seriously as, "a *different* idea, goal and agenda for change: different from conservation, different from environmental clean-up and protection; different from ecological modernization, narrowly conceived" (458, their italics). Thus, while there are many views of what sustainable development means, there are also - the authors imply - different *levels* of perception and understanding operating.

Here we can look again at the model of learning levels, as outlined in B.1.3 above. What I shall argue is that an ecological consciousness is arising from a struggle to realise epistemic learning - and that this consciousness recognises the need for reconstruction and learning *throughout* the learning levels and system levels of knowing. The mainstream position, which Orr characterises as 'technological sustainability' and which is rooted in what has been called here the dominant paradigm, is arguably largely rooted in the first-order learning position and finds it difficult to progress beyond the measures associated with this stance (such as ecoefficiency and clean-up) without undergoing paradigm change i.e. deep or transformative learning. At the same time, Lafferty and Meadowcroft indicate that a gradual shift or learning

process has taken place on the part of policymakers since Rio, (although they themselves make little specific mention of 'learning' as such). They find for example, that "in the historically short span of three decades":

> The complexity, interconnectedness, and uncertainty surrounding environmental issues has become better appreciated, as has the intimate contact between environmental policy and other spheres of government and social policy.
> (2000, 443)

Perhaps then, there are signs of a dawning second order learning - an incipient realisation of paradigm. This idea of gradual shift ties in with O'Riordan and Voisey's helpful idea of the 'sustainability transition', (first introduced in A.1.1). In a major study, *The Politics of Agenda 21 in Europe* (1998) funded by DGXII of the European Commission, these authors suggest that a four-stage shift in the transition to sustainability is necessary, from 'very weak sustainability' to 'very strong sustainability', characterised by changes in environmental and economic policies, in degrees of public awareness and in types of public awareness, with the last phase involving:

- much closer integration between environmental and economic policy,
- a cultural shift in public awareness (partly facilitated through change in education), and a
- renewal of emphasis on local democracy and activity.

Their thinking is summarised in table B.1 below.

Table B.1: The transition to sustainability

Sustainability	Environmental Policy	Economic Policy	Public Awareness	Public Discourse
Stage 1 ***Very weak***	Token policy integration	Minor change to economic instruments	Dim awareness, little media coverage	Corporatist discussion and consultation
Stage 2 ***Weak***	Formal policy integration and specific targets	Substantial restructuring of economic instruments	Wider public education	Roundtables, and stakeholder group participation
Stage 3 ***Strong***	Binding policy integration and strong international agreements	Full valuation of cost of living and green accounting	Curriculum integration and local educational initiatives to strengthen community	Community involvement together with North-South initiatives
Stage 4 ***Very strong***	Strong international conventions and national statutory and cultural support	Formal shift to sustainability accounting at all levels	Comprehensive cultural shift	Community-led initiatives are the norm

Adapted from *The Politics of Agenda 21 in Europe*, Tim O'Riordan and Heather Voisey,

Later in the Thesis, (C.2.4) I make a direct parallel between *learning responses to sustainability* both in society (as above) and in education. These learning responses can be illuminated through the systems idea of 'orders of change' - which is closely associated with that of learning levels. This idea is outlined above in B.1.3. Using this theory, it is possible to suggest that the mainstream response to sustainability is essentially one of maintenance and adaptation i.e. a response which, although taking on board some aspects of sustainability, essentially still maintains the stability of the system (and its political, economic and social subsystems). Again, taking a systems viewpoint on what appears to be happening: the challenge of sustainability (or the highlighting of unsustainable patterns) may be interpreted as an outside perturbation or disturbance to existing systems, including belief systems. The initial learning response (equating with 'very weak sustainability', which is at least a step beyond ignorance or outright denial) is to adapt just sufficiently to *accommodate* this disturbance, without fundamentally changing the whole system. Bell and Morse (1999, 103) suggest that Maturana and Varela's work on *autopoesis* in living systems - which sees such systems as essentially self-referential - helps explain why organisations can be "progressive and inclusive, or narrow and blinkered". Disturbingly, O'Riordan and Voisey (1998, 2) suggest that many of the institutions "that need to be readjusted in order to embrace the sustainability transition" actually thrive in a non-sustainable world:

> The innate logic of these institutions encourages them to vary marginally the status quo, though never more than is suboptimally tolerable…..No wonder

> sustainable development is taking time to be credibly articulated in policy and day-to-day behaviour.

First order change then, is associated with making adjustments in the existing system, with 'more of the same', with increasing efficiency and effectiveness to meet identified goals: this sometimes called 'doing things better' (Ison and Russell 2000, Banathy 1991). Thus, for example, we have the whole green auditing movement including ISO 14001, EMAS, and ecoefficiency in production. This is not to denigrate such change, but to try to account for why change often stops at these more immediate levels. In relation to the systems 'levels of knowing model', we can say that first order change involves change at the more immediate levels of behaviour, without change at deeper levels of knowing. If these models and arguments are valid, they help provide an explanation of:

- why weak sustainability is a likely and pervasive mainstream response at all system levels (individual, community, organisation, national and international policy *etc.*)
- why integrative thinking and integrated policy in the mainstream (including educational policy and practice) only goes 'so far'
- why rational argument alone, or warnings of crisis, are not sufficient to invoke deep change.

A first order response to sustainability tends to be that of attempting to grasp, contain and control it, as if it were an external 'thing'. This reminds me of Whitehead's 'fallacy of misplaced concreteness', the mistake of rendering abstractions as concrete 'things' - rather than seeing sustainability as an emergent quality. Bell and Morse's (1999) book *Sustainability Indicators – Measuring the Immeasurable* is of particular interest here. Writing from a systems background and perspective, the authors are critical of the burgeoning attempts over the last few years to tie down sustainability through trying to arrive at 'exact measures':

> Although many have tried to quantify sustainability - with all the jargon and apparent rigour of the objective and reductionist mindset of much of the academic community - when looked at more closely the approaches do not seem to work.
> (1999, xii)

Instead, the authors attempt to set out "a more holistic, realistic, participative and systemic approach to gauging sustainability". As their chapter 4 'Paradigms and

Professionals' shows, the fundamental argument again, is between operative paradigms. The tension, they suggest, is between the scientism, objectivism and reductionism of the dominant paradigm, and an emerging paradigm which the authors describe as systemic, holistic and participative. The former approach, say Bell and Morse, sees sustainability as a 'thing' that can be identified, and through scientifically inspired methodology, can be quantitatively measured. But sustainability is not a single or fixed thing, say the authors, and the quantitative approach tends to both oversimplify the complexity of sustainability and reduce "a variety of relevant and legitimate views and understandings to the dominant mindset of the scientist" (1999, 100). Similarly, even with respect to physical aspects of sustainability, which at first sight appear amenable to conventional scientific analysis and measurement, O'Riordan and Voisey (1998,11) suggest:

> scientists remain very vulnerable to immense uncertainty when trying to assess survival thresholds or capacities of tolerable resource depletion. What, for example, would be the true indicators of the ecological health of the North Sea? Since keystone and indicator species alter so frequently in their ecological roles, we are left with the uncomfortable conclusion that we may have to impose our own political discourse on ecosystem processes and critical loads.

Thus, Bell and Morse emphasise the importance of context, of local knowledge and perspectives, and of multiple views (of which the objectivist view, they say, might be one). Further, the authors equate sustainability with the quality of wholeness, with the "perception of systemic wholeness" and "the sustainability of wholeness" (101). The authors also make the distinction between first order and second order change, and suggest the problem of sustainability indicators requires recognition of our own participation in making meaning of and interpreting sustainability. Bell and Morse's thinking is in line with my own - but yet I feel it doesn't go far enough. What is missing, is any strong sense of what I am calling here the ecological worldview, and yet the ecological worldview is implied. As the authors recognise, sustainability raises epistemological, ontological and methodological issues, and while they are strong on the methodological implications of a systems approach to sustainability, they are weaker on the other two key aspects which are necessary to challenge the overly scientistic approach which they critique.

A different position on sustainability is what might be called a deconstructionist position. This rejects the suspect certainty of the technological/objectivist sustainability approach, and further, does not recognise the validity of the ecological position.

However, the deconstructionist position and ecological position are agreed that we do not know and cannot prescribe any blueprint for approaching or achieving sustainability. They are also agreed that there are, and need to be, multiple views of sustainability. But from this point there is a very significant departure. First, because the ecological view sees a need for multiple views of a complex reality or problem to provide a richness of perspectives that may together provide new insight. Thus Bell and Morse state (1999, 80) that "Alternative views or even multiple views of reality are encouraged in a truly systems approach". So this is a revisionary view, rather than a deconstructionist view, which is essentially relativist.

Second, the ecological view differs markedly because it asserts that *there are* principles and values which must be part of any movement towards sustainability. As O'Riordan and Voisey suggest, while there is "no template for the transition to sustainability...*there is a direction and there are principles*..." (1998, xv, my italics). This is a vital point, not least as in my experience, a significant part of environmental education debate (particularly in academic circles) tends to be influenced by the deconstructionist position - for the best of reasons - which denies the possibility of such principles.

Outlining these principles, O'Riordan and Voisey suggest that three conditions should underpin "any serious analysis of sustainable development" and which are mutually necessary and co-dependent (1998, xiv):

- continuation, durability and reliability of economic performance
- stewardship, trusteeship and a duty of care towards vulnerable ecosystems and peoples, and to future generations
- localism, democratic innovation, and greater self-reliance in communities.

Similarly, such principles as democracy, community, localism, participation, durability, diversity, self-reliance, sufficiency, efficiency, and equity are common themes in what might be termed ecological perspectives on sustainability, and are reflected in such on the ground schemes as Local Agenda 21 initiatives, but - and this is key - if sustainable development is allowed to flourish, it will produce "a huge variety of outcomes at many levels" (O'Riordan and Voisey1998, xv). So the ecological view *does not* provide prescriptive solutions or blueprints, but it *does* indicate directions - which need to be translated and adapted according to specific contexts. Critically, from an alternative paradigm at the level of third order change - that is, a different way of looking at the

world - different sets of actions at the first order level become available. The guiding star here is not ‘doing things better’ (as mentioned above in connection with first order change) but ‘seeing things differently’ which in turn leads to ‘doing better things’.

One of the key ideas which expresses the ecological paradigm is self-organisation. O’Riordan and Voisey acknowledge this (and indicate their own position) by stating (1998, 6): “at the heart of sustainability is self-generation - of the soul as well as of economy, polity and society” and they align this idea directly with the Gaian view of the Earth as a self-regulating organism. Thus at conceptual level, the ecological view of sustainability is expressed through such principles as self-organisation and autopoesis which underpin a coherent ‘living systems’ view of reality. (This is looked at in more detail in **Appendix I**.) These concepts are implicit in many of the ideas that surround the sustainability debate from ecopolitics to ecodesign, but at deep level they challenge the assumptions of the dominant paradigm to do with determinism, reductionism and control.

From an ecological point of view, sustainability (in all its aspects, social, economic, political, environmental) appears to require what might be termed a ‘double-shift’ in thinking. In other words, first, a vertical or deepening shift which involves epistemic learning about the limits of modern and deconstructionist positions, and second, a horizontal shift through time towards a larger gestalt which the ecological worldview appears to promise. In terms of analogy, it is not just a matter of escaping the prevailing cage, or ‘trap’ to use Vickers’ term, but also finding an alternative platform. (This is represented by Diagram A.1a in Part A.). Meantime however, the response of the mainstream political, economic, and social culture to sustainability largely remains one of accommodation or at best limited reformation, rather than deeper transformation (Christie and Warburton, 2001). As noted above, paradigm change theory and learning levels theory helps explain this limited learning response.

In sum, there are some signs of an ecological view in the social and institutional response to sustainability, but these are limited. Systems thinking might be reasonably seen as a means of developing a more fully-fledged ecological response, but this depends on how far systems thinking is part of, or apart from, the ecological paradigmatic shift. This is the next topic.

2 SYSTEMS THINKING IN CHANGE

The theme in this second section of Part B is evolutionary change in the field of systems thinking. I examine how far it is embracing - and indeed, can help articulate - the postmodern ecological worldview, and I further explicate the nature of whole systems thinking which, I argue, requires an expanded sense of systems. This requires greater convergence between systems thinking and ecological thought. (At this point, it will be useful to bear in mind the use of terms as summarised in Box A.2 'Clarifying terms', in Part A.1.1.)

2.1 Evolutionary change in systems thinking

Systems thinking, like any other field, is in a state of change. As we shall see, there is definitely a perceptible move within the field of 'systems as discipline' towards (what I am calling here) whole systems thinking, based on the 'living systems' view of the world, and on the new sciences of complexity (Capra 2003). As ecological thinking is also increasingly referring to these bases, the potential for more convergence between (some schools of) systems thinking, and ecological thought - around a commonly understood *whole systems thinking* – appears great.

I want to first trace a little background and history of systems thinking. It is not necessary to trace this in any detail - it is already well documented (Checkland 1981, Capra 1996, Flood 1999, Flood 2001), and there is little point in writing it out again. What matters here is the fundamental pattern of change in systems approaches over time.

Systems thinking as a recognisable discipline, that is, as identified and distinguished from its evolutionary roots and influences, is relatively young (Checkland 1992), emerging in the twentieth century as a response to and critique of the prevailing reductionism (Flood 2001). Most writers in the field point to modern systems thinking as developing from two main directions and sources, being engineering and biology. The engineering roots began in the 1940s, notably with Weiner's work on cybernetics, which is usually understood as concerned with control and communication. The biological roots were drawn as early as the 1920s, particularly through von Bertalanffy's work on open systems, and later, his 'General Systems Theory'. This made a further critically important contribution which has since had seminal influence in the field (von Bertalanffy 1968). In the decades since, 'systems as discipline' has developed considerably "from a number of different traditions which may not inform each other" (Ison, Maiteny and Carr 1997,258).

Thus, despite its ostensibly holistic nature, systems thinking has emerged from its two main sources, and divided into a number of emphases, methodologies and applications. Ison's 'influence diagram' (Diagram B.4 in **Appendix II**) maps the main traditions in systems thinking. Despite the variety of schools or traditions, most of them place emphasis on methodology, and particularly on problem-solving. It is these schools that I am collectively calling 'systems as discipline'. This is on the grounds that: systems scholars themselves regard systems as a discipline, there are academic departments devoted to their advancement, there is a fairly large literature devoted to systems ideas, methodologies and tools, and there are national and international systems societies. Further, very largely, most other disciplines and the 'man in the street' know little or nothing about systems thinking as a discipline, which, in a rather ironic way, confirms that systems thinking as a diverse field is nevertheless relatively contained within the boundaries of a discipline. It is ironic because a critical aspect of systems approaches is to question the perception, location and meaning of boundaries (Blackmore and Ison, 1998).

Of course, by using this term 'systems as discipline', I have used a boundary to group together a number of approaches and methodologies, some of which have had little to do with each other, or even been in some conflict for some time. The fundamental tension is between the more mechanistically based, more objectivity oriented, 'hard system', or 'closed system' approaches - reflected in systems engineering, systems analysis and operational research - and the more organicist, constructionist, 'soft system' approaches. The first is concerned with problem-solving, control and feedback, the second with understanding and influencing change; the first with being an observer and manager, the second with being more a participant and actor. Checkland (1980) explains that hard systems thinking derives from the engineering tradition where the problem is definable and defined, and the task is to select and provide an efficient means of achieving the desired end or stated objectives. This approach, "looks at 'how to do it' when 'what to do' is already defined" (Checkland and Scholes 1990, 17).

Chambers notes that Checkland developed soft systems methodology (SSM) at Lancaster University when he found that the problem-solving approach derived from systems engineering failed when applied to messy, ill-defined problems. That is, situations where "the notions of a 'problem' and a 'solution' are inappropriate, and what makes more sense is a process of learning which is never-ending" (Chambers, 1997, 196). What is needed in this - often more prevalent - situation according to Checkland

and Scholes is “a system of enquiry” (1990, 18), and this is what soft systems methodology attempts to be, stressing the centrality of our interpretation rather than independent and contained problems ‘out there’.

This development in systems thinking can be seen as a shift of emphasis from concern with first order change to second order change (as described above in B.1.3). As Ison, Maiteny and Carr state (1997, 258):

> Recent systems scholarship has moved beyond many of the concerns of ‘first-order cybernetics’ (or ‘hard’ systems methods) to those of second-order (or ‘soft’ systems).

Philosophically, the critical difference between these approaches is the assumption in hard systems methodology that there really are systems ‘out there’: by contrast, the soft systems approach sees systems or holons as useful metaphors for understanding a complex reality and change. Checkland’s concern is that too often, systems people fail to “make this intellectual distinction between real-world happenings and the epistemological device which may help to make sense of them” (1992, 1029), that is, they fail to distinguish between ontology and epistemology. In the (soft) systems field, Checkland continues, “we are concerned with the attempt to map the concept of wholes onto what we perceive as complex happenings in the real world”. This links with my comments above on Bell and Morse’s work on sustainability and indicators, where they reject the ‘hard’ approach, in favour of a soft systems methodology. But as I noted there, what is missing is a sense of the ecological worldview. Checkland’s work also misses this, and any real sense of the need for greater social justice and ecological sustainability.

For example, Flood’s criticism is that SSM, “barely touches upon the notion of knowledge-power and social transformation” (1999, 60), that is, the role of politics in what counts as valid knowledge. It is a criticism that Flood also make of Senge’s work. Further, Checkland’s reference to ‘worldview’ in his well-known SSM mnemonic CATWOE (Customers, Actors, Transformation, Worldview, Owners, Environment) (Checkland and Scholes 1990) often refers to a subparadigmatic level of worldview, while his reference to ‘transformation’ can mean any form or level of change, and does not imply any liberatory or emancipatory process. These uses are perfectly valid, but do not address the larger context of the need for deep change in cultural worldview or transformation that has been discussed in this Thesis. Whilst ‘soft systems’ approaches, particularly as developed by Checkland, have made a seminal

contribution to the systems thinking field, they may be said to be 'necessary but not sufficient' in the articulation of whole systems thinking.

I want to quote further from Checkland to illustrate this point. It is clear that he is most opposed to any idea that smacks of systems thinking being 'ideological', and comments very critically on a reference that suggests that systems approaches are 'intrinsically emancipatory'. He gives a graphic example, saying that systems engineers would have been able to make the Nazi's holocaust more efficacious, and more efficient. He regrets "much writing in the systems field which would import ideological concepts into (systems) epistemology, where they have no proper place" (Checkland, 1992, 1029). In a sense, I think he is right - but only if systems approaches are regarded purely as a methodology, which can be employed within *any* valuative framework . But I am arguing that the larger cultural context in which this methodology is being employed is changing, and there is evidence of the emergence of an ecological worldview which suggests a deeper shift of epistemology, than the level that Checkland is addressing here. To summarise quite simply, the emergence of SSM maybe said to be evidence of second order change in systems thinking, whereas whole systems thinking (WST) derives from or aspires to third order learning.

In recent years, a significant part of systems scholarship has moved in the direction of exploring the implications of complexity theory, holistic science and recent theories of living systems, which are opening up debate and thinking about the need for a more participatory worldview, and particularly in relation to sustainability (see for example, Capra 1996, Capra 2003). It is this that takes the field of systems thinking into significant new territory.

- Keypoint: It is a foundational argument of this Thesis that this territory is of *equal interest* to *systems as discipline* and to *ecological thinking*, thus there is a *convergence of interest* here (Capra 1996), which I am calling whole systems thinking, or systems as worldview.

However, it must be said that the perception among some ecological thinkers is that *all* systems thinking is 'part of the problem', that it never fulfilled its early promise, and that it has been co-opted. For example, the ecophilosopher Skolimowski (1994, 171) comments:

> Systems thinking and cybernetic thinking have been 'objectivized' and then co-opted. In the process their potential novelty as *new* forms of thinking has been

> diminished. They have become status quo forms of thinking. Every big corporation and every big government uses systems thinking and cybernetic thinking. Are we better off as a species and as individuals for this reason?

Similarly, Joanna Macy (1990, 41) a systems scholar, states:

> The systems view of the world, unfortunately, has not characterized or informed the uses our society has made of systems science. The advances permitted by its perceptions of pattern and its models of circuitry have been mainly employed to further values and goals inherited from a mechanistic, reductionistic interpretation of reality.

Similarly, Berman (1989, 305-306), an advocate of Batesonian holism, warns strongly against what he terms ‘cybernetic holism’, and the ‘co-optation’ of the holistic worldview by advanced mechanism. He is equally concerned by a ‘systems view of life’ not wedded to “real presence, real bodily engagement with the world”. This it seems, is additional fuel to my argument that systems as discipline is not sufficient in itself to address the epistemological crisis that writers such as Berman, Bateson and Skolimowski point to.

During the last century, systems as discipline was influenced and (arguably) constrained by the broader prevailing social, scientific and cultural paradigms within which it operated - perhaps more than its progenitors anticipated. Thus, Ackoff, a leading systems writer, suggested in 1974 that the 1940s marked “the beginning of the end of the machine age and the beginning of the systems age” (in Lockett and Spear 1980, 26). Yet the ‘systems age’ arguably - and certainly as seen by Skolimowski and others - has until recently been accommodated as part of the mechanistic paradigm rather than the other way round.

Thus, the identification by some environmentalists of all systems approaches with the mechanistic paradigm, whether or not deserved, has often led either to narrow interpretation and restricted application of systems thinking in environmental education, or the rejection of systems thinking as a means of working towards sustainability (Gough 1991, 1993). According to Gough, “Systems models perpetuate Newton’s ‘world machine’ by reinforcing the view that environmental systems are metaphorically equivalent to mechanical or cybernetic systems”. This criticism is echoed by Wilber (1996, 116) who accuses systems theorists of “subtle reductionism” and providing

another “reductionist nightmare”. Similarly, the social ecologist, Bookchin (quoted in Button, 1988), notes that the language of cybernetics - born of wartime research into missile guidance - has replaced living terms with the language of ‘feedback’, ‘inputs’, ’information’ and so on.

I would go less far in criticising ‘systems as discipline’. Nevertheless, while systems methodology ostensibly implies epistemological and ontological orientations which challenge those of the dominant paradigm, systems approaches have often been little more than tools for problem-solving within the values and outlook of that paradigm. Yet a key argument of this Thesis is that ecological thinkers and practitioners, and educators, who dismiss systems thinking are ignoring a powerful mode of thinking which would, at least, enrich their discourse, and moreover, enable their work to be more effective in understanding and perhaps addressing the essentially systemic issues with which they are concerned .

Thus, I want to defend systems thinking, but I recognise that to address the criticisms and dangers touched on above, it is necessary to articulate an expanded or deepened sense of systems thinking, one that is commensurate with (and indeed is, I would argue, embodied in) the emergent postmodern ecological paradigm. This is why I have used the term ‘whole systems thinking’, which can be realised by ‘reinventing’ and ‘reinvesting’ our view of systems thinking. To some extent, the rejection of systems approaches by some in the ecological movement reflects a problem of language, or more precisely, language-as-model. By itself, the word ‘systems’ in ordinary usage does not necessarily convey the levels of meaning that I attach to it (in fact, my experience is that it rarely does). It may be that I (or we) should be talking about *‘holonic’* thinking, and ‘holonic’ education, echoing Koestler’s term, but to most people, this would convey even less. Holonic relationships are an important concept in elaborating whole systems thinking however, and one to which I return in **Appendix I.** In the same book as he voices rejection of systems thinking, Skolimowski (1994) identifies what he terms *‘participatory thinking’* which largely equates, in my view, with systemic thinking as it is expressed within the postmodern ecological paradigm.

The distinctions at play in this area increase the difficulty of clarifying what is meant by whom, and of communicating meaningfully. As such terms as ‘systems thinking’, ‘holistic thinking’, ‘participatory thinking’, ‘ecological thinking’ and so on are not concisely defined or agreed, it is important to be careful in their use (see my definitions

in Box A.2 in section Part A.1.1). I would place all the following uses as consistent with my understanding of whole systems thinking:

- ecosystemic thinking (van der Hoorn 1995)
- organic systems view (Pepper 1984)
- ecorelational thinking (Engwicht 1992)
- reflective living-systems thinking (Elgin 1997)
- whole systems thinking (Korten 1995)

As noted above, systems thinking is rejected by a number of writers who come from an ecological perspective. It is reasonable to suppose that they represent a significant part of the 'ecological paradigm' community. But another reaction, which I have noticed from my own involvement and experience in the field, is the ignorance of many about systems thinking. For example, arguably everything that Schumacher College - 'an international centre for ecological studies' - does, is systemic (Sterling and Baines 2002). It is grounded in exploring and enacting how relationships of all kinds can be bettered and made more whole. Yet, a number of conversations I've had with course participants and staff otherwise steeped in aspects of ecological thought and practice, indicate a common lack of awareness and knowledge of the field or discipline of systems thinking.

Yet, as noted above, I would argue that there is a *gradual convergence* taking place, which adds credence to the notion that a postmodern ecological worldview is becoming more strongly recognised and expressed. While 'systems as discipline' is increasingly reflecting the ideas of living systems and complexity theory, ecological thinking and practice is also increasingly informed and inspired by the same perspectives and emerging field of enquiry. In addition, there is a perceptible - and I think very significant - convergence at the deeper levels of philosophy. Thus, in his review of the main systems thinking 'schools of thought', Flood (1999, 83) writes on "the essence of systemic thinking" and states:

> Systemic thinking is not something that can be explained easily and understood comprehensively. It is not recommended to rush into rationalisation of this sort…Systemic thinking begins with an intuitive grasp of existence.

Thus, this deeper view of systems thinking is turning away from the idea that it is 'only' a methodology concerned with such things as systems efficiency and effectiveness, and towards the idea that deep existential questions turn on what and how we know.

2.2 Towards whole systems thinking

Ackoff's belief, stated in 1974, in the ascendancy of the 'systems age' incorporating rather than being incorporated by the mechanistic age, may yet be broadly proved right. The current interest in systems thinking circles in living systems theory and complexity theory together with an awareness that systems thinking has an important place to play in addressing what are increasingly complex, systemic issues which affect living today (Capra 1996, Ison and Stowell 2000, Capra 2003), indicates a potentially much bigger role in the future. This evolution in the development of systems thinking lends strength to the notion that it can provide an important *bridge* and a means of going beyond the influence of mechanistic and positivist paradigms in our thinking towards something much more holistic - *particularly* if it can link more overtly with the ecological worldview, to synergistically give rise to 'whole systems thinking': further, if this is accessible and understandable rather than contained within the confines of an esoteric discipline.

This potential role of systems thinking - as a transformative bridge - remains a key assumption of this Thesis, which is not tested empirically here, but would be an important basis of further research. I am assuming then, that an educational paradigm based on a whole systems approach, would help lead not only to a systemic awareness and competence amongst all those involved in the education process, but also to a deeper ecological sensibility and orientation. What such a paradigm might look like is explored further in Parts C and D.

To help clarify the meaning of 'whole systems thinking' and address the problem of the narrow interpretation or use of systems approaches, as noted by critics quoted above, I use the words 'reinventing' and 'reinvesting' systems. Reinvention recognises - very importantly - that the systems view of the world is indeed a view, a metaphor, a representation, and often a tool; it is not reality itself; thus this view can be revised, changed and *expanded.* As reviewed briefly in the subsection above, such change in systems thinking has indeed been in progress. Whole systems thinking is a dynamic approximation, an abstraction, which I am suggesting, is a 'truer' – i.e. more adequate, and therefore, more useful - model than the still predominantly mechanistic paradigm which informs much of our individual and collective thinking.

My thesis is that the emerging view of whole systems thinking draws from, and could further draw from, at least four main sources (as noted in section A.3.3) which are elaborated in **Appendix I:**

1. the development of systems thinking and systems science, from the early 20th century onwards
2. ancient wisdom and indigenous worldviews
3. the organicist tradition in Western science and philosophy
4. holistic science, particularly complexity theory

In essence, the idea of 'system' is a metaphor, which may even be replaced by a better one in the future. One of the progenitors of the whole, organicist, sense of systems is Whitehead (introduced earlier in A.3.4), who described paradigms as a 'groove of abstractions' (Whitehead 1927). The question then, is whether a reinvented, expanded, deepened sense of systems allows us to climb out of such grooves (paradigms), and whether this sense of systems, as another set of abstractions, is a more complete if still ultimately limited way of comprehension.

'Reinvesting' means recognising and encompassing meaning and value within systems thinking. Whole systems thinking is not therefore just a practical tool, but a 'total' systems view, that does not seek to keep outside its boundary the affective world; and admits a more expansive and deeper reality than the dominant ontological view permits. It provides an alternative to what Norgaard (1994, 74) has described as:

> …our excessive reliance on particular metaphysical and epistemological premises which are inappropriate for understanding complex systems, especially systems with the 'understander' inside of them.

The 'understander inside' is a critical part of whole systems thinking, which recognises our participatory role in co-creating reality. But in using words like 'total' and 'whole' systems approaches, I mean to convey the importance of an expanded and integrative view, rather than their literal sense which in practice is impossible. As Wilber warns (1997, 59):

> We cannot make a statement about the whole of Reality, because any conceivable statement is itself merely part of that Reality.

This realisation stands in contrast to the modernist epistemology which holds that in principle everything is knowable, and therefore, by implication, can be controlled and managed.

Whole systems thinking subscribes to the possibility of what Flood (1999, 83) calls "learning within the unknowable". He goes on:

> Balancing mystery with mastery means living somewhere between the hopelessness of the belief that we are unable to understand anything and, at the other extreme, the naivety of the belief that we can know everything.

This implies a profound revision of some key assumptions, stemming from long-held traditions associated with the modern Western worldview. They may be stated as follows:

1.'To every problem, there's a solution'
(belief in the power of problem-solving approaches)
2. We can understand something by breaking it down into its component parts'
(believing a complex whole can be understood by looking at the detail)
3. 'The whole (of something) is no more than the sum of its parts'
(there are no emergent properties)
4. 'Most processes are linear and characterised by cause and effect'
(events and phenomena have a identifiable beginning and finishing point)
5. 'Most issues and events are fundamentally discrete or may be regarded as such, and may be dealt with adequately in a segregated way'
(most issues are essentially unrelated)
6. 'It is ethically acceptable to draw your circle of attention or concern quite tightly, as in "that's not my concern"'
(our system of concern is restricted - we do not need to look beyond our immediate concerns as an individual, a householder, a consumer, a businessman etc.)
7. 'Objectivity is both possible and necessary to understand issues'
(it is important to exclude our feelings and values in our analysis and judgement)
8. 'We can define or value something by distinguishing it from what it is not, or from its opposite'
(a belief that economics is separate from ecology, people are separate from nature, *facts are separate from values, etc – putting boundaries around that which we value)*

9. ‘We can understand things best through a rational response. Any other approach is irrational’
(we need to downplay our intuition and non-rational knowing)
10. ‘If we know what the state of something is now, we can usually predict future outcomes’
(a belief in certainty, prediction, and the possibility of control)

These ten assumptions can be re-stated as basic habits of thought or tendencies which characterise modernist thinking, in the same order and as follows:

1. problem-solving
2. analysis
3. reductionism
4. cause-effect
5. atomism
6. narrow boundaries
7. objectivism
8. dualism
9. rationalism
10. determinism

Whilst such words “sound abstract and remote, the concepts (they) represent have touched us at the centre of our being” (Zohar and Marshall 2000, 26). Importantly, each of these ten assumptions and habits of thought are questioned by second-order systems thinking and the ecological movement as a whole. From a systems point of view, it is well known that complex and living systems require a very different sort of intervention and relationship than mechanistic systems. It is this distinction which lies behind the emergence of ‘soft systems’ approaches, when it was discovered that ‘hard systems’ approaches, based on mechanical systems did not work when applied to complex systems (see Bell and Morse 1999, 109).

Brian Goodwin, (a former professor of biology at the Open University), in discussing environmental and health issues, clarifies this point (1999, 5).

> The new sciences of complexity suggest that (emergent problems) may arise because we are failing to grasp a basic property of the complex processes that are involved in maintaining healthy environments, healthy bodies and healthy communities. Those cannot be manipulated and controlled in the ways that work for mechanical systems such as cars, computers, radios, and television

> sets. Their complexity is such that we cannot predict the consequences of what appear to be scientifically reasonable actions…Commercial interests encourage the adoption of reductionist principles because they seem to promise control over complex systems…But (these) function in terms of emergent, holistic properties, that we are only beginning to understand; and they require us to adopt a different pattern of relationships from the manipulative, exploitative style of interaction that we have learned from our science of quantities.

The issue here is not only the nature of the problem involved - whether, using Ackoff's terms (1980) the problem is a contained 'difficulty' amenable to technical 'problem-solving' or a complex 'mess' which is not. At a deeper level the issue is the fundamental ontological metaphor that we employ: whether we see the world primarily in terms of mechanistic systems, or in terms of organic or living systems. This is a critical distinction.

- Keypoint: it is the inappropriate application of mechanistic systems thinking and approaches to non-linear and complex systems that compounds problems.

Here, I would include education, people, and environmental and sustainability issues as phenomena that can be distinguished as 'complex systems' and which require us to engage differently.

A summary of the difference between mechanistic and whole systems thiinking is suggested in the next table.

Table B.2: Suggested differences between 'hard' and whole systems thinking

Hard systems thinking (mechanistic)	**Whole systems thinking (ecological)**
Primarily a methodlogy or tool	Primarily a sensibility and worldview
Seeking an equilibrium or end state (goal)	Recognises dynamic learning process through self organisation
Objectivist	Realist / constructivist / participative
Intervention from outside system (observer)	Participation with / within system (actor)
Descriptive ('as is'); analytical emphasis	Metaphorical ('map'); normative emphasis
Systems models as ontologies	Systems models as epistemologies

Essentially 'neutral'	Ethical, with wholeness and sustainability at core
Problem-solving	Problematising/ 'situation improvement'
Primarily intellectual, rational	Also engaging non-rational thinking and experience
Often specialised, technical, expert-led	Accessible, participatory, welcoming multiple perspectives
Reductive methodology	Holistic methodology
Focussing on material reality	Admitting different realities
Ethos of control	Ethos of appreciation, self-organisation, emergence
More a part of reductive than of ecological paradigm	Part of ecological paradigm
Learning for controlling change	Learning as change
Learning about systems	Transformative learning as systemic development and change
Purposive	Purposeful

Interestingly, soft systems methodology - which developed as a necessary response to hard systems thinking - may be seen as occupying a space somewhere between these modes, but with more in common with the right hand than the left.

In terms of the 'thinking habits' suggested above, a whole systems/ecological approach suggests a necessary shift of emphasis from the dominant descriptors (on the left) towards a new set of bases for thought (on the right), as follows:

Table B.3 Shifting our modes of thought

Dominant modes of thought	**Holistic / ecological modes of thought**
Problem-solving	Appreciation / problematising / situation improvement
Analysis	Synthesis
Reductionism	Holism
Closed cause-effect	Multiple influences through time and space
Atomism / segregative	Integrative

Narrow boundaries	Extension of boundaries
Objectivism	Critical subjectivity
Dualism	Monism / pluralism / duality
Rationalism	Rational / non-rational ways of knowing
Determinism	Uncertainty, tolerance of ambiguity

Again, it is important to state that the ecological worldview does not consign the left hand modes to history, even if this were possible. Instead, we are - in ecological thought - more reflexively aware of them, allowing their *appropriate* employment within an *extended* epistemology.

The essential distinguishing characteristics of the emerging sense of 'whole systems thinking' (noted briefly above in A.2.2) can be summarised thus - that it:

- articulates an ecological, participative worldview or *epistemology*
- recognises a co-evolutionary *ontology*
- manifests a systemic, integrative *methodology*

Importantly, this *expanded* sense of systems, building on sources such as ecological philosophy and complexity theory, stresses the idea of interrelating *self-organising systems* as an ontological description, as a theory of learning, and a normative orientation which underpins self-realisation, radical democracy and ecological integrity, and what might be termed a creative, non-deterministic evolutionary process. This contrasts with the more objectivist, mechanistic systems approach which stresses separation, control, problem-solving, linearity, determinism, a transmissive conception of learning, and which stays within the limits of first-order change - and therefore does not recognise the need for transformative change in relation to the sustainability transition.

This new sense of systems then, implies a changed epistemology, ontology, and methodology, where *wholeness* is the 'guiding star' of perception, conception, and practice. I would also add that it implies a teleological and spiritual dimension, through which we might regain our sense of participation with the rest of creation that was lost through the dominance of mechanism, materialism and dualism in our thinking and psyche (Berman 1981).

The bases and nature of whole systems thinking are explored in more detail in **Appendix I,** and this is summarised in the triadic model of paradigm and of human knowing/experience (as introduced above in A.3.1). The implications for theory and practice in education are the subject of Parts C and D, but prior to that, I now examine the influence of changing worldviews on education.

Summary

In section 1 above, I have looked at the nature of the postmodern ecological worldview, and suggested that its emergence, albeit fragile, indicates evidence of deep cultural change and learning. In section 2, I discussed further the nature of whole systems thinking (WST), and actual and potential movement towards WST in the systems field. In the final two sections of Part B, I look at related change in the field of education. The focus is how far education and environmental education are influenced by the context of changing worldviews, and how far they are in a position to assist transformative learning towards ecological thinking. This sets a context for discussion of paradigm theory in education in Part C, and the possibility of paradigm change through a whole systems approach.

Following nesting systems logic, the level of 'education as a whole' is examined at first (section 3), and then the sublevel of environmental education, (in section 4).

3 EDUCATION AND CHANGE

In this section 3, I reiterate and further explain the critical distinction between 'education for change' and 'education in change', arguing that the possibility of transformative education depends on the latter, that is, on change in educational thinking and policy. I then look at the 'ecology' of education, seen as a subsystem of society, at the effect of restructuring on education, and how far this has limited the transformative potential of education as a change agent.

Before proceeding further, I will take stock of progress to this point.

Box B.5 Taking stock

The Thesis attempts to build towards a theory - or set of theories - which (reiterated from A.1.1):

- help explain the lack of fundamental change in educational paradigm, (that is, the relative inability of the prevailing educational culture as a system of thought to change through learning),
- help construct a theory of transformation that might assist such fundamental change - which would in turn…
- enable a transformed educational paradigm to support a quality of transformative learning necessary to societal movement towards sustainability.

The foundational ideas and models outlined so far in Part A and Part B, which build towards such a theory, include:

- the idea of epistemological 'error' or inadequacy
- learning levels and orders of change
- systemic levels of knowing
- the 'sustainability transition'
- paradigm theory and the three dimensions of paradigms
- modernism, postmodernism, and revisionary postmodernism
- the nature of the ecological worldview
- whole systems thinking

Additional theories/models, outlined below, include:

- education 'in' change and education 'for' change (B.3.1)
- the 'ecology' of educational systems (B.3.2)
- intrinsic and instrumental values in education (B.3.3)

3.1 Education 'in' and 'for' change

At this point, I want to reiterate and elaborate the important distinction made in the Preamble and Part A.3.1 between 'change in education', and 'education for change'. Practitioners and policymakers in environmental and sustainability education often focus on the latter, and thereby stress the need to change *provision* in education, particularly curriculum, to develop an appropriate 'education for change'. I argue, rather, that prior attention needs to be given to power of the underlying *paradigm* which shapes the purposes, policy and provision that are dominant and the changes that are

deemed possible. Hence, the need, as stated above for 'learning *within* education' or change in education, as a necessary precursor to adequate learning *through* education or education for change.

Education for change focuses on the role of education in bringing about change in the person, group or society. It is about purposeful change sought or achieved through educational practice. *Education in change* (or change in education) refers to change in educational rationale, policy, theory and practice that affect and may facilitate (or hinder) education for change. Having made the distinction between these categories of change, we can then make a further distinction between fundamental methodologies, which might apply to either types of educational change, as follows*:*

Table B.3: Types of educational change and methodology

	TRANSMISSIVE Methodology	**TRANSFORMATIVE** Methodology
EDUCATION *FOR* CHANGE (practice)	INSTRUCTIVE	CONSTRUCTIVE
CHANGE *IN* EDUCATION (policy)	IMPOSED	PARTICIPATIVE

I would argue, that essentially, all education can be seen as being expressed through either a broadly 'transmissive' or 'transformative' methodology:

- Within a transmissive methodology, 'education for change' is *instructive* - i.e. associated with the transfer of information, while 'change in education' tends to be imposed through direction.
- Within a transformative methodology, 'education for change' is *constructive* - i.e. engages the learner in constructing and owning meaning, while 'change in education' is participative and collaborative.

'Imposed' and 'participative' describe the style of policy change and management, and apply to any level of the education system. Importantly, 'education for change' and 'change in education' are necessary to each other: the former cannot be achieved

without sympathetic change in the latter, and vice-versa. A further point here is that in practice, both categories of change are usually matched, reflecting either a transmissive or transformative style.

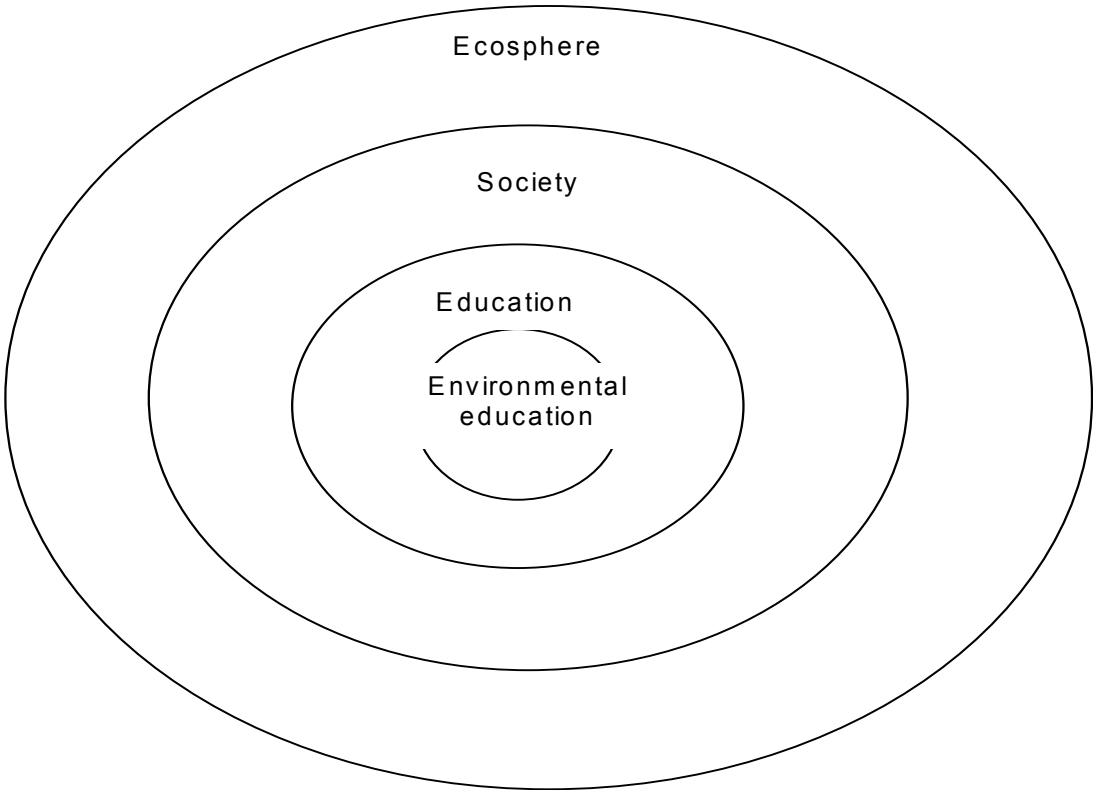
My argument, which is developed in detail below and in subsequent Parts, is that an ecological, holistic 'sustainable education' paradigm is essentially transformative, constructive, and participatory/democratic. By contrast, the dominant model is fundamentally transmissive (or informative), instructive, and non-participatory or less democratic (Sterling 1996b, Sterling 2001). Of course, reality is not as simple as this, and - following the paradigmatic argument above - there is an important point about the transformative subsuming rather than negating the transmissive orientation in any sustainable education paradigm. But for now, the model seeks to clarify basic patterns and orientations, and these are illustrated further, below.

3.2 The 'ecology' of educational systems

Another useful model employs (again) the concept of nesting systems. Thus we can describe an 'ecology' of educational systems to clarify the existence of different interacting system levels (Banathy 1992). Clearly, it is possible to regard to identify a set of related components including policies, institutions, curricula, actors *et cetera* as 'an educational system', and further identify that system as a *subsystem* of wider society: on the grounds that it is organised by, financed by, and mandated by this society. It is predominantly shaped and oriented by the needs, policies, values and norms of the social context which it serves - rather than the other way round.

At a lower system level, environmental education or other movements for educational change can be seen as subsystems of the larger or mainstream formal educational system: they are manifested and operate within this larger political, cultural, and organisational context, which influences both discourse and practice. These relationships can be simply represented, as in Diagram B.5.

Diagram B.5: The ecology of education systems



If we now jump up a step in the hierarchy, the larger socio-economic and cultural systems may be regarded as subsystems of the planet as a whole, in the sense that they are entirely dependent upon the functioning of the biophysical world. Indeed, as Meadows et al. (1992), Daly (1996), Clayton and Radcliffe (1996), Brown (2001) and The Natural Step programme point out, socio-economic systems must be regarded as subsystems of the encompassing biophysical or ecospheric system, and the fact that the economic system is often seen as independent of or encompassing the biophysical system is partly the root cause of our current crisis. This is a critical point to do with where and how boundaries to our individual, social and corporate concerns are seen and drawn, and may be said to be a fundamental starting point for most ecological thinking.

This model is a simple one - Banathy (1992) for example, distinguishes six levels of systems, which substantiates the point that the distinction of system boundaries depend on the observer. For my purposes, I think the four levels distinguished here are sufficient and helpful. A number of ideas are suggested by this model, including that:

- in the dynamics of the three levels of the human systems, top-down influence (which seeks to integrate the levels below) is stronger in sum than bottom-up influences (which seek to affect the higher levels)
- any 'education for change' movement which seeks to affect society, also needs to look at change in the educational context in which it operates, that is, also pay attention to the next system level, as well as the higher contextual level.
- education for change is never a one-way linear process.

This model indicates that the central question that has been occupying environmental educators for decades is misplaced or at least, over-optimistic: 'how can environmental education change people's regard for and behaviour towards the environment?' This instrumental and linear idea (which still retains currency although much less so than in the 1970s and 80s), that more environmental education would change people, and thereby would change society, ignores at least three realities:

- radical education for change is often outweighed by the larger educational system which enacts vocational and socialising roles and purposes, and can both constrain and 'cancel out' such educational endeavour,
- the larger-still social system affects and shapes the educational system more than the other way round, although they are in a recursive relationship, and,
- in an age of mass communication, the socio-cultural milieu arguably affects people and influences values more than formal education programmes do.

These dynamics do not mean that environmental education or other education for change movements cannot be effective, but that they are always limited by factors beyond their influence.

I have suggested (Sterling 2000a), and above in Part A, that the systems perspective - which recognises recursive rather than linear relationships - encourages a change of question, to 'How can education and society change together in a *mutually affirming* way, towards more *sustainable patterns* for both?' The challenge here is to work for a relationship of positive feedback, where changes towards sustainability in wider society support what I have called a paradigm of 'sustainable education' (Sterling 2001), which support changes in wider society, and so on. As stated in Part A.1.1, this takes us from a model of education as one of social reproduction and maintenance, towards a vision of continuous re-creation or co-evolution where both education and society are engaged in a relationship of mutual transformation (Banathy 1991,129). I believe

environmental and sustainability education has an important role in catalysing this process.

The possibility of such whole system paradigm change is explored in Part C. At this point, however, it is necessary to look again at recent and current change in educational policy, thinking and practice and make an initial assessment as to how far ecological thinking is informing, or is constrained by such change. (This builds on the introductory discussion in A.3.6).

3.3 The restructuring of education in the postmodern world

Since the mid-eighties, educational systems in Western societies have undergone 'restructuring', informed by neo-liberal and neo-conservative values and ideas. This process, as Torres points out, involves altering the "purposes, assumptions and methods of school systems rather than merely transforming the efficiency of existing systems" (Torres, 446 in Marshall and Peters 1999). The shift of the centre-ground has been from neo-classical and liberal views of education - that is, the academic and individualist views which have informed educational debate and practice for much of the last century - towards neo-liberal and neo-conservative views of the role and nature of education.

A very managerialist, instrumental view of education has come to dominate, modelled on economic change and the perceived 'demands' of a globalised economy and increasingly, globalised culture. This change is not peculiar to the field of education, but 'marketisation' and 'modernisation' has infiltrated virtually all areas of public life including sport, health, the penal system, policing and local government (Marshall and Peters 1999). A number of writers suggest the change in education is well represented by a changing language. Robertson (in Goodson and Hargreaves 1996, 26) for example, writes:

> Notions such as inputs, equity, centralized bureaucracy, mass education, seniority and unionization which defined post-world war mass schooling have been replaced by a new language: outputs, performance, added-value, choice, markets, quality, competencies, excellence, flexibility, deregulation, and school-business partnerships.

Further, a new language relating to the actors in education has become commonplace, inducing a changed personal and professional perception of identity, and defining a new set of relationships which have undermined older understandings and tacit

agreements. Thus “teachers are constructed as ‘providers’, principals as ‘managers’, parents as ‘employers’, and students as ‘consumers’” (Smyth and Shacklock 1998, 97).

It is important to review the main features of this shift, not least as the change is exerting a profound effect on educational thinking and practice, arguably to the exclusion of other educational models. A further reason for this inquiry is that environmental education and education for sustainability discourse tends to weigh the relative merits of educational paradigms - such as positivism, interpretivism, critical theory, and post-structuralism - with little or no reference to the nature of the dominant operational cultural and educational metaparadigm within which these orientations fare more or less strongly. This appears a curious omission, where educational movements that seek to affect social change often do not address directly the overriding context which they seek to influence. This argument - which relates to the ‘ecology of educational systems’ model above, and the influence of paradigms - is touched on again in B.4.1 below, and is revisited in greater depth in Parts C and D.

Further, this inquiry is made because some aspects of the neo-liberal/neo-conservative model of education appear at first glance to support more holistic or systemic models of education and learning, for example, with regard to encouraging life-long learning and decentralised self-management. However, closer examination shows that significant differences remain - although I will suggest that at least some of the new changes perhaps open doors for more systemic approaches. Overall, however, the currently dominant educational model - seen from my interpretation of a systemic view - is largely a dysfunctional and inappropriate model for our times. Indeed, in many respects, I would argue that it is headed in the wrong direction, away from what I have termed ‘sustainable education’: thus it is possible to contrast the mechanistic paradigm underlying the neo-liberal conception of education against an ecological educational paradigm (Sterling 2001). (This discussion is also revisited in more detail in Part C).

Whilst this is a brief examination, I will try to resist the temptation to oversimplify. Certainly, it is not possible to isolate a single factor that has changed the dominant educational paradigm in the last twenty or so years. Political, economic, cultural and intellectual change all have played some part, leading to a current situation of some complexity. These changes can be very briefly summarised thus:

Political

A shift of the locus of political thinking from liberal and social democracy, and the Keynesian welfare state, towards the Right thus giving neo-liberal and neo-conservative thinking ascendancy.

Economic

A shift from 'Fordist' to 'post-Fordist' economic organisation, or from 'organised' capitalism to 'disorganised' capitalism, and global 'economic restructuring' which favours 'free' movement of capital, investment and goods, and seeks a supply of 'human capital' with flexible skills.

Cultural

Late modernism and postmodernism, implying preference for plurality and diversity, but also leading to individualism and moral relativism.

Intellectual

Poststructuralism - rejection of all 'grand narratives'. The dimensions of deconstructive postmodernism and poststructuralism add to the paradox of our current situation. Whilst they possess the intellectual argument to oppose modernism and central organising principles, and instead celebrate diversity and multiple realities, they offer little critique of a monocultural and homogenising globalised economy, and no constructive alternative. Further, the idea of a 'sustainable future', central to sustainability education movements, is undermined.

The combined effect of these changes have been widespread and profound. In education, changes have affected everything from the purposes of education, to curriculum, funding, management, the role of schools and teachers, and even the overall ethos of education. The emphasis has shifted from *educational* values to do with developing potential and autonomy in students, and *social* values relating to equality of opportunity and social cohesion, towards *economic* values which education is required to serve much more closely. Whilst education has always had some economic function, in the recent past this has been balanced through it being seen as one of several co-existing functions. Recently however, as Marshall and Peters (1999, xvii), paraphrasing Lyotard, suggest, education:

> …has been turned into a strategic factor in the efficiency of national economic policies…education is no longer concerned with the pursuit of ideals such as that of personal autonomy, emancipation or leadership…but instead with the

> means, techniques or skills that both contribute to the efficient operation of the state in the world market and contribute to the maintenance of an internal cohesion and legitimation of the state.

Or as Maguire and Ball suggest (1994, 14), "…schooling is no longer being articulated as a public service but rather as a state regulated private good".

However, the new model cannot be simply characterised. In 1990, when Thatcherism was making its mark on British education, Ball (1990, 213) wrote:

> The neo-liberal influence emphasises an orientation to the future, constant adaptation to new circumstances and an absence of state controls; the neo-conservative influence stresses an orientation to the past, traditional values and collective loyalties. Education is thus contested in terms of its role in both restoring authority and responding to the contemporary logic of capitalist development. The internal culture and ideological dynamics of these struggles serve to underline Williams (1962) point that 'An educational curriculum…expresses a compromise between an inherited selection of interests and the emphasis of new interests'. The pattern and outcome of these compromises are different at different historical moments.

The current compromise under 'Blairism' has arguably shifted towards the neo-liberal, but neo-conservative elements remain. Meanwhile, in common with patterns of change in other Western education systems (Marshall and Peters 1999), long-established liberal ideas of the purposes of education have been overshadowed. Australian academics Smyth and Shacklock (1998, 11) for example, argue:

> Schools as sites of comprehensive intellectual growth, as places that foster and value the wider social good compared with self-interested individualism, and that sustain and maintain local discourses about social justice, are decidedly unfashionable at the moment and are tending to be relegated to the interstices, the cracks and the crevices of discussion, rather than firing the wider public imagination of what schools exist for.

Whilst many educators have reeled at the effects of the managerialist revolution in education, it is doubtful that it should be seen as constituting a "new educational paradigm". Smyth and Shacklock (1998, 135) opine:

> It is not clear that the changes currently being inflicted upon schools actually amount to a paradigm shift - but they certainly represent the replacement of a

> set of discourses about the educational and social utility of schooling, to ones that are driven by narrow vocationalist, managerial and economistic agenda.

Certainly, taking the effect as a whole, the change is 'new' and many aspects would be unrecognisable to teachers and educators some twenty years ago. But if we take given definitions of paradigm visited elsewhere in this Thesis such as Capra's (1986), "a society's dominant belief structure that organizes the way people perceive and interpret the functioning of the world around them" - it more likely represents a subparadigm located within the project of late modernity, one organised around what might be termed economism. This educational 'subparadigm' is still underpinned by a deeper paradigm embracing positivistic, behaviouristic and technocratic thinking, and founded on a mechanistic view of the world.

The analogy with the factory is telling: children and qualifications are produced, there are precise goals and targets, the curriculum provides directives for each stage of production, teachers are technicians and are therefore substitutable, there is uniform monitoring, 'quality control' and standardisation through testing and inspection, and so on (Smyth and Shacklock 1998, 49). And I would add, neither teachers nor the taught are really required to think critically or creatively.

At the same time, however, the move to 'modernise' and create 'the learning society' has led to a certain opening up of the educational landscape, and arguably, some aspects of these have positive potential seen from a sustainability perspective. These changes include more emphasis on:

- learning than teaching
- life skills and 'life-long learning'
- hybrid and multidisciplinary subjects
- information technology as learning and 'delivery' tool
- distance and open learning
- 'the learning organisation', and
- recognition of the transitory nature of much knowledge

(Jarvis, Holford and Griffin 1998, Bentley 1998)

Meantime there have been a number of reports that seek to speed up this process of change (Bayliss 1999, Bentley 1998). The discourse is about the need for more

flexibility in learning and schooling, about getting ready for the information revolution, about life-long learning, about learning to learn, and so on. The current changes are largely about moving education suited to the modern industrial age to one appropriate to the postmodern information age. As in many ways formal education is still largely based on the 19th century factory model, some of these changes might appear welcome. But without asking deeper questions concerning *ethos*, and posing the sustainability context, they may exacerbate rather than contribute to the sustainability issue. Ideas of 'the knowledge society', 'the information economy', 'the information society', and 'the learning society' often hide questions about what sorts of knowledge, controlled by whom, for whom, and for what purposes.

- Keypoint: In such emphases as the 'knowledge society' and 'learning society', there is an assumption that learning is self-evidently a good in itself: whereas from an ecological point of view, the purpose and context of learning often implies an ethical dimension.

I can, for example, equally learn how to rob a bank, as look after sick children. Without an ecological understanding, there is some danger of creating post-modern learning institutions, whose graduates are able to exploit others and the environment more efficiently and effectively than their predecessors.

In other words, we can argue that the changes that the late-modernist agenda have wrought, however far-reaching they appear to their progenitors or bearers, are largely within the bounds of the existing paradigm: what Clark (1989, 236) calls "change within changelessness" (as noted above in B.1.3), that is, first order change. This, as noted above, is only concerned with *doing things better* i.e. with efficiency, efficacy and improvement. But, as Ackoff has said, "It is better to do the right thing wrong, than the wrong thing better and better" (1995), the latter being a danger with first order change.

Thus, we can make the following distinctions (based on Banathy 1991):

Box B.6: Orders of change in educational systems

Making adjustments in the existing system (first order change)

Education and school/college improvement - doing more of the same, but 'doing it better'. Emphasis on efficiency.

Education restructuring - re-organising components and responsibilities in the education system. Emphasis on effectiveness.

Changing the educational paradigm (second/third order change)
Redesign of education system and institutions - achieving awareness of the nature and limits of prevailing education paradigm, and re-thinking, on a participative basis, whole systems according to insights of systems thinking, ecological democracy and complexity theory.

As noted in B.1.3 above, second order and third order systemic change are concerned respectively with *doing better things,* and with *seeing things differently.* Thus, Weil (1999, 171) argues for a shift away from "systematic control" which is characteristic of the neo-liberal revolution, to "systemic learning and inquiry" which (in my terms) represents an ecological change model.

The former approach reflects mechanistic beliefs in determinism, and predictability, and therefore the possibility of control. This is manifested, for example, in the emphasis on outcomes and standards - if we know what the inputs are and process is, we can say with certainty what the outputs should be, and can judge success and failure on the basis of how far predetermined outputs are achieved. Viewed this way, the concern with standards is arguably more about *standardisation* than quality of learning.

- Keypoint: The mechanistic way of thinking about education and learning has become part of the shared psyche and culture, ousting previous and perhaps more valid and truthful ways of perceiving education and learning, and narrowing perceptions of what constitutes worthwhile knowledge and enquiry.

"Outcomes rhetoric", according to Smyth and Shacklock (1998, 49), "has apparently become the discourse of a normal and natural approach to the provision of education, an approach which has largely reduced, marginalized and rendered other discourses irrelevant."

In terms of the analogy I suggested above (section A.3.3) it seems, is an example of the imposition of a 'square peg consciousness' on a 'round reality'. The non-recognition by policy makers that humans and human systems are characterised by complexity, emergence and difference, is a major flaw. The idea of emergence is a crucial one

here. If complex systems are not seen from a whole systems perspective and treated with a commensurate awareness, then emergent properties are likely to be negative rather than positive. Emergence is sometimes referred to as 'surprise', that is, what happens beyond the scope of the intention or goal. The negative emergent properties apparent in the UK are now less of a genuine surprise, as they are well known and documented. But it would be interesting to know how far policy makers associate negative emergent properties (such as those in the second list block below) with recent policies. The following are indicated by Smyth and Shacklock 1998, and I have arranged them into 'policies' and 'effects' in two blocks as follows:

Policies

- a narrowing of what counts as achievement to that which can be measured
- emphasis on targets and performance indicators
- a shift towards traditional pedagogies
- a promotion of competition rather than collaboration within and between institutions

Effects

- intensification of teachers' and lecturers' work
- stress amongst teachers and a feeling of being 'squeezed dry'
- a breakdown of a sense of sociability and collegiality within institutions
- a general decline in vitality and creativity of teaching.

Bassnett, a university pro-vice chancellor, argues strongly that the obsession with 'quality' is leading to the opposite, a loss of quality if a wider set of quality criteria is taken into account. The amount of energy and time that goes into bureaucracy and administration to "prove you have demonstrable quality learning outputs" she argues, has led to loss of good teaching and research, loss of tutor-student contact and the growth "a whole new cadre of university bureaucrats living comfortably off the quality industry".

> What is happening in higher education is a dumbing down of the whole system, under the pretext of improving quality for all.
> (Bassnett 1998, ii)

Laurillard, of the Open University in the UK, points out that none of the assessment processes that HE now has to follow enable the HE sector to *itself learn:* "they merely describe, and at a level of description that does nothing to help us understand whether we are actually serving our students better" (Laurillard 1999, 119). Yet the insistence

on measuring, on accountability is everywhere in formal education systems. Tate (a former chief executive of the Qualifications and Curriculum Authority) states, “As a society we are preoccupied with assessment. Never before have so many been tested, for so long, and under such scrutiny” (Tate 2000,3).

There appears to an increasing irony in this whole story. Whilst the restructuring of education has it seems been driven by an economic rationale, the business world that education now mimics has, in some quarters at least, moved on. At the same time, there is criticism that the performance-driven model foisted onto education has driven out the space for developing the creativity, and self-reliance that such business quarters actually require educational systems to nurture (Jupp, Fairley and Bentley, 2001).

The application of complexity theory - which is about how complex natural and human systems work - is leading to a new language in business management which is questioning the validity of long term planning and outcomes, of heavy top-down management and control. The emerging language is about seeing organisations as living machines, or as organic wholes, and the application of new thinking from the complexity sciences is displacing mechanistic metaphors. Roberts (1998, 5), in an issue of a newsletter of a leading management training institute comments on the implications of complexity theory:

> Leaders and managers should aim to develop conditions in the organisation which allow self-organising behaviour to flourish. This means creating adaptive organisations with flexible structures, skills, processes and information flows. Instead of hierarchically imposing change, managers need to unleash the potential for change.

What is emerging here is more emphasis on genuine participation and collaboration, flexibility, trust, inclusivity, diversity, creativity, and the role of local and personal knowledge as inherent to the learning process. Instead of an ethos of manipulation and control, some leading businesses are recognising the value of ‘capacity building’, and facilitating and nurturing self-organisation in the individual and community as a necessary basis for ‘systems health’ and sustainability. What these businesses are recognising is that the power of emergent properties can be used to generate what are called in systems jargon ‘positive synergies’, where positive and interacting spin-offs arise.

This is much closer to the whole systems perspective which recognises that whole systems health depends upon the proper and dynamic balance between *autonomy* and *integration* at all levels of the system. Yet, in the neo-liberal and neo-conservative models of education, integration and conformity are intentionally given primacy, while autonomy is undermined. As Torres remarks (446, in Marshall and Peters 1999), “A central component of the neoconservative restoration is a critique of the liberal notion of autonomy and its implications for classroom practices. Autonomy is interpreted as lack of accountability”.

I will now suggest and summarise some criticisms of the neo-liberal, managerialist model of education from a whole systems point of view. Thus it tends to:

- have a limited view of the whole person or of personhood
- ignore social learning and undervalue the social benefits of education
- promote a simple ‘first order’ notion of learning
- be essentially mechanistic
- be undemocratic and overemphasize control and competition
- be monocultural and homogenising
- have little sense of promoting community or mutual wellbeing
- distort the allocation of resources - rich schools/institutions get richer and brighter students and poor schools get poorer and less bright children (Olssen 342, 1996)
- be controlling rather than empowering despite the decentralisation of immediate management
- have little sense of the intrinsic value of education or the qualitative difference of the nature of learning (compared to other human activities) as an essential and intrinsic part of being human
- be concerned with universals and uniformity, and display insufficient respect for local or individual difference or local or personal knowledge
- afford little room for spontaneity, imagination, creativity or aesthetics
- replace full participation, engagement and voluntarism amongst teachers and learners with a contract mentality
- ignore process values such as nurturing, encouraging and trusting
- engender more fear than trust and more dysfunctionality than wellbeing.

In sum, the mechanistic paradigm which is now in control of education is inappropriate because it does not recognise that the process and quality of education and learning is

fundamentally concerned with relationships rather than 'things', products or commodities. As Smyth and Shacklock state (1998, 201):

> Teaching is being remade by global economic forces which have little to do with the *relational* world of teaching and learning inhabited by children and teachers. (my italics)

The fundamental difference of orientation is partly explained by distinguishing *methodologies* (see Table B.3 above) and partly also, by distinguishing intrinsic values from instrumental values in education. This is outlined in Box B.7 below.

Box B.7: Intrinsic and instrumental values in education

In understanding underlying educational values a clarifying distinction can be made between *intrinsic* values, and *instrumental* values. Educational orientations stressing *intrinsic* values view education as an end and a good in itself, as having inherent value, purpose and meaning. There is a strong sense of the question, 'what is the nature of education?' In this orientation, the end use to which the 'educated person' put his/her education is a secondary consideration, but there is a belief that a well-rounded education will only have beneficial social consequences. This was exemplified by the child-centred and 'progressive' movement in education that was at its zenith in Britain in the 1960s.

On the other hand, the *instrumental* stance values education as a means to an end, whether this be to assist international competitiveness, or combat drugs, or racism, or indeed, promote peace or environmental quality, for example. Hence any phrase conjoining 'education' and 'for' usually implies an element of instrumentalism. There are many of them, as education is so often seen as the universal answer to problems. Thus, education 'for literacy', 'for health', 'for development', and even 'for the environment', is seeking some sort change in the individual or in society through education.

This is an important distinction, because there is a tension in educational thinking - and certainly in sustainability education - between views of education that tend to focus on one orientation or the other (rather than both). So an instrumental view of education tends to stress *purpose* and product, that is, outcomes and 'effectiveness'. It is concerned more with 'what education is for', rather than the nature of education. The intrinsic view however stresses *process* - the quality of experience of teaching and

learning, and is primarily concerned with 'what education is' rather than what it might eventually lead to or influence.

- Keypoint: Sustainability is essentially about integrative and relational thinking and action, and requires a synergy between the intrinsic and instrumental values.

However, there is a real tension in sustainability education between instrumental and process views of education, echoing the realism-idealism tension discussed above, and this is explored in more detail in Part D.

The restructuring of education helps explain the limited response education as a whole has made to the challenge of sustainability. This is introduced in the next subsection, and discussed in more detail in Part C.

3.4 The limits to education as an instrument for sustainable development

As noted above in A.1.1, since the UN Stockholm conference of 1972, numerous international statements and mandates have pointed to the key role of education as a change agent, from creating "new patterns of behaviour of individuals, groups and society as a whole towards the environment" (a goal of the Tbilisi intergovernmental conference, UNESCO 1978) to being "critical for promoting sustainable development and improving the capacity of the people to address environment and development issues" (Chapter 36, UNCED 1992). Agenda 21 Chapter 36 talks of the need to 'reorient' education towards sustainable development (UNCED 1992). The Brundtland Report of 1987, which gave rise to the 1992 Earth Summit, called for a "vast campaign of education, debate and public participation (which)...must start now if sustainable human progress is to be achieved" (WCED 1987, xiv).

Post the seminal Tbilisi conference, what was new about the later calls, was that they were not specifically about improving 'environmental education' whilst wider educational policy and practice went on unchanged, but concerned the redirection of *education as a whole.* Education as a whole was seen as an instrument to help assure sustainable development. Unsurprisingly perhaps, the response has been very limited. A report to the Commission on Sustainable Development, charged with monitoring progress on the implementation of Agenda 21, indicated that the major work was still to be done (UNESCO Secretary-General 2000), and the same conclusion was reached in a report for the 2002 World Summit on Sustainable Development (UNESCO, 2002) held in Johannesburg.

On another front, concern for ‘education for all’ (EFA), that is, universal provision of basic education, which is seen by UNESCO as a basic right, is also frustrated. Arguably, EFA is a fundamental part of education for sustainable development as most development studies show a link between quality of life and basic education. Yet, the goal of the UNESCO Jomtien conference of 1990 on Education for All (EFA) which promised basic education for all by 2000, remains far from being met (UNESCO, 2000). As the Dakar EFA conference concluded in 2000, “Without accelerated progress towards education for all, national and internationally agreed targets for poverty reduction will be missed, and inequalities between countries and within societies will widen” (WEF 2000).

There is a crisis here, and a major reason seems to be that member states are less interested in ‘education for change’ of this sort, but rather of a different kind, relating to the global economy. As the UNESCO Director-General suggested (Matsuura 2000), following the April 2000 World Education Forum meeting, “education for all has often been seen as a burden by governments trying to adjust to the demands of global competition”. In other words perhaps, the instrumentalist view of education critiqued above, through which policymakers deem education as critical to immediate survival in a globalised economy, has more importance than an alternative instrumentalist view, being education for long-term sustainable development. Thus, in assessing how far education as a whole has responded to the challenge and discourse of sustainability, there is not a great deal that can be said because the response has been weak and patchy (Smyth, 2002).

A further reason why educational systems across the globe have hardly responded to the challenge of reorientation towards sustainability or EFA, relates to my distinction above: discussion tends to focus on ‘education for change’ rather than on changes in education that would be necessary for educational practice to fulfil the international rhetoric. Certainly, there has not been much discussion about the limits of a solely instrumental view of education - whether this is geared towards the globalised economy or towards sustainability. With respect to the latter, certainly many environmental educators have seen the international rhetoric as a mandate to push education for sustainability or education for sustainable development, and this has attracted a fair share of criticism from those who may be said to espouse intrinsic educational values above instrumental educational values (Jickling 1992, Jickling and Spork 1998). (This debate is further reviewed in Part D.)

What has been largely missing in all this is an extensive and fundamental discussion about the kind of education that 21st century conditions require, whether a changed educational paradigm is required, clarity about the basis of such a paradigm, and also a strategic sense of how progress towards such a vision could be made, bearing in mind the power of the prevailing social and educational paradigms. In other words, whole systems thinking is needed, I would argue, about the nature and purpose of a reoriented education, and about how systemic change throughout all levels of educational systems might be brought about. This Thesis is, of course, attempting to contribute to this thinking, and models and ideas are outlined, reiterated and developed as the argument is gradually woven.

What we can conclude from this subsection and B.3.3 above, is that mainstream education is now largely bound within what is now a late modern/postmodern paradigm which has limited ability to address sustainability issues let alone move towards a more sustainable educational paradigm. It can be characterised by such keywords as: technocentric, instrumentalist, reductionist, managerialist, and globalised. Orr (in Sterling 2001, 8), in his characteristically forthright style, suggests:

> The upshot is that we must take education back from those who intend it to be centralized, homogenized, standardized, technologized, and industrialized.

This is easier said than done of course, but I argue that the need now is to shift attention from the subsystem level of 'adjectival educations' interested in 'education for change' (such 'environmental education', 'development education, 'human rights education' and so on), towards the articulation of an alternative post-modern ecological educational paradigm. This is what I have called 'sustainable education'.

The inertia in the mainstream does not mean there can be no movement in educational thinking and practice, or no calls for change, but most of this is arguably 'first order change' (Clark's "change within changelessness") as reviewed in B.3.3 above. But other calls for change appear to be inspired by second order change or third order positions, deeper analyses which I would say are resonant with 'sustainable education', and it is these which the next subsection reviews briefly.

3.5 Calls for change in education

Beyond the many voices calling for the inclusion of some special interest in education - be it health, sex, drugs, international understanding, peace and conflict resolution,

human rights, economic understanding, development, citizenship, moral development, and so on - including it must be said, environment - there are some fewer voices which seek a deeper reorientation, or indeed transformation of education. These voices seek not an 'add on' to the curriculum but a shift in educational culture. A few are briefly reviewed here.

Amongst the most prestigious was UNESCO's International Commission on Education for the 21st Century, which was chaired by Jacques Delors (Delors, 1996). Their report took a holistic and humanistic view of education. In particular, the report proposed four pillars as the foundations of education and life-long learning. These are in sum:

- learning to live together
- learning to know
- learning to do
- learning to be

What the Delors report failed to do - which is not surprising given its mainstream positioning - is critique the values and ideas of the prevailing managerialism that constrain the realisation of the orientation they favour. Other writers espouse an holistic and humanistic orientation in education, but also go further to critique, and/or contrast this orientation with, the dominant operational paradigm. These include, Beare and Slaughter (1993), Slaughter (1995), Hutchinson (1996), King and Schneider (1992), O'Sullivan (1999).

Whilst these writers come from variously 'peace', 'futures', and 'environmental' orientations, all advance an holistic vision of education. A further critical base which is reviewed, for example on the London South Bank University MSc where I teach, is that of critical pedagogy and development, and writers here include those such as Freire (1972), Fals-Borda (1991), and Chambers (1997). Interestingly, the other base from which writers have advanced both a critique and a vision, is a systems orientation, and a number of writers can be loosely or strongly be identified with this perspective. These include Meadows (1993), Milbrath (1989, 1996), (Bawden 1997a and 1997b) and particularly Banathy (1991, 1992, 1999).

Without spending too much time and space outlining the arguments put by these writers, the main conclusion I want to draw here is that there is a broad pattern of similarity between their stances, as they tend to endorse humanistic, holistic,

constructivist, and transformative views of education and learning. In sum, they advance a more relational or systemic view than the mainstream. Whilst some would no doubt dislike being tarred by the same broad brush, I think there is justification for suggesting that such writers - whether or not they would use this terminology - are contributing to the emergence of a postmodern, participatory, ecological paradigm in education.

I now want to turn attention specifically towards trends in environmental education.

4 ENVIRONMENTAL EDUCATION IN CHANGE

In this section, I argue that both realist and constructivist views of environmental education constrain its ability to move towards manifesting a sustainable education paradigm. Some of the history of the dominant instrumental approach to environmental education is briefly outlined and its relative ineffectiveness is seen as a product of the paradox whereby education for change is both required and constrained by social pressures. The possibility of deeper change in environmental education and indications of the postmodern ecological worldview are outlined in section 4.2.

4.1 The limits of environmental education in relation to sustainability

In the thirty or so years of environmental education's history there has been a gradual shift of paradigmatic base from environmental realism towards idealism, from behaviourism towards constructivism. For most of this period, the former has held sway, and environmental education discourse has been less concerned with critiquing and changing the larger contextual educational paradigm in which it is located (its metasystem), and more concerned with behavioural change at individual level and social change. (My argument here is supported by Smith and William's analysis, 1999.) In terms of the nesting systems model outlined in B.3.2 above, the focus of environmental education has tended to 'jump' a level: it has been less concerned with change in education and more concerned with education for social change. To give one example, a recent book entitled *Education for a Sustainable Future – A paradigm of hope for the 21st century,* makes virtually no reference to the dominant paradigm which limits the possibility of the 'paradigm of hope' becoming fully realised (Wheeler and Bijur, 2000).

In the past decade, however, there has been increasing interest in the 'education' (and learning) part of 'environmental education', and therefore, environmental education has been less driven by the 'environmental' part of the equation. I find this an interesting

change of emphasis, and it relates in part to the distinctions (above) between education ‘in’ and education ‘for’ change, and between intrinsic and instrumental values in education. It appears that most ‘leading-edge’ environmental educators are now concerned with the nature of the change in education and the kind of learning experience that is necessary, if we are to nurture personal or social transformation through learning. However, there is still an overall reluctance I feel, to critique and recognise the power of the dominant educational paradigm which constrains and in some ways contradicts and negates this new constructivism in environmental education circles. Fien (2000) is one of the few leading environmental education commentators who addresses these bigger issues in any detail, and talks about the need for second-order change.

There is another problem: in critiquing the more behaviourist/content-led/environment-led aspects of environmental education, some of this constructivism has abandoned any attempt to indicate the nature of sustainability. My feeling is that, while they know that it is not a ‘a thing’ (the criticism which Bell and Morse, 1999, make of the technocratic/scientistic view of sustainability, reviewed above), some environmental educators are unable to accept or articulate an ecological or whole systems view of sustainability, and so discussion tends to stop short. An understandable reluctance to be prescriptive, extends to a reluctance to be indicative too.

I will argue below, particularly in Part D, that:

- Keypoint: sustainable education is constructivist but also realist; that sustainability does imply a direction with regard to values and content which need to be explored through education; and that both intrinsic and instrumental education values are implied.

As I have stated above, what is needed is an alternative to the dominant epistemology, and I think that current discourse in environmental education is to some extent reaching towards that goal but needs to go further.

At present, dualism is deeply reflected in educational discourse, and this can apply almost as much to various forms of education (such as environmental education) that see themselves as transformative, as it does to mainstream education. So ‘here’ we have education (subject), and ‘there’ we have the environment (object), or health, or sustainability, and extensive debate follows upon how education can address the other. The best of recent debate in environmental education is beginning, I think, to break this down. I am interested to explore the ways in which an ecological or systemic

understanding of ‘sustainability’ and of ‘learning’ can reframe both and bring them into some form of mutual illumination and recursive relationship. It harks back to Bateson - what is the ‘pattern that connects’ learning, education and sustainability? Posing this question opens the perceptual door, it helps us begin to envisage, and indeed to design, an integrative and coherent ‘sustainable education paradigm’. This is taken further in Parts C and D.

Meanwhile, at the other end of the spectrum, a good deal of environmental education and education for sustainable development discourse remains strongly instrumental, at the cost, it seems, of sufficient reflection on the nature of the learning/teaching experience. I was surprised when I took part in the international ‘ESDebate’ internet debate in 1999 (Hesselink, van Kempen, and Wals, 2000) - hosted by the Dutch government and IUCN - how much this seemed to be the case. I want to now go back and review some of the history of this orientation.

Environmental education has long been seen in the body of literature that informs environmental education theory as a vehicle for change. Thus for example, the seminal ‘Countryside in 1970’ conference held in March 1965, which was critical to the emergence of environmental education in the UK, stated:

> Positive educational methods are needed to encourage awareness and appreciation of the natural environment as well as responsibility for its trusteeship by every citizen. The educational system has a decisive contribution to make in creating this awareness and sense of responsibility.
> (Council for Environmental Education, 1970, 6)

The Department of the Environment (DoE) echoed this sense of the role of environmental education in 1972:

> The opening up of opportunities for public participation in decision-making is the most important of all means to environmental education, which should aim at developing a critical, moral and aesthetic awareness of our surroundings.
> (Department of the Environment 1972, 2)

The DoE report was produced in the atmosphere of environmentalism that surrounded the UN Conference on the Human Environment of 1972, which itself underlined the importance of environmental education (recommendation 96) and lent it international legitimation. The UN Stockholm conference led, three years later, to the International Workshop on Environmental Education held in Belgrade. While the UN First

Intergovernmental Conference on Environmental Education held in Tbilisi in 1977 was to have a much higher profile and direct effect on the subsequent course of environmental education, it was Belgrade where the philosophy of environmental education was elaborated, and this had a decisive influence on the nature of the discourse at Tbilisi. The Belgrade conference was held by UNESCO-UNEP and it was here that the UNESCO-UNEP International Environmental Education Programme was launched. The Belgrade conference set out 'The Belgrade Charter - a global framework for environmental education' which made reference to the need for 'a new global ethic' (UNESCO-UNEP 1975).

Something of the faith in and great expectation of environmental education at that time is shown in Tolba's opening address to the Belgrade conference (he was then Deputy Director of UNEP):

> Education is at the heart of the process of development; and environmental education alone can make sustainable development feasible.
> (Tolba 1977, 48)

The Tbilisi report of 1977 states, among its many recommendations, that:

> Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world...By adopting a holistic approach, rooted in a broad interdisciplinary base, it recreates an overall perspective which acknowledges that the natural environment and man-made environment are profoundly interdependent...It should encourage initiative, a sense of responsibility and commitment to build a better tomorrow. By its very nature, environmental education can make a powerful contribution to the renovation of the educational process.
> (UNESCO-UNEP 1978, in Barry 1992, 11)

What is interesting about the interpretation of environmental education in the Tbilisi conference, and also (but to a lesser extent) in Tolba's view, is that they suggest a balance and integration of intrinsic values and instrumental values. Both the educational and sustainable development process are seen as having intrinsic value - the process itself is important, while reaching change goals through and in education and in sustainable development is also important (instrumental values). In other words, in these early statements, education is not merely seen as a tool in the service of

attaining a better environment - an instrumental view of environmental education - but process and change are seen and valued as part of the same dynamic.

The Tbilisi document then, appears to reflect an engaged, participatory view of environmental education, through which education is both transformed and transformative. Whilst current writers, including myself, tend to see this participative/process view of environmental education as a fairly recent insight, my point here is that early environmental education discourse was less overtly instrumental and behaviourist than we often remember. However, by contrast, a number of international documents since have tended to see environmental education primarily in an instrumental light. Four important examples follow:

From the World Conservation Strategy (WCs):

> A new ethic, embracing plants and animals as well as people, is required for human societies to live in harmony with the natural world on which they depend for survival and wellbeing. The long term task of environmental education is to foster or reinforce attitudes and behaviour compatible with this new ethic.
> (IUCN, UNEP, WWF 1980, Chapter 13, 1)

The EC Council of Ministers 1988:

> The objective of environmental education is to increase the public awareness of the problems in the field, as well as possible solutions, and to lay the foundations for a fully informed and active participation of the individual in the protection of the environment and the prudent and rational use of natural resources.
> (EC 1988, 1)

From the revised WCs of 1991:

> Sustainable living must be the new pattern for all levels: individuals, communities, nations and the world. To adopt the new pattern will require a significant change in the attitudes and practices of many people. We will need to ensure that education programmes reflect the importance of an ethic for living sustainably.
> (IUCN, UNEP, WWF 1991, 5)

And, perhaps most significantly, from Agenda 21, the main product of the UNCED conference:

> Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues...It is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making.
> (UNCED 1992, Chapter 36)

This international endorsement has provided an important mandate, legitimation and encouragement for those involved in environmental education. However, Martin (1996, 43), long-time the senior education officer of WWF-UK, the largest NGO provider of environmental education resources in the UK, is critical of the international statements, arguing that they imply prescriptive sets of values relating to the environment, rather than opening up debate on the "attitudes and values that underpin and motivate the main socio-economic model and its resultant impact on the environment".

So the international mandate that has stimulated, informed and encouraged environmental education for some thirty years reflects paradox. While it tends to have emphasis on an instrumental view of environmental education (and by so doing rather devalues and ignores educational process) it tends not to recognise the cultural limitations and influences on environmental education and education as a whole. Further, the international mandate gives little idea of what sort of environmental education -what pedagogy and methodology - is appropriate. The resultant forms of environmental education tend to underacknowledge the powerful contextual influence that wider society and the dominant paradigm exerts upon the philosophy, nature and practice of education. By default perhaps, the forms of environmental education that respond to the mandate tend to be unchallenging, and therefore unlikely to bring about the changes in attitudes and behaviour envisaged by the high level calls (Fien and Trainer 1993).

- Keypoint: Education is seen as a means of effecting change in the social and cultural context - yet it is this same context which has overwhelmingly prescribed education a role of socialisation and maintenance, rather than transformation.

From a 'critical theory' perspective, this paradox is explained by the necessity to maintain hegemony - the 'dominant social paradigm' necessarily restricts the forms of

education for change possible. However, as my discussion above on paradigm theory might indicate, I am less convinced by the idea of hegemony with its implication of the purposeful and designed holding onto power, than the idea of paradigm as a powerful influence and 'trap'.

In some ways, the growth of interest in and provision of environmental education - from a standing start somewhere around the mid-sixties - has been impressive. Since then, there has been a huge explosion of interest in environmental education and training worldwide. Work on philosophy, research paradigms, pedagogy, curricula, resources, communication and dissemination strategies and so on, has multiplied with support from international agencies such as UNESCO, UNEP and IUCN, internationally active NGOs such as WWF, intergovernmental agencies such as the EC and OECD, national government policy and national NGOs, and increasing academic involvement.

Yet the results of all this work and activity might be said to be disappointing - across two levels. First, as far as it is possible to tell, it appears that environmental education and training programmes in the formal and non-formal sectors have made some, but not a great deal of difference to society's views or behaviour in relation to environment or sustainability issues, except to those relatively few people who have experienced excellent programmes. As UNESCO's then Director-General commented at the last UNESCO international environmental education conference, "who would deny that too little has been achieved?" (Mayor 1997, 1). Sauve adds, "the record is not impressive with regard to the importance of the social, environmental, and educational challenges at issue" (1998, 47). Second, as noted above, education as a whole has not reoriented itself around education for sustainable development (UNESCO, 2002).

It is perhaps not surprising that such giant goals as those at Tbilisi (to "create new patterns of behaviour of individuals, groups and society as a whole towards the environment", UNESCO-UNEP 1978), or others quoted above, are not met some twenty-five years later. But a systems perspective gives us further insights (see Diagram B.5 above). First, we cannot expect environmental education to be effective if it is working from a marginalised status, that is, if the dominant conception of the purpose and goals of education - its broader context - as a whole are largely unchanged. In other words, we cannot expect environmental education to be transformative where it shares a simple, instrumentalist, instructive, first order change, view of education and learning with the dominant educational paradigm. Second, (and moving up the system hierarchy), we cannot expect education as a whole to orient

itself around sustainable development if the dominant values of society, its forms of economic organisation and use of technology, on balance support unsustainable practices.

Thus in contrast to the often simplistic statements contained in international mandate - and often in curriculum documents - along the lines that 'increased environmental education will lead to a more sustainable world', a deeper enquiry has to concern itself with a whole range of questions, relating to epistemology, theories of education and of environmental education, social and cultural change, and the relation between these areas. This is necessary to the creation of what I have called here a sustainable education paradigm.

In Part A.1.1 (see Box A.4, 'Articulating and realising an ecological worldview'), I argued that environmental education, as a community of practice, would be more able to assist the realisation of a sustainable education paradigm if it were able to move towards five conditions. Overall, my conclusion based on recent reading and involvement in the field, and key sources such as Jarnet *et al.* (1998), Hesselink, van Kampen and Wals (2000), is that it has not yet met these conditions, although it is perhaps 'getting there'. These conditions as a whole are returned to in Parts C and D, meanwhile, the degree to which systems thinking and ecological thinking are reflected in environmental education (part of the five conditions) is discussed below.

4.2 Searching for systems thinking and for ecological thinking in environmental education

It is not particularly easy to find systems thinking in environmental education theory or practice. As someone deeply interested in both areas, I have found it surprising that environmental educators generally have not taken up, adapted, and used systems theory and practice in their work. It is odd, because both environmental education and systems thinking are 'ecological' in the sense that they are primarily about relationships, the one about people and environment, and the other about understanding and managing complexity. They both purport to be holistic.

There are perhaps several reasons for this lack of connection:

- the different - and quite separate - histories and background of environmental education and systems thinking

- the lack of systems thinking to be found in education generally - it is not 'on the agenda' of most policy makers and curriculum writers. (See whole issue of *Systems Research and Behavioral Science,* John Wiley, vol 16, no 2, Ison, ed. 1999.)
- the suspicion among some environmental educators that systems thinking equates with cybernetics and mechanism (Gough 1991)
- ignorance among many environmental educators about systems as a discipline.

My research indicates however, that this situation is changing. Even in the few years that this Thesis has been underway, there is evidence that, on the one hand, the systems thinking movement is taking a greater interest in both education and sustainability (Ison 1999, Wals and Bawden 2000, Blackmore, Ison and Martin 2000, Wals and Corcoran, in press), whilst on the other, environmental education is taking more interest in systems thinking (see Gauthier *et al* 1997, Wylie 1998, Day and Hough 2000). For example, a fairly recent book on education and sustainability begins by stressing the importance of systems thinking: "education about sustainability in essence is about learning to make and understand the connections and interactions between…complex systems" (Wheeler and Bijur 2000, 2). However, Wheeler and Bijur's book, despite its subtitle 'a paradigm of hope for the future', makes virtually no attempt to outline how systems thinking contributes to the ecological paradigm.

According to my research, there are several forms and instances of environmental education taking on board systems approaches. While it is perhaps unnecessary to catalogue these in any detail, three categories might be distinguished as follows:

- In general environmental education where systems tools are used as a methodology (Bakshi and Naveh, 1980, Keiny and Zoller, 1991, Day and Hough 2000). I have found but a handful of books on these lines which although very interesting to me, represent a minority interest in environmental education.
- In environmental science where systems theory is employed in understanding natural environmental systems (for example, Tivy and O'Hare 1981, Park 1997).
- In training for professionals in the area of sustainable development. For example, the Professional Practice for Sustainable Development project (Institution of Environmental Sciences), and The Natural Step programme. This is less surprising, as systems thinking has a much stronger presence in business practice than in education (Senge 1990).

I have few reservations about these manifestations of systems thinking in education and training, and indeed, would welcome a much greater movement of this kind. However, arguably, much of this use of systems thinking is in the area of first order learning, that is, use of systems tools to conceptualise and problem-solve, rather than encourage deeper systemic learning and change in people or organisations. This may be an overgeneralisation however, and some of this material indicates interest in deeper holistic change.

This brings me to the second search, which is how far ecological thinking - which I have distinguished from 'systems as discipline' in Part A - is manifested in environmental education. That is, how far environmental education reflects the emergence of a new, participatory, ecological epistemology. Again, I've been surprised over the years to find that the answer is less than I've always thought 'should' be the case. The reasons for this are reflected in much of the discussion in this Part B, and include the influence of the dominant epistemology. Thus, the instrumentalism and behaviourism of much environmental education reflects ecological managerialism and ecological modernisation which are part of this dominant epistemology, rather than deep ecological thinking.

However, there are signs that some environmental educators are beginning to articulate what I have called here the postmodern ecological worldview. I would count David Orr amongst them, particularly his *Ecological Literacy: education and the transition to a postmodern world,* of 1992. Other more recent authors (and titles, which are instructive here) include Laura and Cotton 1999, *Empathetic Education – an ecological perspective on educational knowledge;* O' Sullivan 1999, *Transformative Learning - Educational Vision for the 21st Century;* and Smith and Williams, 1999, *Ecological Education in Action.*

Such works are interesting because they develop an *expanded* view of environmental education as a basis for a changed ecological educational paradigm, in keeping with and parallel with the ecological worldview expounded and illustrated above. What these writers tend not to do however, is advance a sufficient theory of whole systems thinking which, in my view, gives this movement coherence, complementarity with parallel movements in ecological sustainability, and a more immediate intelligibility and practicability.

5 A SUMMARY AND CONCLUSION

To recap, to this point the Thesis has:

- in Part A, outlined the critical and historic nature of our times and the need for deep change in society and education, and
- in Part B, explored the meaning and emergence of an ecological postmodern paradigm in the context of worldview change.

In particular, in Part B, I have sought to outline the philosophical debates and cultural and social changes which influence both the form of education as we now find it and the environmental education debate. This shifting context, and the account of the nature and extent of the emerging ecological worldview, indicate the constraints on and possibility of deep learning in the education community: that is, the possibility of transformation in education whereby it might become more transformative and effectual in regard to the sustainability transition. I have used learning level theory to differentiate between qualities of learning and suggested that despite most learning in both formal education and social learning contexts being 'first order', there are signs of deeper learning in both areas that hold the promise of positive co-evolutionary change in future. Such deep learning may be a combination of both *contingent* and *intentional* learning.

As regards contingent learning, the systems perspective tells us that any system under stress reaches a 'bifurcation point' whereby it breaks down or breaks through to a new state. If we apply this model to our times, it appears that the current sense of loss of old certainties and structures associated with modern times present the possibility of increasing chaos and/or of some sort of transformation through learning. As Henderson (1996,2) suggests:

> the dysfunctionality of the paradigm forces us toward new approaches…we see how breakdowns are often precursors of and even necessary for breakthroughs.

Stress, chaos and breakdown may or may not precipitate deep learning, but a constructive vision of an alternative epistemology would help 'accelerate the shift' (Gardner 2001,189) to a more sustainable and more peaceable world, with less pain. As I suggested in A.3.2 'the learning society' is one that seeks to understand, transcend and re-direct itself, and the need to critique and remake its epistemology through intentional learning is pivotal in this urgent task. I have argued above that

whole systems thinking may be seen as a worthy and plausible basis for such an ecological epistemology, and this is explored in more detail in **Appendix I.** The theme of re-thinking and re-visionising the guiding educational paradigm accordingly is the subject of Part C, and this theme is then echoed with particular reference to environmental and sustainability education in Part D.

PART C - WHOLE SYSTEMS THINKING IN EDUCATION AND LEARNING

Purpose: to further explore how far whole systems thinking is part of the current education and learning debate, and the implications of whole systems thinking for transformative learning and change towards a more ecological educational paradigm.

Introduction

Part C looks critically at paradigm discourse in education and research from a whole systems thinking viewpoint, and argues for an ecologically based educational paradigm, building on the foundations outlined earlier in Part B, and elaborated in **Appendix I.** In section 1, nesting system models are used to illustrate an ecology of the education/society relationship, and to suggest how a co-evolutionary rather than a simple linear view of this relationship helps explain the maintenance of the dominant educational paradigm - but also indicates the possibility of reorientation towards the sustainability agenda in both social context and in education. Also in section 1, I look at paradigm discourse in research and education, to explore how far a participative paradigm consistent with whole systems thinking is currently emerging as part of a process of collective learning. In section 2, liberal and critical traditions in education are reviewed briefly as antecedents to an ecological paradigm, and systems based critiques and alternatives to the dominant paradigm are also discussed. This sets the scene for an elaboration of the bases and broad implications of the ecological education paradigm. Section 2 concludes with a discussion on learning levels and transformative learning as a key to the realisation of such a paradigm. Lastly, section 3 summarises some implications of recent thinking on complexity and management in relation to change, learning and sustainability.

1 THE EDUCATION PARADIGM DISCOURSE

1.1 Educational paradigm: modelling, maintenance and movement

In this subsection (1.1), a systems view is used to help explore: maintenance of the dominant educational paradigm, ‘systems failure’, and the possibility of movement or deep change.

As noted previously, such movement necessarily takes us beyond focusing on mainstream education as an agent of change towards sustainability (whereby both concepts of education and sustainability stay within existing perceptual boundaries), towards the exploration of how deep or transformative learning can take place in the way that we view and practice education, so that it might become more transformative. This implies, at least, a second order learning process for all involved or interested in education, and beyond this, ideally, experience of third order or epistemic learning amongst at least a significant minority who can act as 'change agents'. These processes involve the realisation both of a *deeper critique* and a *broader vision* than is possible by staying 'in paradigm', and abandonment of assumptions which suggest a linear relationship between education and its social context.

The dominant education paradigm - as any paradigm - is self-referential and self-reinforcing, whilst still flexible and accommodatory. So often, what appears to be innovation and change is still mostly within the existing parameters. As Bawden insightfully remarks:

> It is so much easier, and thus pervasive, to deal with unfamiliar issues in a familiar way than it is to deal with familiar issues in an unfamiliar way. (Bawden, 1991, 2365)

Such maintenance tends to hold despite debate on educational 'reorientation' in relation to sustainability. For example, I have often argued (see for example, Sterling 1996, Sterling 2002), that the achievement of individual or social change *through* education requires change *in* education (see discussion in Part B.3.1). At one level, this argument is often accepted: what is frequently not appreciated is the depth of cultural change that appears necessary both in society and in education, in the light of the sustainability imperative. The response deemed necessary in education tends to be cosmetic, while the main focus of any attention remains an instrumental and behaviourist 'change *through* education', while underlying values and contradictions '*in* education' as a system of interest go largely unexamined and unchallenged.

Predictably, perhaps, the World Summit for Sustainable Development (WSSD) held in 2002, provided more evidence of the lack of substantive progress as regards the 'reorientation' of education agreed at the Rio Earth Summit held ten years earlier (see Part B.3.4 for discussion on this lack of progress). A UNESCO report (2000, 9) prepared for the WSSD notes that "much of current education falls far short of what is required", and calls for a "new vision" (2000, 10) and "a deeper, more ambitious way of

thinking about education" (2002, 8). Yet predictably also, the report does not attempt - in common with much of the 'education for sustainable development' discourse - a deep analysis of why education 'falls far short', or explain why, far from being the vehicle of transformative change advocated at successive international conferences from Stockholm (1972) onwards, education worldwide remains largely a conservative influence. Nor does the report indicate what the basis of a 'new vision' might be.

Often missing from the 'education and sustainability' debate is a deeper appreciation of the culture of education as an expression and manifestation of the wider cultural milieu. Using systems terms, the issue may be interpreted as a lack of perception of education as a subsystem of wider society, and therefore also as a subsystem of the dominant social paradigm or worldview. Partly because of this non-recognition, education (using the word here to connote a paradigm/belief system/practice), lacks what I have called sufficient 'response-ability' (Sterling 2001), that is, the ability to respond fully to the sustainability crisis.

To explore these issues further, in this first subsection I use a systemic view to outline a theory of paradigm maintenance, and of paradigm change and movement. I also introduce the notion of 'systems failure' (Peters 1999, Chapman 2002). To reiterate (as stated at the beginning, in Part A.1.2) throughout the Thesis, and continued here, I am attempting to build a theory that:

- *helps explain the lack of fundamental change in educational paradigm* (that is, the relative inability of the prevailing educational culture as a system of thought to change through learning),
- *helps construct a theory of transformation that might assist such fundamental change* - which would in turn…
- *enable a transformed educational paradigm to support a quality of transformative learning necessary to societal movement towards sustainability.*

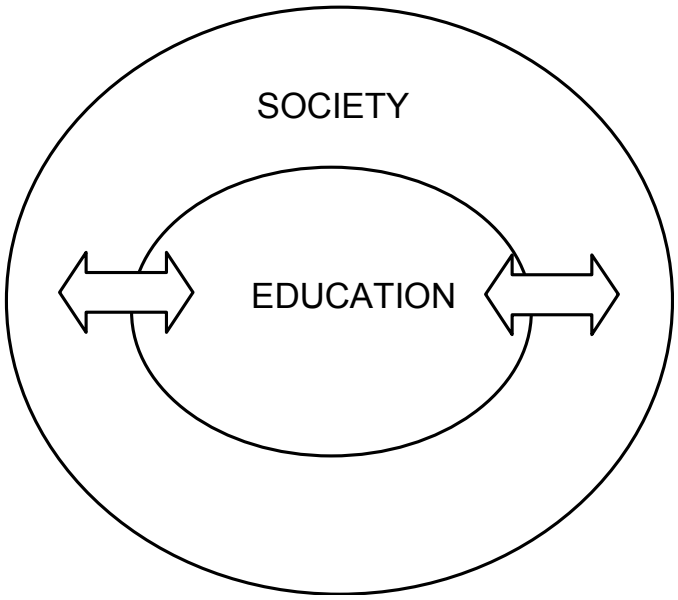
To begin, I re-present my whole system models as tools to assist analysis and discussion in this Part C.

As argued previously, understanding of paradigm is crucial to understanding everything that is influenced by that paradigm - including thinking, policy, and practice. By 'understanding' I mean more than the intellectual comprehension of the concept of 'paradigm': rather, the difficult step of moving beyond the dominant paradigm enabling

us to ‘see’ through it rather than with it: a transformative learning experience. As I have argued above, the nature of such a meta-perspective is some form of whole systems thinking.

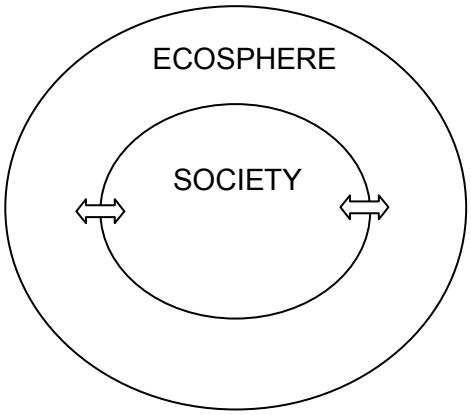
The model and idea of *nesting systemic levels* is important and helpful. Amongst other things, this indicates the importance of being cognisant of the *level* of paradigm that we are considering at any one time (as argued in Part B). Thus, I identify the relationship between a dominant social paradigm and a dominant educational paradigm as a co-evolutionary and nested one, whereby the latter may be seen as a subparadigm of the former (Diagram C.1).

Diagram C.1: Education and society as nesting systems



This simple diagram graphically illustrates the problem: how far current changes - as reviewed in Part B - towards an ecological worldview in the social/cultural sphere, can inform, stimulate and interact with parallel changes in the educational paradigm, or how far the latter are more conditioned by the dominant social paradigm. While this diagram can be read ‘downwards’ to yield more detail at subsystem level (and I do this in section 2.3 below), it can also be read ‘upwards’ and placed in the larger ecospheric context (Diagram C.2):

Diagram C.2: Education and society as nesting systems



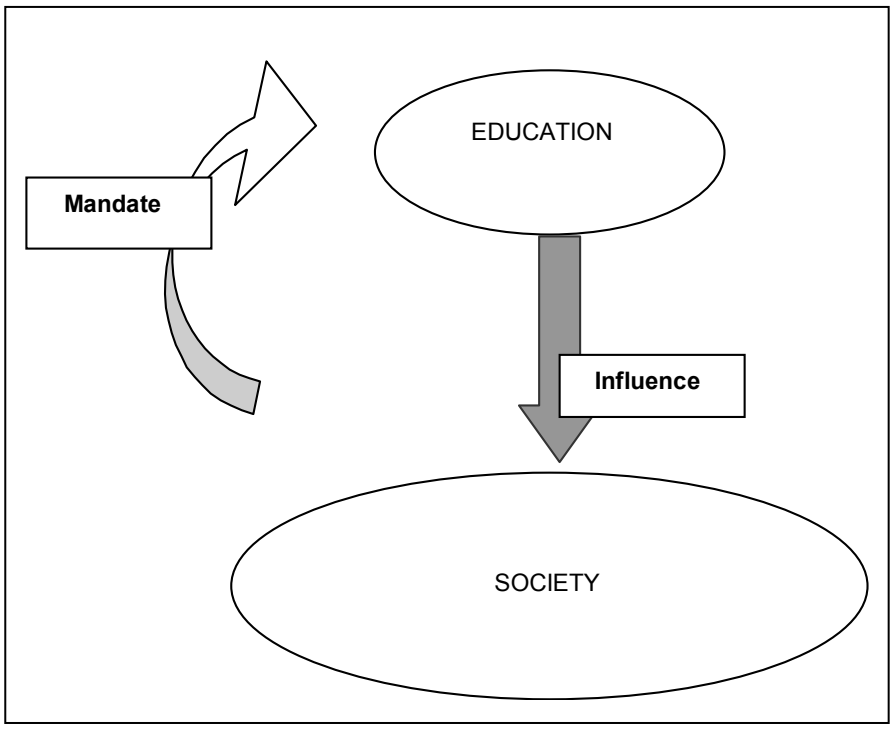
This diagram echoes the critical point (made in Part B.3.2) regarding the lack of integration, 'fit' or congruence between dominant Western socio-economic systems and the ecospheric system (Daly 1996, Brown 2001). These nesting systems relationships suggest a perspective on the status of, and possibility of change in, education. If we read down the hierarchy, education may be seen as a subsystem of the socio-economic system. In recent years, as documented in Part B.3.3, the rise of the managerial, instrumental, marketised view of education in many Western systems has narrowed its function. Therefore:

- Keypoint: the 'vehicle of change' role accorded to education since the 1972 Stockholm conference clashes with its role and status as a servant of an unsustainable socio-economic system at odds with the ecosphere.

We can invoke here the notion of 'systems failure'. According to Peters (1999, 124) failure can be considered to be of four types: objectives not met; undesirable side effects; designed failures; and, inappropriate objectives. Criticism of education - particularly in political debate - often centres on the first meaning, but in terms of the ecology of systems outlined above, education largely 'fails' in terms of the other aspects of failure: the purposes or objectives of education largely fail to take into account sustainability, many participants and actors in the system are disengaged, while undesirable side-effects include widespread ecological illiteracy and its consequences (Orr 1992, Jucker 2002). Using this notion further, we can distinguish 'nesting failures' - of educational systems failing society in terms of 'falling short' (UNESCO 2002), and of society/economy failing to 'fit' the ecosphere in the sense that Daly and Brown have argued.

These problems are compounded by a prevailing modernist/mechanist view of education that is essentially instrumental, and that views the relationship between education and its social and political context as linear. This is represented by the following diagram (C.3):

Diagram C.3: Linear perception of the education-society relationship

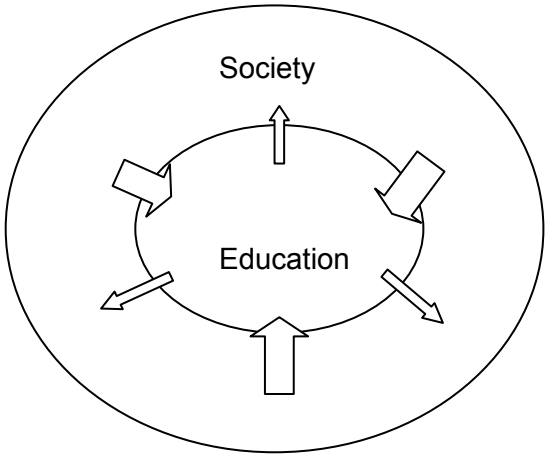


In this view, education and society are considered as parallel and separate systems. While society provides a mandate for and influences the values and purposes reflected in education, there is a general assumption that education directly or indirectly affects the kind of society that emerges over time almost irrespective of the social context that education operates in. In its strongest form, this instrumentalism is behaviouristic and positivistic, whilst often in a milder form, it may be seen in government and NGO initiatives and campaigns to educate *for* something (environment, citizenship, international understanding, etc) or *against* something (drugs, racism, sexism etc): often with rather disappointing results, particularly when such education is 'delivered' through instructive rather than participative strategies (Sterling 1996b).

From a systemic point of view, (as so often) this dominant view appears not so much 'wrong' as limited. Education is unlikely to have a transformative effect on society in this instrumental sense, whilst (if better seen as a subsystem of that society) it has an

adaptive relationship with it. The nesting systems diagram C.1, suggests that the larger social system, its values, culture, norms and expectations have a greater effect both on people (and young people) than formal education systems do, and also on the nature of education systems, than education has on the nature of emerging society. This does not deny that education affects people, and that transformative change can take place at the micro level, but holds that the overall effect is limited by the values, purposes, and expectations that society (and politicians in particular) places on education. There are also different time scales at work: society has a 'fast' effect on change in education, for example as regards policy change, whereas education has a long-term effect on society as individuals and groups change. As related in Part B, the recent restructuring of education systems towards the market paradigm in many Western democracies is illustrative of this relationship. This unequal dialectical relationship might be represented as follows (Diagram C.4):

C.4: Systemic and dialectical view of the education-society relationship



The tendency of the dominant social paradigm to be self-sustaining, and the subordinate relationship of education does not augur well for positive movement towards sustainability in either education or society. Yet, there are progressive elements within both systems, and moreover, as outlined in Part B, there is at least evidence of social learning towards sustainability even within mainstream debate. Further, the recursive (rather than linear) relationship between systemic levels or layers indicates the possibility of an intentional co-evolutionary and transformative relationship between progressive movements both in education and wider society (as noted in B.3.2), and I will look at this further in C.2.4 below.

Something of this possibility is revealed by an examination of the shifting ground and thinking in discourse about education and research paradigms. According to the nesting systems model, the overall socio-cultural paradigm influences the subparadigms of social science research and education, which also in turn influence the 'subsub' paradigms of environmental education - and, incidentally, limits the possibility of the development and expression of radical paradigms in environmental education and similar education for change movements. Yet there is some evidence of the emergence of what might be termed ecological/whole systems thinking in paradigm discourse, which appears to echo the stirrings of the postmodern ecological worldview in wider society. This is the next topic, where I attempt to discern pattern and movement towards a participative research paradigm.

1.2 A brief review of paradigm discourse in research and education

A number of writers have analysed education by providing models which make distinctions between sets of philosophies, theories and practices (i.e. paradigms). As Fien (1993,18) points out, a number of such models are bi-polar (e.g. authoritarian/democratic, or traditional/progressive) but there is a stronger trend amongst writers towards a tripartite paradigm model, indicating some consensus about the range of possible paradigmatic positions. Other writers, however, distinguish four- or five-part categorisations, and I look at these later. The point of doing so is to query how far thinking about education and research may be constrained by our categorisations, and to examine recent trends that challenge their seeming orthodoxy. Hence, I argue that the 'participative paradigm' can be seen as a necessary extension to mainstream models.

Lawton (1989) offers a three-part model distinguishing between 'classical humanism', 'progressivism', and 'reconstructionism' in education, whereas Kemmis, Cole and Suggett (1983) discern 'vocational/neo-classical', 'liberal/progressive' and 'socially critical' orientations in education, and Popkewitz (1984) proposes 'empirical-analytic', 'symbolic', and 'critical' paradigms. All these may be seen as broadly similar categorisations - and I have written the three parts in the same order above to indicate a common pattern of analysis. Such tripartite models have echoes elsewhere. Thus, in widely accepted models of research paradigms (positivist, interpretive, and critical), in sociological theory (particularly the three ways of knowing identified by Habermas, being the *empirical-analytic* or technical interest, *historical-hermeneutic* or practical interest, and *critical* or emancipatory interest) (Grundy 1987), and the very widely

quoted model of environmental education forms (education *about*, education *in,* and education *for* the environment) first outlined by Lucas (1972).

Each of the identified orientations within these models has differing views on the nature of education, its purpose, and methodology. They appear to be very different, and have been and are the bases of so called 'paradigm wars' (Mrazek 1993). But if we move our attention to the more fundamental meta-level of cultural paradigm, an important question is how far all these orientations are more or less influenced by the ghosts of mechanism, positivism, reductivism and dualism and the assumptions of modernism in the broader cultural paradigm, even where these ghosts are thought to be banished. A similar question can be addressed to the wider sphere of social science research, and I will now review discourse here.

According to Denzin and Lincoln (2000, 19), "all research is interpretive; it is guided by a set of beliefs and feelings about the world and how it should be understood and studied". This interpretive framework, they say, is the researcher's paradigm. In the field of social science qualitative research, the work of Lincoln and Guba (1994) has been particularly influential. They have elaborated four inquiry paradigms, being positivism, postpositivism, critical theory and constructivism, and identified their own position as lying within the latter. In a later essay, they state:

> Our own position is that of the constructionist camp, loosely defined. We do not believe that criteria for judging either "reality" or validity are absolutist but rather derived from community consensus regarding what is "real", what is useful, and what has meaning…
> (Lincoln and Guba, 2000, 164)

They go on to say that meaning making is of central interest to constructionists as this shapes action, or inaction. Further, they state that meaning making activities can be changed when they are found to be incomplete, faulty e.g. discriminatory, oppressive or non-liberatory.

Constructivism is attractive to the liberal mind, and seems almost self-evidently valid. Indeed, according to Heron (1996, 10), a good deal of qualitative research follows Lincoln and Guba's lead and as such, is presented as interpretive science within a constructivist paradigm. But there are problems with constructivism. For example, Heron's critique of this stance rests on the problem that this paradigm presents itself as idealist - i.e. where reality is seen as primarily an internal construct - and does not

properly acknowledge an independent reality yet at the same time denying relativism. Heron says that Lincoln and Guba are equivocal about whether or not reality is a mental construct and that their "explicit idealist stance seems to rest on an implicit realism, and leaves the paradigm in a state of wobble" (1996, 10).

Constructivism can be seen as an attempt to go beyond positivism and modernism, and one that partly succeeds. But from a whole systems perspective, constructivism seems to be insufficient, and in strong forms, too rooted in the idealist camp, too close to philosophy of the postmodern deconstructionist (see Part B). It is therefore vulnerable to charges of relativism, and taking insufficient account of the 'real world', or cosmos 'as is'. This argument indicates the need for something beyond Lincoln and Guba's four orientations, a fifth paradigm which is postmodern, postpositivist, and ecological, one which is able to marry and transcend the idealist and realist positions - and able to accommodate but also extend the breadth and depth of the sense-making that is the concern of constructivists. Taking again Lincoln and Guba's view that meaning making activities can be changed when they are found to be incomplete, we might say that this time has come. Indeed, taking Denzin and Lincoln's panoramic view of historical 'moments' in qualitative research, we can suggest the ecological moment is now.

Before moving on, I want to comment briefly on the critical theory position associated with writers as Marcuse, Habermas, and in education, Giroux and Freire. This reconstructivist and 'emancipatory interest' position is infuential in my own field of environmental and sustainability education and is often referred to as 'socially critical education'. (I discuss this further in Part D.1.1). I recognise the important contribution of this position and am sympathetic to it, but at the same time, it is important to mention some differences between this view and the ecological, participative view. In critical theory, there is an assumption of conflict and struggle in the world and therefore the need to align with 'counter-hegemonic social movements' (Lather 1991, 3). The ecological view begins, rather, with an assumption of the necessity of co-existence. For example, Bawden (2000a) quotes Maturana and Varela's work on the biology of cognition, saying they claim that "conflict is mutual negation, which can only be resolved...if we adopt another position where we can 're-establish a relationship from which we can 'bring forth a world together'" (Bawden 2000a, 10). This position, say Maturana and Varela (1987) is one of love as the basis of ethics - which echoes my discussion of the 'I-Thou' relationship earlier. Hence, the ecological paradigm supports a participatory view which sees appreciation and inclusivity as necessarily *preceding*

any analysis of power and adoption of an empowerment or emancipatory purpose. Transformation begins with ourselves, rather than with 'the other', and stresses 'emergence' rather than any predetermined 'agenda'. The empowerment orientation can at times assume a degree of certainty, and carry an "openly emancipatory intent" (Lather 1991, 51) which may or may not not be shared by the apparently disempowered. It may imply a degree of prejudging which can ignore the subtleties of the actual situation or of other views. The counter-hegemonic orientation may perpetuate anger against and fear of the 'oppressor', and hence support a dualistic and ideological 'us and them' mindset which is fragmentary rather than healing. Whilst 'empowerment' is often critically important, in conditions of uncertainty and complexity it is very important *first* to try to 'appreciate' and understand 'what is'; to recognise context and the nature of relationships. There is an important difference here, between *intervention and a problem-based orientation* on the one hand (which is consistent with the whole mechanistic ethos, and indeed is also seen in mechanistic schools of systems approaches), and *appreciation, suspension of judgement and valuing on* the other. This latter orientation is reflected in the systemic research tradition of 'appreciative inquiry' (Ludema, Cooperrider and Barrett 2001, 189). As they suggest:

> If we devote our attention to what is wrong with organisations and communities, we lose the ability to see and understand what gives life to (them) and to discover ways to sustain and enhance that life-giving potential.

This important difference of approach applies as much to the way we might treat and understand a landscape, as it might the way we treat and understand an organisation or individual in an educational setting. Whilst critical theory has played a major role in exposing the limitations of positivism and instrumental rationality, and illuminating the power-knowledge relationship, it is arguably still too fundamentally rationalistic itself. I see critical theory as subsumed within the larger framework that the ecological worldview offers.

Hence, Heron and Reason offer a 'fifth paradigm' which they call participative. This may be seen as a manifestation in the area of research paradigms of the ecological worldview that is the subject of this Thesis. Their work is recognised in the second edition of Lincoln and Denzin's tome on qualitative research (2000). Thus, a four-part paradigm table carried in Lincoln and Guba's chapter in the 1994 first edition, becomes a five-part paradigm table in their chapter in the second edition of 2000. Interestingly, it appears that recent literature - including Reason and Heron's work - led Lincoln and Guba to reassess the importance of axiology, ethics, and spirituality, and to their

expressed wish to include this area as “part of the basic philosophy of paradigm proposal” (Lincoln and Guba 2000, 163). This expansion and inclusion would bring constructivists, critical theorists and participative inquirers much closer together, they suggest. This is entirely consistent with my argument about the need for extension in the perceptual or ‘Seeing’ domain of knowing.

I now want to look to look further at limits and learning in paradigm discourse.

1.3 Limits and learning in paradigm discourse

There is a logic to the idea that the main recognised paradigms in paradigm discourse are limited. This stems from the notion of nesting paradigms, whereby the subparadigms of social science inquiry or of education have roots in or are heavily influenced by the underlying dominant cultural paradigm. Thus, if this metalevel is insufficient in some sense, then its related subparadigms are likely to be as well. Fien and Hillcoat, for example, suggest that research methodologies are “very much a puppet of their underlying assumptions” (1996, 26). So we can make a distinction between the subparadigmatic level of research methodology, and the underlying cultural paradigm and its assumptions.

Clearly the discourse has changed over time, and oppositional movements such as the reconstructionist and critical schools of theory and research seek to critique the limits of the empirical-positivist and interpretivist positions, whilst the latter critique the former in turn. The arguments employed by the non-positivist schools point towards or imply a more whole and even ecological position, yet often still fall short. There are still commonalities, such as a basic dualistic foundation as regards people-nature, shared between ostensibly opposing subparadigms which suggest they have more in common with each other, than they do with the ecological and co-evolutionary view that is explored in this Thesis. Yet, at the same time, the latter draws from and builds on aspects of the commonly recognised paradigms - it does not and cannot arise in an intellectual vacuum. As Heron and Reason note, the participative paradigm requires not a brand new and separate epistemology but an extended epistemology, through which - I would add - the paradigm antecedents become integrated and transformed.

Thinking again of Bateson’s notion of a fundamental epistemological error or inadequacy that characterises the Western worldview (see Part A.3.1), one has to wonder how far this runs like a deep vein throughout our attempts to climb out of the modernist view, however ‘postmodern’ we attempt to be. This reminds me of

Spretnak's observation (1997, 66) that postmodernism "stays comfortably within the essential parameters of the modern worldview" (see B.1.5 for more on this). Or as Reason (1994b, 9) unequivocally suggests:

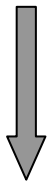
> Despite systems thinking, the 'new' physics, the metaphors of catastrophe and chaos, the reported emergence of a post-positivist paradigm, and the postmodern movement, the common epistemology of the Western mind remains crudely positivist.

Yet, as outlined in Part B, there is much evidence of movement and change, pushing against and beyond the constraints of this 'common epistemology'. It is possible, then, to acknowledge and view the development of research paradigms over time (positivist, post-positivist, critical, and constructionist) as a deep learning process, a type of second order 'learning about learning', where we have come to know and recognise the limits and partial validity of the preceding paradigm and attempted to transcend them by constructing the new.

- Keypoint: In this sense the shift across and development of the spectrum of research paradigms and philosophies is an evolutionary process, which still continues.

Whilst not denying the complexity of the field of qualitative research (as mapped for example by Denzin and Lincoln 2000), the *barebones* of the shift can be represented as follows (Table C.1 read downwards):

Table C.1: The essence of the shift in research paradigms

Positivism	Modernism	Foundationalism	
Constructivism	Deconstructive postmodernism	Relativism	
Participativism	Constructive postmodernism	Relationalism	

It's worth requoting Wilber here (1996, 67) (see B.1.5), who suggests that worldviews (paradigms) succeed each other as 'higher consciousness' emerges, and that the new emerging worldview transcends and includes the old. Because the new is more inclusive, it is more adequate. The old is not totally wrong, the new not totally right: "The old one was adequate, the new one is more adequate".

Thus each main research paradigm has a partial and specific value, but appears inadequate. Using the systems terms ‘purpose’ and ‘boundaries’ now, the main research paradigms, as systems of knowledge, reflect certain limitations:
Purpose - there can be a ‘poverty of purpose’, and therefore also often a diminished ethical sensibility, particularly as regards positivistic research. As Reason and Bradbury (2001, 2) suggest, “the purpose of knowledge-making is so rarely debated”. Purpose is often caught somewhere between a supposed value-free ‘knowledge for its own sake’ and a narrow instrumentalism allied, for example, to commercial or interests.

Boundaries - while the positivists attempt to rule out subjectivity, the constructionists attempt to rule out conceptual and material certainty. At the same time, all main research paradigms have tended to be anthropocentric, and the ecological state of the planet has usually been a secondary concern.

Using the five tests of progress towards an ecological worldview outlined in Part A, we can ask how far the main research paradigms are *sufficiently* aware of :

1) their own value bases at deep level - in relation to dominant worldview - and of the influence of the dualistic epistemological ‘error’
2) learning levels and the need for epistemic learning
3) the postmodern ecological worldview
4) whole systems thinking
5) sustainability in relation to complexity theory.

Again, echoing Wilber’s (1996) interpretation, it is reasonable to view the participatory research paradigm - allied to and stemming from the emerging postmodern ecological worldview - as the next evolutionary stage in the emergence of research paradigms. The postmodern ecological worldview accepts the materialists’ ‘realness’ – the ‘given cosmos’ or ‘resurgence of the real’ argued for by Heron and by Spretnak respectively, but also accepts the constructionist’s argument that any interpretation and articulation of that realness and of our relationship with it is inevitably mediated through language, culture and heuristics. In this sense, the participatory view is more whole. It heals an historical but unnecessary and damaging schism, and puts ‘subject’ and ‘object’ into relationship. It is not a bid for what Lincoln and Guba call “intellectual and paradigmatic hegemony” (2000, 163) because it is inclusive and subsuming rather than replacing.

I would argue that the participative paradigm is not just 'another position' on the research spectrum but represents a significant and historic qualitative change. Denzin and Lincoln are right when they suggest that there is a flux of research paradigms, subparadigms, and methodologies, a 'bricolage' (their term) which can be chosen from, mixed, applied and adapted as circumstances require and as the researcher or 'bricoleur' judges is appropriate (2000, 6). This suggests, (and Lincoln and Guba's chapter 'Paradigmatic Controversies' in the same book bears this out), that there is the possibility now of more interplay and commensurability between methods and even philosophies than earlier literature based on 'paradigm wars' suggests. Thus, while Lincoln and Guba's 1994 chapter in Denzin and Lincoln's book includes the term 'competing paradigms', the title of their 2000 chapter includes 'emerging confluences'. Yet I would argue that this overview of an apparent 'bricolage' occupies a middle space in a broader spectrum of argument, which at one end, needs more cognisance of the currency of mechanistic paradigm roots in our collective psyche, and at the other, a greater sense of the postmodern ecological worldview.

The participative paradigm derives from a 'bigger' ecological or relational worldview and cosmology that seeks - as we have seen in the earlier part of the Thesis - to transcend the still-present grip of modernism and mechanism, and acknowledge the contribution and limitations of postmodern deconstructionism. Applying again the idea of learning levels, I suggest that the emergence of the participative paradigm and ecological view is evidence of a degree of (continuing) epistemic learning at both individual and social levels, a deeper level of learning which recognises the nature and limits of the epistemological roots of the dominant paradigm. Something of this is sensed in Lincoln and Guba's open conclusion that:

> We may be entering an age of greater spirituality within research efforts. The emphasis on inquiry that reflects ecological values, on inquiry that respects communal forms of living that are not Western, on inquiry involving intense reflexivity regarding how our inquiries are shaped by our own historical and gendered locations, and an inquiry into 'human flourishing'….may yet integrate the sacred with the secular in ways that promote freedom and self-determination…and promote others' being as whole human beings.
> (2000, 185)

It is further reflected in Denzin and Lincoln's concluding chapter 'The Seventh Moment' which, drawing on Bateson, anticipates a form of inquiry in the 21st century, that "seeks a sacred espistemology that recognizes the essential ethical unity of mind and nature"

(2000, 1052). Yet in this chapter, with its embracing of postmodern plurality, bricolage and uncertainty, and anticipation of a ‘New Story’, lacks full cognisance of the grounding of such a sacred epistemology, in a paradigm of revisionary postmodernism and ecological thought that I have sought to review in this Thesis. This lends weight to my argument, perhaps, that both the research community and wider society is engaged in a lengthy second order learning period, leading towards perhaps, epistemic learning (which a growing minority now spearheads).

Interestingly - as far as I am aware - literature explicitly on the ecological/participatory paradigm is far more extensive in the areas of research, particularly in social science research, action research and cooperative inquiry, than it is specifically in education, including environmental education. The influence of paradigms in environmental education discourse is explored in Part D.

In sum, in section 1 of Part C, I have looked at the possibility of movement towards an ecological educational paradigm through learning, and illustrated this through discussion of current movement towards a participative paradigm in research discourse. Section 2 below now looks at the manifestation and implications of an ecological paradigm in education and learning, beginning with a brief resume of sympathetic antecedents.

2 EVIDENCE OF AND ARGUMENTS FOR A MORE SYSTEMIC EDUCATIONAL PARADIGM

In subsection 2.1, I look briefly at liberal and emancipatory traditions in education. Whilst sustainable education may be seen as a successor to the traditions of holistic education, the contribution of emancipatory traditions is acknowledged despite the difference in underlying assumptions informing these two approaches. This is followed in 2.2 by a look at some challenges to the dominant educational paradigm from a systems perspective and some ideas and iniitiatives which seek to articulate an alternative framework. In 2.3, I return to and employ the triadic model to elaborate a ‘vision’ of sustainable education. I then suggest some descriptors which elaborate an ‘image’ of sustainable education, and discuss in some detail one aspect - curriculum - from this viewpoint, before discussing the term ‘sustainable education’ in more depth. In subsection 2.4, I investigate the meaning and possibility of transformative learning in more depth, and employ staged learning levels to compare learning journeys towards strong sustainability in society and sustainable education in the education community.

2.1 Antecedents

As I have argued above, the ecological view in cultural or educational contexts is not arising in isolation but links to antecedent movements and philosophies. It is not of particular value to recount here the detail of these movements, but it is important to acknowledge the precursors of ecological thought in education. The most obvious link is with educational thinking that in one way or another has reflected an ethos of the learner as a 'whole person'. Typically, this meant regard for all aspects of human-ness, including spiritual, ethical, intuitive, intellectual, and physical aspects, as well as (to a lesser extent) interactions with others including environmental, social, community, and political aspects.

This lineage can be traced far back, at least to Locke and Rousseau. According to Randle (1989), much later work on child-centred, liberal, experiential and holistic education had its roots in Rousseau's thinking. Rousseau was followed notably by the work of Pestalozzi, Froebel, Montessori, Steiner and Dewey, putting emphasis on the learner and the learning environment, on learning by doing and participation, and on differentiated learning needs and styles. While it does no justice to summarise their extensive work in such short space, these educators broadly shared a non-materialist and holistic rather than mechanistic approach to curriculum and pedagogy, and a belief in human potential and community. These thinkers gave rise to the progressive education movement, beginning in the nineteen-twenties and continuing strongly through the sixties (before suffering from increasing attack from conservative forces in the seventies). In progressivism, the emphasis was (and is) on the quality of learner's experience, giving rise to educational values to do with liberalism, learners' autonomy, self-realisation, and self-esteem. Meanwhile, from another direction, arose another radical liberal education movement, this time emphasising empowerment, 'conscientization', liberation, participation, democratisation and social action, summed up in the term 'critical pedagogy'. This movement was given impetus particularly by Freire's (1972) work in adult education in Brazil and his subsequent writing, and echoed by writers such as Giroux advocating the role of the 'transformative intellectual' and Fals-Borda (1991) and Chambers (1997) emphasising participatory action research methodology (PAR). One key difference is that holistic education has tended to focus primarily on the original meanings of education *educare* (to rear or foster) and *educere* (to draw out or develop) in relation to the individual, and thereby has stressed intrinsic values in education. The Freirian legacy, meanwhile, has focussed on emancipation and social change in a community and political context, and thereby seen

education more in instrumental terms: education for change. In terms of links with research and inquiry paradigms - reviewed briefly above - progressivism links with liberal humanism, interpretivism, and constructivism, whilst Freirian traditions resonate with critical theory and reconstructionism.

In the evolution of environmental education since the 1960s, the influence of progressivism is strongly represented in the nature studies and experiential learning aspects of the field. The Freirian tradition is echoed more strongly in the socially critical emphases in environmental education, and also has been particularly seminal in the parallel evolution of development education (which has a shorter evolutionary history than environmental education, having arisen with NGO involvement in the early seventies).

It may be reasonable to suppose that a whole systems view of education and learning might be little more than an updated view of the traditions of ‘holistic education’, but I would argue that this is only part of the story. The holistic education tradition has undoubted strengths. It has, unsurprisingly, a whole view of the learner, and his/her needs and potential. It is concerned with meaning making that transcends utilitarianism and is often spiritually oriented. It favours a broad curriculum with balance between affective, cognitive and conative aspects, and the curriculum may be differentiated and partly negotiated according to the needs of the learner. It is aware of the importance of the learning environment; and places value on experiential, participative learning and process.

At the same time, I would argue that much holistic education has limitations. With an emphasis on the individual, it can lack sufficient attention to social and political contexts, and transformative engagement in those contexts. With an emphasis on negotiated curriculum and process, it can lack sufficient structure and collective agreement about what is important in terms of common curriculum. With an emphasis on developing individual autonomy, it may give insufficient attention to integration in the group or wider community. And like most educational approaches, it has in the past given little attention to ecological or sustainability issues.

The critical pedagogy tradition addresses some of these weaknesses, shares others, and carries new problems, viewed from an ecological stance. The main problem is that it remains dualistic, and grounded in an anthropocentric view of the world, and is often overtly ideologically bound. Bowers (1991, 1995, 2001), a significant writer on

ecological education and culture, is critical of all liberal education traditions, whether technocratic, neo-romantic, or emancipatory (although he has strongest words for the latter) on the grounds that fundamentally they share an Enlightenment-based view of change and progress through rational discourse. Quoting Bateson's views of mind, he argues instead (1995, 15) for a view of mind and "larger sense of community" that is, in his view, deeply ecological and systemic. We need to adopt a view of the individual, he writes, "as an interactive member of the larger and more complex mental ecology that characterises the culture/environment relationship". Philosophically, I have much sympathy with Bowers' view, but at the same time am less dismissive of both holistic and emancipatory education. Whilst I remain concerned about the rationalism, dualism and ideological aspects of critical pedagogy, I still find some sympathy with O'Sullivan's (1999) view which suggests that holistic education and critical pedagogy are complementary. Both are concerned with developing and changing the quality of interrelationships in a dynamic learning situation. To this extent, they are purposeful systemic traditions, and both have a contribution to conceiving an ecological educational paradigm and practice. It is not surprising that educational movements should reflect their times, and liberal movements are no exception. Yet in the shift from modernity to, one hopes, a more ecological postmodern future, there is still much of value in these movements to carry through.

Liberal education movements have largely been ignored and to some extent disparaged in the political rise of neo-conservative and neo-liberal thinking on education which is now in the ascendancy (see B.3.3). In elaborating an ecological, whole systems view of education, we need to reclaim some of the best values and practices of holistic and emancipatory education and liberal humanism. The argument is the same as that quoted above regarding research paradigms: elaborating an ecological view of education is more a matter of building on and subsuming, rather than replacing, earlier traditions.

I now look at some challenges to the educational mainstream from systems-based research, and systemic views of a transformed educational thinking and practice which is more able to be transformative in effect.

2.2 Systemic views of a transformed and transforming education

At the broadest level, there is an argument that postmodern conditions such as complexity, unsustainability, uncertainty, and economic and cultural globalisation require a very different view of education and learning than that which has prevailed for

a century or more. As argued throughout this Thesis, the foundational issue here is the root metaphor. In Part B.3.3, I reviewed the mechanistic metaphor that is dominant in shaping educational thinking and practice and, with the rise of managerialism and marketisation, has become stronger in recent years (Hutchinson 1996).

Bentley (1998, 175) takes a systems view of the problems that are ensuing and of the lack of learning in the system as a whole:

> Systems which cannot respond to radical change in their environment will always fail in the end. In the short term, there are always some productivity gains from working the machine harder, reprogramming more often from the top, tightening specifications and quality standards, and setting ambitious targets. But in the end, if the only response to a new environment is to run the machine harder, the result is that its components break down faster.

This appropriately describes the current 'control paradigm' that governs educational thinking, policy and practice, and *within* which, much of the discourse about standards, quality, targets and so on takes place. Bentley goes on to suggest that within other sectors of society, particularly business, organisations are abandoning the mechanistic model and transforming themselves using "new insights from the natural world" being the development of complexity theory and systems thinking, the study of evolution, and breakthroughs in understanding brain functioning (Bentley, 1998, 176).

Such organisations are working with the understanding that people and organisations are *not* machines but living systems. It is this, the living system or organism that is providing a fruitful 'new' metaphor for a blossoming of current thinking about education and learning, research, management, organisation, health, design, and sustainable systems. As discussed earlier, this switch signals a profound change - from a focus on and concern with such things as entities, products, and control to relationship, emergence, and self-organisation.

Bentley argues that the grand organising narratives - whether for example Marxism, Christianity or the market - have provided an imposed, definitive, closed account of what matters and what it means for our lives, but that these need to be replaced with a far more open and flexible view, where solutions are not preordained but generated, based on "our capacity to behave intelligently and to learn" (Bentley 1998, 172). In brief, conditions of complexity and connectivity require adaptive and generative learning to be our common currency. This reminds me of Ison *et al.*'s (Ison, Maiteny

and Carr 1997, 261) very useful distinction between ‘system-determined problems’ and ‘problem-determined systems’. The mechanistic paradigm determined (and still determines) what the educational and learning problems are, and how to tackle them, according to the constructions and worldview of this system of knowledge. What Bentley is suggesting instead is that a new awareness of complexity and living systems presents us with a matrix which should be shaping our organisations and institutions. The emergence of the ecological worldview (or system of knowledge), is part of our learning response to the newly recognised conditions. But it is not a unidirectional process: rather, the new fluid ‘social-economic-ecological conditions’ and ‘responsive educational systems’ are, or would be, in co-evolutionary relationship. (I return to this theme in section 2.4 below).

The question arises what to do with, or within, existing education and learning systems, in order to realise such a positive co-evolutionary state. Some writers argue for change at a number of levels simultaneously; for whole system change in the orientation and philosophic grounding of education and learning systems, and in more detail, towards manifestation of systemic approaches in ethos, management, curriculum, pedagogy and the whole learning environment.

Banathy (1991, 1992, 1999) has been a leading writer in a field characterised by a fairly thin literature. Banathy is more influenced by systems thinking than by ecological thought. However his argument proceeds from the assumption that we need to move beyond the traditional paradigm, through which - he says - our inquiry is still dominated by reductionism, ‘objectivity’ and determinism. This approach cannot, he says, “possibly cope with the complexity, mutual causality, purpose, intention, uncertainty, ambiguity, and ever accelerating dynamic changes that characterise our systems and larger society environment” (1991, 10). His work makes a series of useful distinctions that function in two ways: they clarify the nature of what he terms the ‘design journey’ towards a more systemic conception of education, and second, they give intellectual credence to the idea that indeed, there is a necessary difference of paradigmatic perspective here, rather than a tinkering within existing boundaries. These distinctions include the difference between:

Improving/reforming educational systems	AND	Transforming educational systems
Making adjustments in existing system		Redesigning educational systems
Piecemeal change		Whole system/systemic change
Planning process		Design process
Designing for the future		Designing the future
Adaptive learning		Transformative learning

Hence for example, Banathy distinguishes between *systemic change* which is contemplated with a view to the whole system, its environment and emergence, and *piecemeal change* which does not take these interrelationships into account, is often imposed and is therefore often short-lived (Banathy 1991, 149). The difference appears to be the 'intelligence' the designer or manager brings to the situation. Here is the difference then between first order change and second (and possibility of third) order change - as reviewed in B.1.3. Consistent with this, Banathy suggests that the nature of the questions surrounding education and learning undergo a qualitative shift, from such 'in paradigm' questions as:

> How can we improve the system to make it more efficient/effective? How can we improve student and teacher performance? How can we establish better standards, and how can we test for those better standards? *Et cetera.*

to:

> What is the nature and what are the characteristics of the current post-industrial information age? What should be the role and function of education in this new era? *Et cetera.*
> (Banathy 1991, 17)

That is, a shift "working from the larger perspective of a societal and future generation focussed question" (Banathy, 1991, 17). Banathy elaborates a detailed conceptual framework for stimulating and guiding the whole system change he considers necessary, including the useful 'vision-image-in' model which I will return to below. While Banathy's work is very helpful in clarifying the implications of a whole systems approach to systems change, I feel it has some weaknesses too. These include insufficient recognition of participative process in change, of ecological thinking and values, and of the problems and opportunities of complexity and adaptive

management. It also seems to be more based in theory than experience and praxis. There is a danger perhaps, in Banathy's recipes, that such change could still be somewhat quasi-mechanistic, imposed, and unsustainable despite contrary intentions. This concern echoes my previous argument that systems thinking and methodology can, without the complementary influence of an expressed ecological philosophy, become the servant of mechanistic values.

Despite this, I think the main value of Banathy's work is in the empowering idea that educational systems can be re-designed, not according to blueprint but as a future-creating journey in co-evolution with progressive trends in wider society. This theme links with ecological design and adaptive management as continuous reflexive learning processes, which are looked at in **Appendix I.**

Such an approach was exemplified by the experience of Hawkesbury College in Australia, which for some twenty years starting in the late seventies, explored the possibility and problems of systemic change in education and learning. Founded in 1891, the School of Agriculture at Hawkesbury had a long tradition of technical education for farmers and agricultural support professionals. Independence from State control in the early 1970s allowed the College much greater leeway as regards curriculum, pedagogy, recruitment, strategy and freedom of expression.

Its subsequent experience has been well-documented by the faculty team responsible and provides a fascinating insight into the challenges of introducing radical systemic change into a previously conventional institution and educational culture. I will outline more of the Hawkesbury experience in 2.4 below as an example of transformative change, but for now, will briefly look at the Hawkesbury team's ideas on the need for such change. (My own interest in this story began in 1998, when I had the opportunity to work with Roger Packham - one of the Hawkesbury leaders - for one week at Schumacher College.) The journey at Hawkesbury arose from the critical realisation by some of the faculty that agricultural development "was increasingly incongruent with the environments in which it was being pursued, and that this was in large measure a function of the prevailing paradigm of agricultural science" (Bawden and Packham 1993, 7). There was no considered systems design in the sense that Banathy uses (although Banathy is quoted as an influence on Hawkesbury's work), but systems approaches were fundamental to what transpired:

> We intuitively accepted the view that somehow, somewhere, systems thinking and holistic philosophies would be of use to us in dealing with the complexity and seeming deterioration of the agriculture/environment complex.
> (Bawden and Packham, 1993, 7)

Philosophically, the Hawkesbury story is founded on disillusion with the "the inadequacy" of reductionist science in agriculture and other areas of human endeavour, and a determination to explore the nature and implications of a new paradigm:

> The language of reductionism and positivism does not entertain the very complex and dynamic phenomenon associated with sustainable practices…it is clearly time to argue loudly for a shift in thinking from the Age of Productivity to the Age of Persistence…a new research paradigm in the tradition of what has been called the science and praxis of complexity.
> (Bawden 1991, 2363)

Thus the mission at Hawkesbury became to help "people in rural communities … learn their way forward to better futures, in the face of immensely complex, dynamic and slowly degrading environments, socio-economic, politico-cultural, and biophysical, in which they increasingly recognised they were deeply embedded" (Bawden, 1997b, 1). It was recognised that this would necessitate the provision of experience that would encourage a shift in perception. Bawden (1997b, 1) comments:

> Changing the way we collectively construe ourselves means collectively changing the way we think about ourselves, to lead in turn, to changing the way we collectively act.

For the Hawkesbury team, this meant learning to perceive and think more systemically. Their own systemic awareness at that time led to a reperception of the college and a decision to transform its purpose and operation in three fundamental ways:

Table C.2: Transformations of purpose and operation at Hawkesbury College

FROM	TO
production agriculture	'responsible rural development'
teaching/course based approach	learning/project based approach
Reductionist educational paradigm	an holistic educational paradigm

(Based on Bawden, 1997b and Bawden, 2000)

As the experiment evolved over years, it became clear that the learning journey necessitated by these shifts involved second order and third order learning, drawing consciously on soft systems methodology, experiential learning and systemic action research. Bawden writes, “together we would learn how to see the world differently, and in the process, discover just how difficult a transformation this is” (1997b, 1).

The Hawkesbury experience was a far-reaching and bold experiment by any conventional measure of agricultural education, and one which developed an expanded view of curriculum based on process and real-world problems, rather than on prescribed content and set outcomes. It was also influential. Bawden claims that Hawkesbury can claim some credit for transformation from a techno-scientific view of agriculture in Australia to a “culturally acceptable ecologically responsible productive stewardship” (Bawden 2000b, 298). It also appears to have wider influence on thinking in agricultural education in relation to sustainability, where (perhaps not surprisingly given the immediate nature of the human-environment relationship in land based activities) there has been some of the most forward-thinking work in holistic / systemic approaches in education. (See for example Van de Bor, Holen, Wals and Filho, 2000.)

Ray Ison has also been a key writer in this movement. Consistent with the other authors reviewed above, he makes a critical distinction between educational paradigms (Ison 1990). On the one hand, the dominant top-down expert-led ‘teaching paradigm’ giving rise to a ‘teaching system’ which stifles creativity, initiative and critical thought and ignores the multidimensionality of complex problems: on the other, the need for a ‘learning paradigm’ and consequent ‘learning systems’ which encourage and allow such qualities to emerge and encompasses multiple perspectives. There is a need he says, “to re-establish universities as communities of learners…(lecturers) must become involved in learning about learning, facilitating the development of learners, and in exploring new ways of understanding their own and others’ realities” (Ison 1990, 9). The conventional teaching paradigm, says Ison, is so different from the learning paradigm which sustainability requires, that the possibility of sustainable agriculture is threatened. Here again, is an argument not for just for an ‘add-on’ change of method, but for a profound change of epistemology and methodology.

Like the Hawkesbury team, Ison applies the same critique to agricultural extension, rural development and natural resource management (Ison 1993, Ison, Maiteny, and Carr 1997, Ison and Russell 2000). A plea is made for a shift from the dominance of first order change, to second order change, entailing a shift from ‘system-determined’

problems towards ‘problem-determined’ learning systems which take full account of context. This resonates with emerging discourse on the need for participatory adaptive management in relation to realising sustainability (see discussion in **Appendix I** section 3.3). Similarly, Chambers argues strongly for the systemic methods and approaches which are embraced by the term Participatory Rural Appraisal (PRA), and sees the fundamental issue as contestation between two different development and learning paradigms. One is “linear, organised, predictable and converging on equilibrium”, the other “non-linear, chaotic, unpredictable, divergent and non-equilibrium” (Chambers 1997, 12); one is top-down and is based on blueprints, the other bottom-up and emphasises the learning process (1997, 189). This shift is essential, Chambers believes, to realising justice and sustainability. In Ison’s and Chambers’ work, as well as Bawden’s - I would suggest - there is a coming together of the emancipatory and holistic traditions reviewed above.

Another strand in the emergence of systemic views of education and learning is the emphasis on ‘integrative learning’ (Blair and Caine, 1991, Kolb 1991) which has some currency in management education. At a simple level, this is seen as a necessary response to over-specialisation and the fragmentation of knowledge, at another, the expression of a changed education and learning paradigm. Again, echoing the discussion above, integrative learning “is holistic” and “addresses the whole person in the context of his or her total life”, and implies such changes as “re-examination of our role as teachers or trainers” in order to “manage the process of learning” (Kolb *et al.* 1991, 228/230). There seems to be little difference here: ‘integrative learning’ seems very close to any well-developed conception of systemic/holistic learning. Some of those using the term quote developments in brain research as support for their approach. The brain is seen a complex, highly adaptive, self-organising system and this has allowed insight on how people learn. For example, researchers Caine and Caine (2000) - drawing on research in neuroscience, cognitive science, perceptual change and creativity - have elaborated ‘twelve principles of brain-mind learning’ which underpin the principle of learners as active participants in their learning process. Their research supports such systemic ideas as the importance of the learning environment and social context, recognition that the construction of meaning is innate to learning, that sense making occurs through finding pattern, that emotions and cognition are inseparable in the brains and experience of learners, that the brain perceives both separateness and connectedness i.e. parts and wholes, and that learning involves both focussed attention and perception of the peripheral environment, that learning involves the different levels of both conscious and unconscious process which work at different

time-scales, that neural development depends on the quality of the learning environment and experiences especially in the early years, that the brain learns optimally under conditions of high challenge and perceived low threat, and that each person is unique.

Educators who understand such principles, maintain the Caines, will think and act in ways that are profoundly different from those colleagues "who have learned to base decisions on a more behavioural or industrial-age perspective". What would happen, they ask, if educators "asked themselves what it means to think of learners as living systems instead of sequentially programmable machines?" (2000, 52).

Part of the answer to the Caines' question may be seen in the growth of the 'accelerated learning' movement. Whilst this is laudable in some respects in its attempts to escape the machine metaphor in learning, the implications of cognitive research are only part of the story of a whole systems approach to education and learning. Indeed, bereft of any grounding holistic philosophy, accelerated learning may effectively support rather than counter an aggressive individualism within the dominant paradigm. For example, one the most successful books, *The Learning Revolution* (Dryden and Vos 1997), sees accelerated learning as a new technology through which anything is possible. It thus calls for, "a revolution in learning and thinking to match the soaring changes in technology, information and in our ability to produce an abundance of goods and services" (1997, 17). The title of the concluding chapter borrows Nike's slogan 'Just do it!' and starts with a section, "How any country can lead the learning revolution: and so can you". There seems to be no critical awareness in its 500 plus pages, and no understanding of our critical ecological context let alone any sense of ethics and the systemic consequence of action. Accelerated learning and the 'learning skills' movement has had an increasing had increasing influence in formal education in recent years. But:

- Keypoint: Its emphasis on '*learning to learn'* is fundamentally a first order concern with 'effective learning' skills - as opposed to second order, systemic, '*learning about learning'* which involves critical appreciation and questioning of the values involved in the learning system.

With the exception of Dryden and Vos, all the writers briefly reviewed above reflect or touch on in some way an ecological perspective, but I repeat my argument that systemisism does not *necessarily* involve ecologism, and that both schools of thought needs the other to syncretise a greater whole. The lack of fundamental progress with

the ‘reorientation’ of education in the period following the 1992 Rio Earth Summit (reviewed above in Part B.3.4), and the accommodation and containment of environmental education and education for sustainable development by the mainstream (reviewed Part B.4.1) underline the need for the articulation of an alternative and ecologically grounded educational paradigm, which can inform a change of culture. I have called this ‘sustainable education’ (Sterling 2001). After some thirty years working in the field, I am not naïve enough to believe its articulation will ensure its inexorable rise, not least because radical change is inevitably political (with a small ‘p’) and involves democratisation and reclaiming power by practitioners. However, my experience leads me to believe that there is little chance we can transcend mechanism and modernism without some such vision and grounding which can inspire and indicate coherent alternatives. Bednar (2003, 165) believes that current conditions make such an alternative attractive to some in the educational community:

> The dispiriting nature of the (current) educational enterprise and the moral vacuum that accompanies it could be significantly ameliorated by the introduction of an ecologically oriented curriculum.

In the next subsection, I try to explicate the sustainable education paradigm further, through using Banathy’s model of ‘vision, image, and design’.

2.3 The ecological education paradigm

In previous Parts, I have explored the grounding and nature of the dominant education paradigm, and also, the bases and key concepts informing an ecological and systemic view of the world. In the subsections above (in this Part C), I have looked at some evidence of, and antecedents of, the emergence of an ecological education paradigm, as a subparadigm of the ecological worldview. In this next subsection, I want to bring together some key ideas and models to flesh out the implications of this education paradigm, as I see it.

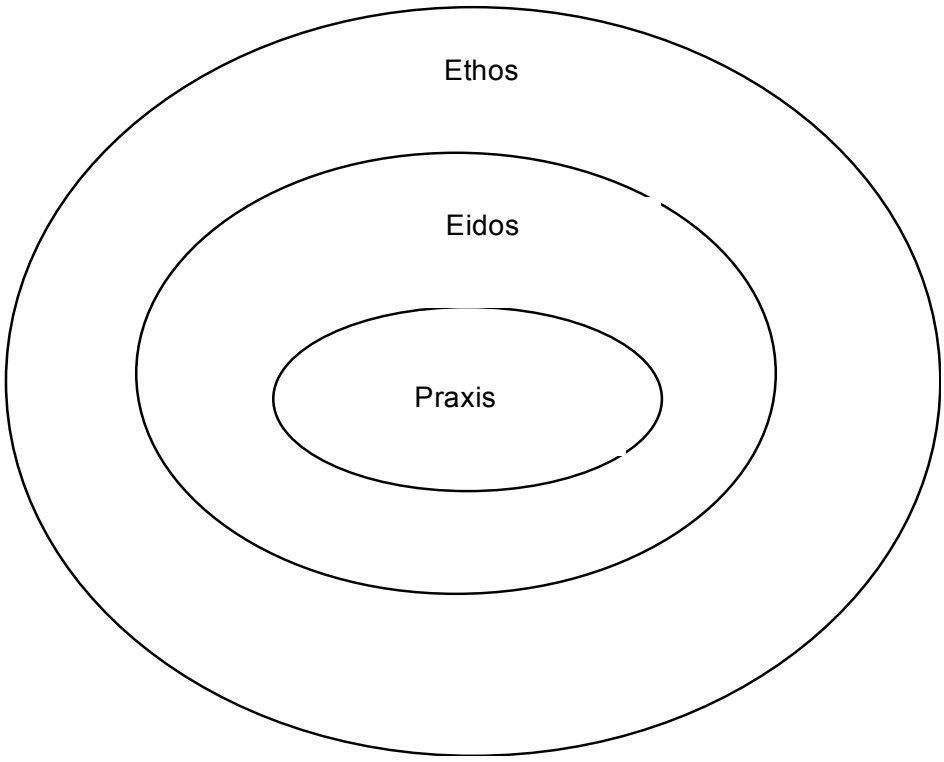
To assist this, I will now reintroduce my suggested model of paradigm and knowing (first outlined in sections A.1.1, and A.3.1, and further elaborated in **Appendix I** section 2.1). To reiterate, any paradigm held at individual or collective level can be usefully understood as a ‘whole system’ in terms of three interrelated ‘dimensions of belief’, being the ethos, the eidos and the praxis. Ethos is the affective, belief and imaginal dimension of paradigm, eidos the dimension of ideas and concepts, and praxis the dimension of reflective intention and action. I have suggested that these *dimensions of paradigm* are in close relationship with the *dimensions of knowing* and of our lived

experience, that is, our epistemology, our ontology and methodology. This model may be summarised as:

Ethos	*relates to*	Epistemology (Seeing domain)
Eidos	*relates to*	Ontology (Knowing domain)
Praxis	*relates to*	Methodology (Doing domain)

Following Bateson's view of epistemology, and earlier discussion on learning levels, I argue that the epistemological dimension of paradigm may be seen as most fundamental, (whilst accepting that it is difficult to separate out epistemology and ontology - see Part A.3.1, and detailed discussion in **Appendix I**). Thus, I suggest in **Appendix I** that it is helpful and valid to represent dimensions of paradigm as nesting systems (Diagram C.5). Whilst these dimensions are systemically interrelated, what we do (praxis) is informed and shaped by our view of reality (eidos), and this is informed by our way of knowing and sense of purpose (ethos). Similarly, what an institution does (provision) is ultimately informed by its dominant view of reality and its operative epistemology (paradigm).

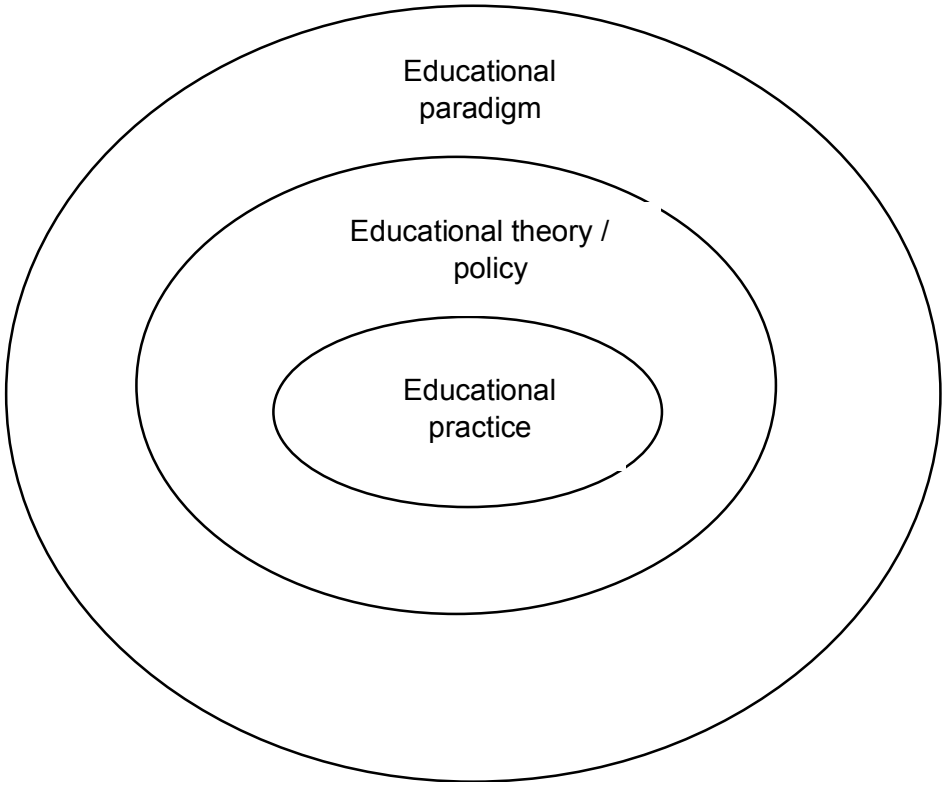
Diagram C.5: Paradigm components as nesting systems



In the educational context, this becomes clearer if we make an association between this model and another 'nesting hierarchy' or ecology of contextual levels (as noted earlier in Parts A and B). These are represented below in Diagram C.6 as:

- the educational paradigm (and purpose)
- the educational policy, theory (and design)
- educational practice.

Diagram C.6: Nesting systems in education paradigms



Hence we can look at education at any system level in terms of this interrelating framework:

Ethos - Epistemology - as reflected in educational paradigm and purpose
Eidos - Ontology - as reflected in educational policy, theory and design
Praxis - Methodology - as reflected in pedagogy and practice

For those practitioners and policymakers interested in transformation, these models give a framework for thinking and discussion about educational currency and change. Morrell and O'Connor suggest "when we speak of transformation, we need to know:

from what to what?" (2002, xvii). I believe these models help us both clarify 'what is' and articulate 'what might be' as regards educational paradigms, but also help clarify the constraints on, and opportunities for, deep learning and transition.

The models do not in themselves, of course, yield an ecological paradigm: they just as usefully represent dimensions of a mechanistic orientation. However, they give us a whole system model through which transformation towards an ecological paradigm can be conceived. To approach this, I want to use the systems writer Banathy's (1991) useful distinction between another triad, which is consistent with those above, thus:

(Ethos)	Vision
(Eidos)	Image
(Praxis)	Design

Banathy used the latter terms to carry meaning as follows:

- A *vision,* that is, a philosophy, inspiration and direction that guides imaging;
- An *image* of the desired state in terms of elaborated core values and ideas as a basis for discussion; and
- A *design* or 'model of the future system' that allows realisation of the image.

(After Banathy, 1991, 27)

These simple models allow us to better understand and evaluate the dominant paradigm (as I have sought to do in this Thesis) and envision an ecological alternative. In Part A, and particularly Part B.1.6 I suggested that the shifts towards such an alternative could be summarised through the keywords *extension, connection,* and *integration,* within and between the three paradigm components. I am now going to look at what this may mean.

Let's take - using Banathy's terms - the ecological *vision* of education first. Following discussion in the Thesis about the nature of the ecological worldview, 'extension' here means at least a change of root metaphor, from mechanism only towards an inclusive metaphor of the living system (which can subsume mechanism where the latter is appropriate). If I now take the bases, values and concepts of the emerging ecological worldview - reviewed in Part B (and elaborated in **Appendix I**) - as a philosophical platform, the following descriptors may be seen as outlining a 'vision' of an ecological educational paradigm. Together, they evoke the distinctive nature of the ecological

education paradigm and characterise the learning systems which manifest it. This is necessary imprecise. As Capra notes (2003, 107):

> A vision is a mental image of what we want to achieve, but visions are much more complex than concrete goals and tend to defy expression in ordinary, rational terms. (While) goals can be measured, vision is qualitative and much more intangible.

Box C.1: Visioning the ecological education paradigm - some descriptive keywords

Participative, democratic, empathetic, collaborative, reflexive, process-oriented, dialogic, systemic, integrative, connective, creative, holistic, synergetic, transformative, purposeful, ethical, epistemic, sustainable, and wisdom-seeking.

Now I want to move onto 'imaging' (in Banathy's sense) the ecological education paradigm. If we view the three educational dimensions presented above as nested subsystems (see Diagrams C.5, C.6 above), *and* indeed the other sets of triads as nesting and interrelated systems, we can begin to set out an image of an ecological educational paradigm (Box C.2). This paradigm answers the three key questions below - 'How do we perceive this? How do we conceive this? How do we do this?' - very differently compared to the dominant educational paradigm.

Box C.2: Beginning to image an ecological education paradigm

1.Educational paradigm (Ethos) The implications of ecological thinking as a basis for an overall educational paradigm which revisions and reorients the purpose of education (theory, policy, research and practice) and its relation with wider society and the ecosphere, and embraces intuitive, inspirational, affective and practical knowing as well as cognitive knowing. The perceptual dimension – 'how do we perceive this'? Key idea: *extension.*

2. Policy, organisation and management of learning environment (Eidos) How whole systems ideas might be reflected in systems change and management, organisational ethos, disciplines and departmental structures, curriculum content/theory and design, hidden curriculum, purchasing policy, and community/social links and

relationships. The conceptual dimension – 'how do we conceive this'? Key idea: *connection.*

3. Learning and pedagogy (Praxis) How whole systems approaches might be reflected in classroom or in community practice, in teaching and learning method, including a systems view of the learner and teacher, participative learning and teaching styles. The practice dimension – 'how do we do this'?. Key idea: *integration.*

Wholeness and synergy are guiding principles here, and the three dimensions should be seen as systemically interrrelated, rather than separate. The critical intelligence or systemic awareness informing an ecological image of education recognises the importance of *healthy emergence* and *systemic coherence* arising from the parts and properties of the system as a whole, whether considered at national, or local levels, and whether in community or institutional contexts.

At this point in the imaging exercise, we can *expand the level of detail* to further suggest a contrast between mechanistic and ecological paradigms in respect of the three system levels suggested above. It is difficult to capture this simply as the implications are far-reaching, and there is by definition no final version or blueprint. To indicate - rather than prescribe - the nature of the change, I will make reference to several interpretations that I have used previously.

- Keypoint: It is not possible to comment here on every suggested shift that is detailed below and shown in **Appendix II**: rather I am claiming that these shifts are consistent with and arise from an understanding of the ecological worldview as outlined in the Thesis, second, that their validity partly rests on their systemic coherence.

In my book (Sterling 2001) I outline 'one image of sustainable education' and this may be found in the **Appendix II** (for reasons of space), in Part C.2.3 and labelled Box C.3 Also in the book, I outline the main differences between mechanistic and ecological paradigms using the three levels of paradigm, organisation and management of the learning environment, and learning and pedagogy. Within this framework I identify nine aspects: core values, curriculum, evaluation and assessment, management, community, view of teaching and learning, view of learner, teaching and learning styles,

and view of learner. This shown as ‘Summarising the contrasting paradigms’ in **Appendix II** in Part C.2.3 and labelled Table C.3.

These frameworks echo a pattern in similar tables from other sources. There is evidence of a growing recognition that sustainability necessarily requires a change of ethos, epistemology, curriculum and practice in education. As there can be no blueprint, it is for each concerned policymaker, institution and practioner to grapple with the difficult transition this implies. One example, is the EU Socrates Thematic Network for Agriculture, Forestry, Aquaculture and the Environment (AFANet), which between 1997 and 2000 explored in some detail - and confirmed that sustainability necessarily implies - a shift from transmissive methodology towards transformative methodology and a fundamental rethink of the academic missions of institutions. (See C.2.4 below for more discussion of this project).

Table C.4: Lessons from the AFANet project (1997-2000)

The integration of sustainability into higher education implies shifts as follows:

From	To
Transmissive learning	Learning through discovery
Teacher-centred approach	Learner-centred approach
Individual learning	Collaborative learning
Learning dominated by theory	Praxis-oriented learning linking theory and experience
Focus on accumulating knowledge and a content orientation	Focus on self-regulative learning and a real issues orientation
Emphasis only on cognitive objectives	Cognitive, affective and skill related objectives
Institutional, staff-based teaching/learning	Learning with and from outsiders
Low level cognitive learning	Higher level cognitive learning

(Based on Van de Bor *et al.* 2000, 309)

Such examples bear out the need for and possibility of a ‘whole system shift’ which can be summarised simply as four ‘P’s (where I have separated out ‘paradigm’ and ‘purpose’):

Box C.4: Basic shifts in the four 'P's

Paradigm: instead of education reflecting a paradigm founded on a mechanistic root metaphor and embracing reductionism, positivism, and objectivism, *it begins* to reflect a paradigm founded on a living systems or ecological metaphor and view of the world, embracing holism, systemisism and critical subjectivity. This gives rise to a change of ethos and *purpose*…

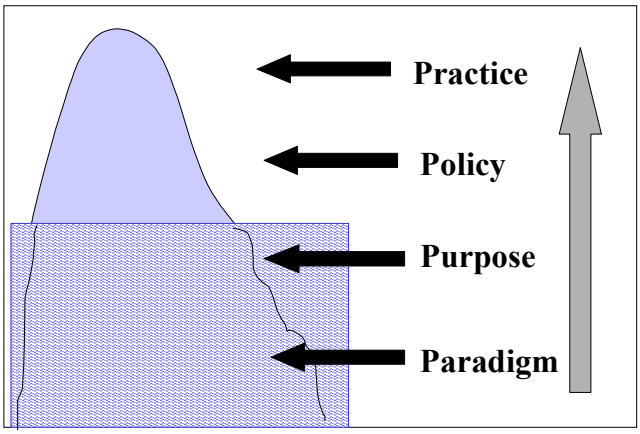
Purpose: instead of education being mostly or only as preparation for economic life, *it becomes*: a broader education for a sustainable society/communities; sustainable economy; sustainable ecology. This *expanded* sense of purpose gives rise to a shift in *policy….*

Policy: instead of education being viewed solely in terms of product (courses/materials/qualifications/educated people) *it becomes*: much more seen as a process of developing potential and capacity through life, at individual and community levels through continuous learning. This *connective* view requires a change in methodology and *practice*…

Practice: instead of education being largely confined to instruction and transmission, *it becomes:* much more a participative, dynamic, active learning process based more on generating knowledge and meaning in context, on real-world problem solving and situation betterment: an *integrative* view of theory, practice and context.

These can be drawn using an iceberg metaphor - reflecting that the deeper levels of paradigm and purpose guiding policy and practice in education tend to be hidden from our immediate consciousness and consequently also, most debate (Diagram C.7).

Diagram C.7: The four 'P's iceberg



Another account, which I have used in different versions (for example Sterling, 1999) is as follows.

Box C.5: Some implications of a systemic view of education and learning

A shift from:

- fixed knowledge *towards* recognising uncertainty and 'other ways of knowing'
- decontextualised and abstract knowledge *towards* applied and local knowledge
- emphasis on cognitive experience *towards* valuing affective, inspirational, intuitive and practical knowing
- valuing intellect *towards* also valuing intuition
- information and data *towards* deeper knowledge and wisdom
- curriculum control *towards* curriculum subsidiarity and negotiation
- teaching *towards* learning
- content *towards* process
- restricted learning styles *towards* multiple learning styles
- passive instruction *towards* participative and critical enquiry
- uncritical learning *towards* reflexive learning

- selection and exclusion *towards* social inclusion
- formal education *towards* learning for life
- specialists *towards* generalists in teachers and learners
- individualism *towards* organisational, community and social learning
- institutional isolation *towards* social and community engagement
- single and separate disciplines *towards* more inter- and transdisciplinarity
- instrumental values *towards* a new integrative sense of social/ecological ethics and responsibility
- competitive values *towards* cooperative values
- placelessness *towards* celebration of place
- valuing 'knowing' *towards* valuing 'being'

With all these tables, the choice is not between binary opposites, but a change of weighting that moves away from the dominance of the old paradigm, and transforms and conserves some of its characteristics rather than jettisoning them in their entirety. Again, what we are seeking here is a more adequate, encompassing, paradigm and one that can evolve from where things stand now.

Clearly, with such imaging exercises, we can focus 'in' or 'out' at any system level - from on the one hand, the paradigm in broad philosophic terms, down to a specific institution and a specific dimension of its operation - and suggest and seek coherence throughout. Organisational change and management is discussed in more detail in Part D, but for the purposes of illustrating basic shifts that paradigm change implies in an educational institution as a whole, Table C.5 provides one summary:

Table C.5: Towards the sustainable education institution

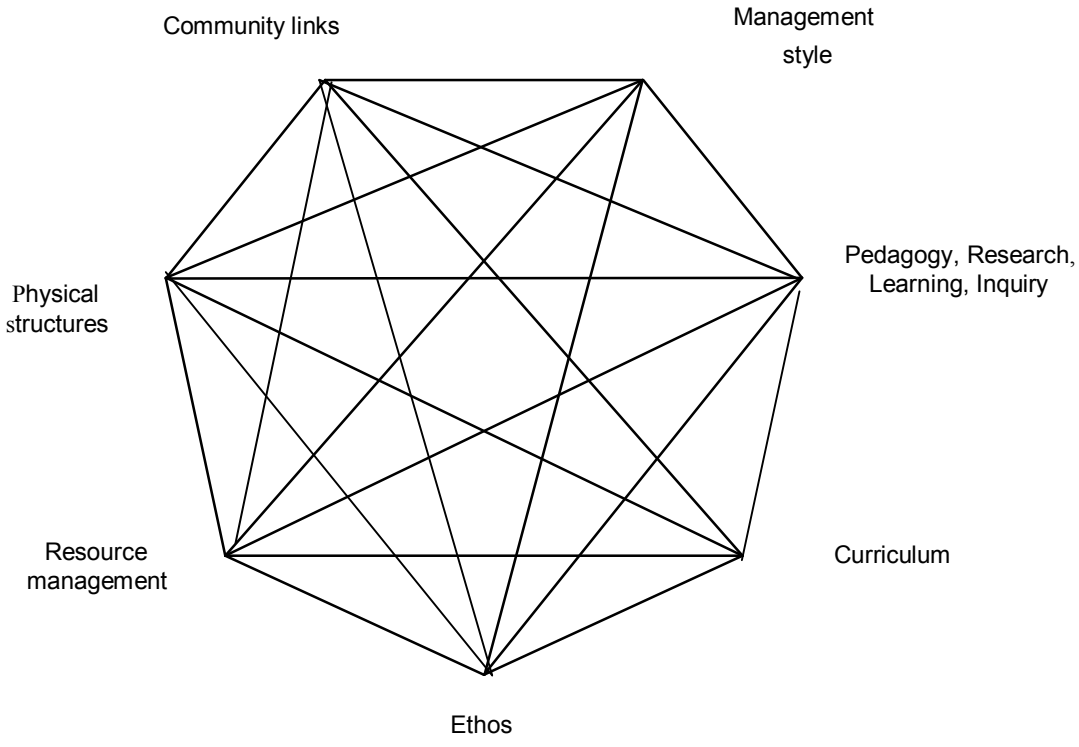
From	Towards
Incoherence and fragmentation	Systemic coherence and positive synergy
Large scale, loss of connectivity	Human scale, high connectivity
Closed community	Open, 'permeable' community
Teaching organisation	Learning organisation
Microcosm of unsustainable society	Microcosm (as far as possible) of sustainable society

Within any particular educational institution, we might identify at least seven dimensions of its operational life:

- ethos
- curriculum
- pedagogy, research, learning and inquiry
- organisation/management style
- resource management and use
- physical structures/architecture
- community links and relationships

These can be represented in relationship as follows (Diagram C.8):

Diagram C.8 Seven operational dimensions of an educational institution



Hence, any dimension has at least six relational paths. The systemic view recognises that the existing relationships in the system may be characterised by dysfunctionality, lack of synergy or by negative and unintended emergent properties, conflict and

contradiction, not least in terms of effects on people. To help move towards a more sustainable state, a whole systems view will pose such inclusive questions as:

- how far are these seven dimensions regarded as a systemic whole?
- how far are the relationships within and between these dimensions characterised by systemic coherence and healthy emergence, or by fragmentation and contradiction?
- how far is planning and change systemic and collaborative - keeping the effects on the whole system and emergence in mind - or piecemeal and imposed?

Focussing down from this whole institution perspective, we can look at any one dimension, not of course in isolation, but in relation to the whole. Space does not permit a full discussion of each dimension and such detail would detract from the thrust of the argument. Instead, I will look briefly at *curriculum.*

Looking at curriculum

Curriculum may be seen as a function of its time and circumstances. Thus, as Grundy (1987, 6) writes:

> To understand the meaning of any set of curriculum practices, they must be seen as both arising out of a set of historical circumstances and as being a reflection of a particular social milieu.

These conditions are changing: my (by now familiar) argument in this Thesis is that in most respects we have reached a critical and watershed state whereby a qualitative break with our 'historical circumstances' (modernism) is imminent, either by default or design, and that our social milieu is similarly in a transitional state. New historical and social conditions, particularly in relation to the challenge of sustainability and uncertainty, suggest and require a commensurate change in our view of curriculum (as well as the other dimensions). Following Grundy, I will make a distinction between a *conceptual approach* to curriculum, which looks at the structure and content of any particular curriculum, and a *cultural approach* which is primarily concerned with understanding the foundations and context of any curriculum, as these significantly influence the structure and content.

This distinction illuminates the difference between a mechanistic/modernist/managerial view of curriculum as being little more than an agreed (often imposed) set of educational goals, content and practices - and an ecological view of curriculum as a

multi-faceted expression of an institution's (and perhaps wider society's) ethos and where the total learning experience is the prime focus.

The former view tends to stress curriculum as *product* - that is, specific goals, objectives, pedagogy, assessment and evaluation procedures, which, it is believed, lead to predictable and measurable learning outcomes. It is normally captured in a set of documents to assist uniform implementation and 'delivery' to achieve pre-defined ends, virtually irrespective of the learner's (or teacher's) own qualities, prior disposition, knowledge and needs. By contrast, the latter view looks at curriculum as *process* and praxis, where the emphasis in teaching, learning and research is developing meaning with students through inquiry, and where learning outcomes are approximate, developing and open-ended. In this view, the curriculum is less a predetermined thing, but is itself adaptive and emergent.

- Keypoint: The conceptual approach is a content-led view of curriculum, the cultural approach a view of curriculum as lived experience.

In a consultancy for a land-based college attempting to redefine its role and operation in the light of the sustainability challenge, my colleague and I used this distinction to develop a discussion document on new approaches to curriculum (Baines and Sterling 2001). Not least, this expanded view of curriculum takes into account that the learning experience takes place beyond as well as within the classroom or lecture hall. For example, Fien (2000, 254) comments:

> Students often learn things…that are not necessarily the result of the official curriculum intended in syllabus documents and textbooks…(they) can learn many lessons about social relationships, power, and the environment from the way that decisions are made about what they will, and what they will not have an opportunity to learn. They can also learn important lessons from the social vision that underlies different teaching methods, from the way teachers treat them, and from the way (an institution) treats its environment…the lessons that students take from the 'hidden curriculum' may contradict, and may even undermine, the intended or official curriculum.

Similarly, Hart, Jickling and Kool (1998, 224) point to the 'null curriculum' which is defined by what is not said or included, which "often tells more about a curriculum than what is said". Others point to the educative power of the institutional environment, both inside and outside the lecture room, how far it is cared for, its aesthetics, its

management with regard to resources, and so on. Orr (1994) refers to the ‘pedagogy of architecture’ meaning the psychological, cognitive and physiological effects of educational buildings on the learner, and makes a case for ‘eco-architecture’ that pleases, inspires, interests and is conducive to learning. In a land-based college, this notion might be extended to the ‘pedagogy of land-use’ i.e. what students might learn unofficially from how an institution's own land is cared for and utilised.

This distinction between a conceptual and cultural understanding of curriculum, raises an important question and issue about content. This echoes previous discussion about the dichotomy between ‘content and process’, ‘realism and idealism’, or ‘realism and constructivism’. Again, it seems the participative paradigm helps span and heal this division. Chet Bowers, in a chapter on an ‘ecological view of intelligence’ (1995), suggests that in an entirely constructivist view of learning, process becomes more important than what students actually learn and content is always relativistic. If this is taken too far, he suggests, content becomes irrelevant and questions of ‘what is important’ fall away. But to many constructivists, the valorising of process is a necessary counter to the domination of a positivistic paradigm and a democratising response to top-down curriculum control. In contrast to such constructivism, Bowers argues that an ecological view of curriculum necessitates the inclusion of “patterns exhibited by all ecosystems” and he suggests Capra’s principles of ecology as one such example of important content - including such ideas as networks, nested systems, cycles, flows, development/co-evolution, and dynamic balance. (This is a more up to date version than that quoted by Bowers, see Crabtree, 2000.). My comment on this debate is that, as I have said above, constructivism is a critically important *part* of the picture, but if taken too far, it falls into the relativistic problems associated with deconstructive postmodernism discussed previously. I believe Bowers is wrong to dismiss a constructivist view of learning entirely, but right to affirm an ecological ‘realism’ in curriculum, and to assert the importance of developing ecological understanding and literacy. In my view, Orr’s emphasis (1994) on ecological literacy in relation to *place*, complements Bowers’ view of realism by rooting it in specific, real contexts, a pedagogic strategy which inevitably takes curriculum away from prescriptivism and towards emergence. Far from divorcing content and process, as if they were opposed or unrelated, from an ecological/systemic point of view we need to examine them in interrelationship. I return to this argument in Part D.

From this view then, one cannot talk meaningfully about ‘curriculum as lived experience’ without also bringing in to the ambit of consideration the other dimensions

of the institution's life - ethos, management, organisational change and organisational learning, teaching and learning styles, resource management and so on (and this is discussed further in the case studies in 2.4 below). In brief, sustainability requires an *expanded* and *interrelational* (whole systems) view of 'curriculum'. Instead, the mechanistic 'maintenance of paradigm' response by curriculum planners to sustainability, is typically enacted through the limited add-on of some sustainability concepts into a set and official curriculum which is otherwise unchanged.

It is the virtual inevitability of such a limited adaptive response that has led me to explore and elaborate not just 'education for sustainability' as a worthy adjunct to the conventional wisdom, but the nature and basis of what I call 'sustainable education' (Sterling, 2001), a term used deliberately to signify an alternative and transcending educational culture based on the ecological paradigm. By using this term publicly, I have hoped to try to help people jump the familiar paradigm ship and, though they might be treading water with me in an unfamiliar sea, help them perceive the nature of the ship and its direction in a new way, for perhaps, the first time. I relate some of my experience and feedback on 'sustainable education' in Part E, but finish this subsection with some further explanation of this term.

The problem with existing labels is that they can leave the existing educational norms and values untouched: they almost invite an 'add on' response. In contrast, the notion of 'sustainable education' addresses the nature of education and educational systems (and not just the instrumental outcome as in 'education for sustainable development'). Rather, 'sustainable education' suggests the shift of educational culture that is required. As I have argued:

> Words have power. This is clearly demonstrated in the world of education where managerialist language has almost replaced more traditional educational terminology and led to a narrowed discourse and practice. If we want a more humanistic, democratic and ecological educational paradigm, then we must find the ideas and language to help create it. The idea of 'sustainable education' is a powerful start.
> (Sterling 2001, 14)

'Sustainable education' then, is an idea or heuristic which can be used by anybody, if they choose, to help them think about educational currency and change. I use the word 'sustainable' in this context to imply four descriptors: educational thinking and practice which is sustaining, tenable, healthy and durable.

- *Sustaining* - it helps sustain people, communities and ecosystems
- *Tenable* - it is ethically defensible, working with integrity, justice, respect and inclusiveness
- *Healthy* - it is itself an adaptive, viable system, embodying and nurturing healthy relationships and emergence at different system levels
- *Durable* - it works well enough in practice to be able to keep doing it.

I would suggest that the current system of neo-liberal, managerial, 'marketised' education, at best, measures weakly against all of these descriptors and at worst, is 'unsustainable education'.

In summary, I suggest 'sustainable education' :

- implies a fundamental change of purpose, or at very least, an additional key purpose for education.
- implies embedding, embodying and exploring the nature of sustainability as intrinsic to and emergent within the learning process. This is education 'as' sustainability - nurturing critical, systemic and reflective thinking, creativity, self-organisation and adaptive management - rather than education 'about' sustainability, or education 'for' particular sustainable development outcomes.
- is not prescriptive, but is indicative and purposeful.
- affirms liberal humanist traditions in education, but goes beyond them through synergy with systemic and sustainability core values, concepts and methodologies.
- challenges the limiting effects of characteristics of the dominant mechanistic paradigm such as top-down control, centralisation, managerialism, instrumentalism and the devaluing of humanities and arts.
- is based on 'systemics' rather than 'systematics', that is, the emphasis is on *systemic learning* as change, rather than *systematic control* in response to change.

What I have tried to encapsulate in this subsection is something of the basis and implications of such a change of educational culture (Banathy's 'vision' and 'image') in general terms. This culture would both develop and embody the theory and practice of ecological sustainability and whole systems thinking in way that is critically aware. This would be a transformative practice that values, and seeks to sustain and realise human potential *in relation to* the need to attain and sustain social, economic and ecological

wellbeing, recognising that they are deeply interdependent. (The reader might now want to jump to subsection D.1.2 to find a discussion of this paradigm specifically in relation to environmental and sustainability education.)

What I have not covered so far is a theory of change and learning through which the ecological paradigm and a culture of sustainable education might be realised. This brings us on to the next subsection, on the relationship between transformative learning, systemic change and sustainability.

2.4 Transformative learning, systemic change and sustainability

In this subsection of Part C, I examine further the 'what' and 'how' of transformative learning, at individual, institutional and societal levels to explore how far this view of deep learning is substantiated by theory and evidence. I also look again at learning levels to help generate further insight on the 'response-ability' of individuals and educational systems to the challenge of sustainability. The subsection also includes some account of exemplars of whole systems change. Further, it touches on Banathy's third category of systemic change: 'design' (which is also taken up further in Part D).

In meaning, the term 'transformative learning' is equivalent to other terms used above, being Learning III (pragmatic interpretation), third order change, triple-loop learning, deep learning, and epistemic learning. It is also sometimes referred to as 'higher order' learning. I have argued that such a quality of learning is essential to the realisation of the postmodern ecological paradigm - in individuals, in education systems, and in society as whole. At the same time, I have also argued that, short of social or ecological catastrophe, transformative learning is unlikely to occur beyond a 'significant minority' but this may be sufficient to help generate wider second order learning, a questioning of values, in any particular learning context.

The case for transformative learning is that learning *within* paradigm does not change the paradigm, whereas learning that facilitates a fundamental recognition of paradigm *and* enables paradigmatic reconstruction is by definition transformative. Restating Senge's view (1990, see B.1.3) that learning involves a 'movement of mind' through which we 'recreate ourselves' we can say transformative learning involves deep movement or significant re-creation. Or let's take another view: "learning - whatever form it takes - changes who we are by changing our ability to participate, to belong, to negotiate meaning" (Wenger 1998, 226). Transformative learning does this to an

unusual degree. It engages and involves the whole person (the three dimensions of my whole systems model of paradigm and knowing), and affects change in deep levels of values and belief through a process of re-perception and re-cognition, giving rise to changed actions. It is not then, just a matter of intellectual or conceptual learning, but engages our emotional, intuitive and spiritual selves as well. In learning theory terms, it signifies a move from first order learning to second order learning where values, beliefs and paradigm are critically realised and examined, and for some, third order learning where a new paradigm emerges.

According to the Center for Transformative Learning at OISE at the University of Toronto, transformative learning involves experiencing:

> …a deep structural shift in the basic premises of thought, feelings and actions. It is a shift of consciousness that dramatically and permanently alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-location: our relationships with other humans and with the natural world. (Morrell and O'Connor 2002, xvii)

They go on to say that this involves a changing understanding of power relations, of body awareness, of the possibility of alternative approaches to living, and a "sense of possibilities for social justice, peace and personal joy". This is a big and very significant claim, because it is suggesting that changed awareness will lead not to a feeling that we need say, more discrimination, more competition, more exploitation of resources and so on, but rather, an empathetic opposite. It suggests that an expanded worldview inevitably leads to an embracing of ecology, social justice, and personal development, and that deep learning inevitably leads to such an orientation. It would take someone other than myself to counter this argument, because it reflects my own belief and indeed, experience. This argument also resonates with Reason's view (previously quoted in B.1.3) that Learning III "implies an experience of self much more fully in transaction with others and with the environment, a participatory self or participatory mind" (Reason 1995, 3).

I want now to look again at the idea of 'response-ability' and learning, in order to discuss further the assertion (made in Part B) that sustainability requires 'higher order' learning. From a systems viewpoint, learning can be seen as a response to change in a system's environment. But as discussed in earlier (see Part B.1.3), there are different levels of learning, corresponding with a progressive change of consciousness. Learning I, otherwise known as single-loop learning or adaptive learning, tends towards

stability and maintenance. Such learning is characterised by negative feedback loops between the system and its environment, which dampen change and through which the system adjusts. It is a limited corrective response to a change in the system's environment (which in this case is the whole sustainability imperative). It keeps the system and its 'theory in use' (Argyris and Schon, 1996) stable, whether we are considering the social or educational paradigm.

Higher (sometimes known as deeper) orders of learning however, tend to be characterised by positive feedback loops between the system and its environment, whereby both attain a new state (Banathy, 1992). Thus learning can serve either to keep a system stable or enable it to change to a new state in relation to its environment. While these ideas are often used to describe organisational change, they apply equally to worldview/paradigm change where the worldview is itself seen as a system. Indeed, as regards the human individual, or human activity systems, the dominant paradigm influences the possibility, nature and extent of the response - what I have termed 'response-ability'. We can now apply this view of learning to the deep challenge of sustainability issues.

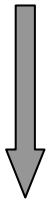
In Part B.1.8, I suggested a correlation between possible learning levels apparent in society, and a four-stage shift in the transition to sustainability from 'very weak sustainability' to 'very strong sustainability' according to O'Riordan and Voisey's (1998) analysis. I suggested that first order learning helps explain why individuals, institutions and society, if they respond at all to the sustainability challenge, tend do so in a way which *accommodates* this change in their environment, leaving assumptions and belief systems largely intact.

Now I want to go a further step and suggest a parallel and link between the *social* learning response and the *educational* response to sustainability, (whilst bearing in mind the idea of education as a subsystem of society).

A model of possible learning responses common to both arenas follows (Table C.6):

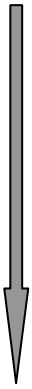
Table C.6: Staged learning responses to the challenge of sustainability

Type of response	Resultant change	Type of learning
1. No response	No change	Denial (no learning)
2. Accommodation	Green gloss	Adaptive
3. Reformation	Serious reform	Critically reflective adaptation
4. Transformation	Whole system redesign	Transformative



This range of learning responses is linked to a range of action responses (Table C.7):

Table C.7: Comparing staged social and educational responses to sustainability



Sustainability transition	Response	State of sustainability	State of education
1. Very weak	Denial, rejection or minimum	No change (or token)	No change (or token)
2. Weak	'Bolt-on'	Cosmetic reform	Education *about* sustainability
3. Strong	'Build-in'	Serious greening	Education *for* sustainability
4. Very strong	Rebuild or redesign	Wholly integrative	Sustainable education

These models beg some explanation.

The first step 'response' is no response (or if there is *some* awareness, minimum response). This may be through ignorance or denial of the sustainability issue.

The second step is accommodation: a 'bolt-on' of sustainability ideas to existing system, which itself remains largely unchanged. This is an adaptive, first order change or 'simple learning'. Through this response, the paradigm maintains its stability.

The third step is reformation: this is a 'build-in' of sustainability ideas to the existing system, through which the system itself experiences significant change. This is critically

reflective, adaptive, second order or ‘metalearning’ response, where paradigmatic assumptions are called into question.

The fourth step is transformation: this is a deep, conscious reordering of assumptions equivalent to epistemic change, leading to change of paradigm.

There are a number of important points to be made about this model (which echo some of the discussion on orders of change and sustainability in Part B.1.7):

- These responses can be seen as *consecutive stages* that learners on the sustainability transition (that is, all of us) need to move through, at least beyond the first and second step levels.
- At the same time, this is not a simple linear progression of discrete stages but is better seen as reflecting the nesting (and therefore subsuming) levels of simple learning, metalearning, and epistemic cognition (Brown and Packham 1999).
- Movement beyond the accommodatory response involves a good deal of learning by all actors - and particularly policymakers, managers, practitioners who shape institutions and organisations - and such learning is inherently difficult.
- Learning is unlikely to progress beyond step 3 (second order change) because of the difficulty of paradigm change and the resistance of any belief system to such profound change.
- ‘Education as a whole’ - seen as a subsystem of society - cannot shift through the transition faster than the shift in ‘society as a whole’ allows without education becoming ‘reined in’. Thus, there needs to be both correspondence and recursion between these shifts.This echoes the argument above in C.1.1 about the relationship between education and society being systemic rather than linear. However, this relationship also indicates that as well as constraint, positive co-evolution through interaction between progressive elements (see below) *is* possible.

A similar model of progressive change is reported by Hicks (2002), drawing on the work of Rogers (1994) whose work with students on global issues suggested a learning cycle over the period of a one-year course. This research, says Hicks, suggests that learning should involve “three awakenings - of the mind, the heart and the soul..(if) truly effective teaching” is to take place (2002, 102). Rogers suggests that learning can involve the *cognitive dimension* (which is traditionally seen as the core of teaching) which involves the intellect; the *affective dimension*, when intellectual knowing moves to a personal and connected knowing involving the emotions; an *existential dimension*

where students are faced with questioning their values and ways of living and with the challenge of the reconstruction of their own sense of self; an *empowerment dimension*, which, if the existential crisis is resolved, involves a sense of responsibility, commitment and direction; and an *action dimension*, which, if the questions raised by the first four dimensions have been resolved, involves the development of informed choices at personal, social and political levels.

Both Hicks, (drawing on Rogers' work, and on his own work with global futures students) and O'Sullivan (2002) point to the nature of denial, despair and grief in relation to coming to terms with the planetary crisis. The mainstream emphasis on cognitive learning, with a little 'values education' thrown in, is simply insufficient to meet this challenge. Indeed, Hicks contends:

> many educators often only make things worse for students by teaching about global issues as this were solely a cognitive endevour.
> (2002, 108)

Rather, Hicks seeks an holistic learning experience, and he quotes Joanna Macy's despair work which allows people to engage with their feelings and pain for the world in order to reconnect with it. A true sense of empowerment, says Hicks, must come from both head and heart, "*but this requires educators who have also worked through these issues for themselves"* (2002, 108). (My italics - this important point is returned to below.)

With this in mind, I now want to focus in on the fourth column of the table above, and outline in more detail the paradigmatic learning response of the education system as a whole, and of institutions and actors within the system (including policymakers, theorists, researchers and practitioners) to sustainability. Whilst teaching on the MSc 'Education for Sustainability' programme at London South Bank University, I developed a model of progressive engagement and change which follows the same logic as the models above. Students have found this model helpful in making sense of their experience in trying to advance education for sustainability in varied contexts.

Beyond 'no response', which is the most common position, there are three levels:

Accommodation: 'Education about sustainability'

This is an adaptive response to the concerns of sustainability whereby the dominant paradigm, its values and *modus operandi* are maintained. In formal education, there is

minimal effect on the institution and on the values and behaviour of teachers/lecturers and students, and take-up of sustainability concepts and values is piecemeal. This is often a cognitive, content-oriented or information-led response, or may be concerned with the greening of the estate, but there is incoherence and conflict between reflected educational values. Sustainability concepts such as 'biodiversity' or 'carrying capacity' may be added into some parts of the curriculum and some subjects, which in other respects carry (consciously or unconsciously) messages supporting or reflecting unsustainability. The response to the challenge of sustainability is 'learning as maintenance' resulting in an accommodative 'education *about* sustainability' in policy and practice which is widely believed to be sufficient. Sustainability is interpreted in terms which are consistent with the worldview. Whilst a long way from leading us to sustainable living, it is 'better than nothing', and can at times open the door to deeper change.

Reformation: 'Education for sustainability'

This is also an adaptive response but involves critical reflection on and meta-learning about on the assumptions and values of the paradigm or 'theory in action', resulting in an attempted 'building-in' of sustainability ideas to and reorientation of existing system. This process involves difficulty and conflict between old ideas and new ideas. Within the institution, there is more coherent coverage of content, an attempt to teach values and skills perceived to be associated with sustainability, and attempts to 'green' some or all aspects of the operation of the institution. The paradigm is modified, and this change is expressed in a reformatory 'education *for* sustainability' in policy and practice. This advocates 'learning *for* change' and there is some assumption that the necessary values, knowledge and skills are known and can be taught. While there is a degree of understanding and acceptance of more radical interpretations of sustainability, there is some incoherence between old and new values within the modified paradigm.

Transformation: 'Sustainable education' (learning as sustainability)

A change of social paradigm amongst educational actors towards the ecological worldview including a strong yet critically open interpretation of sustainability, and giving rise to a transformative education paradigm. Education is re-thought and re-designed - through a continuous learning process - to embody and reflect a whole systems approach and (what is understood of and by) sustainability. This response emphasises process and the quality of learning, which is seen as an essentially creative, reflexive and participative process. Knowing is seen as approximate,

relational and often provisional, and framed in terms of participatory knowing. Learning is continual exploration through practice and is seen in systemic rather than linear terms. The shift here is towards 'learning *as* change' which engages the whole person and the whole learning community, whereby the meaning of sustainable living is continually explored and negotiated through - as far as possible - living it. In this way, *sustainability becomes an emergent property of the sets of relationships that evolve*. There is a keen sense of emergence and ability to work with ambiguity and uncertainty. Space and time are valued, to allow creativity, imagination, and cooperative learning to flourish. There is softening or dissolution of hard distinctions between such dualisms as theory/practice; teacher/learner; researcher/practitioner; institution/community. In this dynamic state, the process of sustainable development or sustainable living is essentially one of learning, while the context of learning is essentially the challenge of the sustainability transition. This response is the most difficult to achieve, particularly at institutional level, as it is most in conflict with existing values, structures, and methodologies, and cannot be imposed. The descriptive term here is 'learning *as* sustainability' or 'sustainable education'.

Let us look now further at the journey through learning levels, building on previous discussion (particularly B.1.3). Whether we are focussing on the individual, or the institution, or society as a whole, progression through the learning levels entails a similar difficult journey. This journey through higher orders of learning involves experience of:

- greater challenge/threat to existing beliefs/ideas - and so more resistance
- greater 'perturbation' required to stimulate learning and the emergence of new order
- greater reconstruction of meaning
- greater engagement and breadth of response in the learner
- achievement of greater flexibility and less rigidity of thought
- higher order of consciousness or mindfulness
- more emergence as a result of learning
- the difference between 'unwitting self-reference' and knowing self-reference and therefore the possibility of transcendence.

At the first order level , 'we don't know that we don't know' - this perhaps is the root of the hubristic Enlightenment belief that 'we do know' or that in principle, everything can

be known and therefore controlled. At the epistemic level 'we do know that we don't know': so at this level:

- Keypoint: systemic understanding gives us more humility and willingness to entertain uncertainty and ambiguity, but also a teleological sense of purpose and participative belonging rather than separateness.

This perhaps helps describe the profound 'movement of mind' that is called for in the earlier quotes from such thinkers as Einstein, Bateson, Laszlo, Bohm and Meadows. Let us now look more closely at the nature of epistemic learning.

There is not a great deal of literature about it - perhaps not surprisingly, as most discourse and most learning are 'within paradigm'. Bawden and Packham, both architects of the Hawkesbury College Centre for Systemic Development, were (as noted above in Part B) influenced by Batesonian learning theory, and particularly by the work of Kitchener (1983) and Salner (1986) on learning levels. Salner drew on research with students' learning by Perry (1968) which suggested, in essence, that during their years at college, students "progress from a simple dualistic view of life and knowledge to a more complex, 'mature' view which is characterised by their increased awareness of the importance of context in defining both truth and value...(but that this journey from) epistemological *dualism*, through a state of *multiplicity*, to eventually reach a state of *contextual relativism*....does not occur without considerable challenge in the learning environment" (Bawden, 2000a, 14). At the last stage, the focus is not just 'thinking about thinking' (Learning II) but evaluating the foundations of thought itself (Learning III) (Bawden and Packham 1993, 6). This, Bawden and Packham state, has very important implications for education, namely:

- it is not possible to 'teach' a systemic/epistemic epistemology to a mind not ready to think in this way
- that a learner cannot 'accept a systemic stance' without epistemic flexibility.

- Keypoint: Systemic thinking in this epistemic sense then, is not simple familiarity with some systems ideas, but "a way of thinking that is independent of the content of systemic concepts" (Brown and Packham 1999, 11).

This important point is borne out, as I have noted previously, by my experience at Schumacher College, where few participants understand or have knowledge of systems concepts as such, but most think systemically.

As noted, transformative/epistemic change is *difficult* - both to facilitate (if you are a teacher/learning situation designer) and as a felt experience (if you are a learner). With

reference to my ‘systemic levels of knowing’ diagram in B.1.3, it is clearly much easier to affect change at the more immediate level, than at the deep level of knowing. Epistemic learning can be deeply uncomfortable, because it involves a restructuring of basic assumptions caused by the recognition of ‘incoherence’ between assumptions and experience (‘incoherence’ is Bohm’s term - see Part B.1.2). This crisis experience can be traumatic - although for some it is inspiring - and can be a lengthy process over time as mental models undergo radical change (Sterling and Baines, 2002). This incidentally, rather counters the simple adage that ‘learning should always be fun’. As Ison and Stowell (2000, 3) suggest, drawing on Prigogine’s theory of dissipative structures:

> …each learner goes through a period of chaos, confusion and being overwhelmed by complexity before new conceptual information brings about a spontaneous restructuring of mental models at a higher level of complexity thereby allowing a learner to understand concepts that were formally opaque.

Similarly, O’Sullivan states (2002, 4):

> The breakdown, or crisis, motivates the system to self-organise in more inclusive ways of knowing, embracing, and integrating data of which it had been previously unconscious.

Such learning gives rise to emergence - the emergence of new order. This is described by Capra (20003, 102) in relation to the learning organisation:

> The system cannot integrate the new information into its existing order; it is forced to abandon some of its structures, behaviours, or beliefs, The result is a state of chaos, confusion, uncertainty and doubt; and out of that chaotic state a new form of order, organised around new meaning, emerges.

A similar idea is reflected in Plato’s allegorical tale of the cave, as told in Plato’s *Republic*. I suggest this process of deep learning can apply also to social learning, involving whole communities and societies, as well as individuals. At all levels, the alternative possible response for a ‘mind not ready’ (see Bawden and Packham’s point above) is, of course, shutdown or denial, through which the existing paradigm is maintained against perceived threat. This raises the important question of methodology: how is transformative learning facilitated? Clearly, there is no mechanistic blueprint which can be simply transferred from one situation to another. As Capra notes (2003, 104):

> Since the process of emergence is thoroughly non-linear, involving multiple feedback loops, it cannot be fully analysed with our conventional, linear ways of reasoning, and hence we tend to experience it with a sense of mystery.

It is clear that a transformative experience may occur without direct design or control of the learning situation. For example, the old byline 'this book will change your life' - despite publishers' hyperbole – is, on occasion, true. Rachel Carson's *Silent Spring*, Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*, and Fritjof Capra's *The Turning Point* are three such books which circumstantial evidence suggests, have had a pivotal influence on many people's thinking (including mine), towards an ecological outlook. Similarly, one of the leaders of the permaculture movement in the UK told me a particular TV programme had helped alter the course of his life. Alternatively, a bodily, aesthetic or spiritual experience may induce profound change (Morrell and O'Connor 2000, xviii). In such situations, the *prior disposition* of the learner is clearly of importance. In more formal learning situations, the occurrence of transformative learning seems partly contingent on the prior awareness of the designers of the learning situation. As Ison and Stowell (2000, 3) comment:

> To understand and deliver a pedagogy which enables and provokes students to move across levels of epistemic competence is in itself challenging. To do so requires an awareness on the part of the curriculum designer and personal tutor so that they can facilitate the emergence of these changes.

- Keypoint: In other words, there has to be an intent on the part of the designers/teachers born of their own learning, to construct a learning system through which they can encourage others to explore epistemic change, as a collaborative inquiry.

This is something I had direct experience of as co-ordinator of WWF's 'Reaching Out' professional development programme for teachers (on education for sustainability), where our tutor team often saw surprising results and - what appeared to be - deep learning in a significant proportion of our participants (Sterling 2000b). This phenomenon can partly be attributed to the learning system that we constructed, through which, after an intensive and challenging stimulus and input, participants were encouraged to reflect on their learning and practice with others, and over an extended period of time. There is then, as indicated previously, a 'two-level' learning process involved: the new 'meaning making' of the designers/teachers facilitates the new 'meaning making' of others. This is what Roling (2000, 52) refers to as 'double

hermeneutics'. Further, as Bawden (1997b, 4) suggests, the evolving learning system is a process which:

> …appreciates and accommodates its own complexity, in addition to that of the main problematic matters to hand (*i.e. the subjects of study – my comment*). The central feature of the approach is therefore the design, establishment, maintenance, and development of self-referential, or critical, learning systems…(which can)…learn about their own learning.

Bawden summarises this praxis neatly, as the "systemic development of systemic development" (1997b, 1). Elsewhere, he suggests that an emergent property - a "great surprise" - of such an inquiry system is the notion of learning as transcendental to what are normally regarded as the prime educational activities such as 'research' and 'education' (1991, 2370). Hence, the Hawkesbury team did not have a clear idea where they were going when they set out to transform the College (see subsection 2.2 above), but entered a deep learning journey themselves. Clearly, others can learn from their twenty years of experience - and the Open University's Centre for Complexity and Change, for example, cites Hawkesbury as a key influence on its own attempts to design for epistemic change - but perhaps another lesson is that a systemic learning community is bound to be involved as a whole in an open-ended inquiry: it cannot be a matter of following a blueprint, however well designed. (This echoes my model of 'sustainable education' above, and the discussion in **Appendix I** on the ecological design of sustainable systems.)

- Keypoint: In brief, transformative learning arises from the interaction between the *state of readiness* of the learner, and the *quality of the learning environment* to yield a particular learning experience as an emergent property of that interaction.

Hawkesbury College approached this by developing what they termed 'methodological pluralism', which was a conscious attempt to transcend "the epistemologies of positivism and reductionism" (Bawden and Packham 1993, 4). Thus, a spiral of 'nested' research methodologies was elaborated, where the methodologies and methods used depended on the context of the research and the participants, (rather than the research problem being moulded to the pre-chosen methodology. The Hawkesbury approach echoes Ison's 'problem-determined system' then). Systems of methods of inquiry were built up in a hierarchy from reductionist methodologies across and up a spectrum towards holistic methodologies, each method being appropriate to the problem in hand. This is shown as Diagram C.9 in the **Appendix II** (Packham 1993, 552). The model seems to have provided a 'ladder' of learning experiences that could

cater to different levels of prior ‘readiness’ in terms of existing knowledge and assumptions, and help lead towards transformative learning experiences within the supportive context of a ‘systemic learning community’.

In terms of both inquiry and pedagogy, the Hawkesbury team saw their work in terms of participatory action research, yet I think their inclusive approach to methodological pluralism perhaps allows for the inclusion of didactic method at one end of their spiral. Whilst it is fashionable to equate didactic pedagogy with ‘old paradigm’ approaches, I think there is room for the inspirational pedagogue to be counted among the routes to transformational learning: it still comes down to the nature of the participative experience of the learner. That said, the quality of participation in learning is key to the possibility of transformative experience, and this is more likely, it seems to me, through designed or intentional participatory action research processes or cooperative inquiry. I now move on to look briefly at these approaches to learning.

Here, it is useful to follow Ison and Russell’s distinction between first order action research, and second order action research. In the first, the researcher sees him/herself as a participant/observer but in practice “the researcher remains ‘outside’ the system being studied” (Ison and Russell 2000, 2). In other words, the old episteme reigns unnoticed. In the second ‘systemic action research’, however, the researcher is “part of the interacting ecology of systems” and is fully aware of this. His/her role is “that of a participant-conceptualiser” and therefore “responsibility replaces objectivity in a whole systems ethic”. This echoes the concept of ‘participatory knowing’ (first introduced in Part A).

I suggest that attainment of participatory knowing, a second order learning state, is necessary to reach a state of transformational or epistemic learning. Further, that the latter is a ‘whole experience’, that is, it engages the three dimensions of paradigm and knowing (outlined in my triadic model), and therefore involves a shift in personal ethos, eidos and praxis. While participatory knowing is one dimension of what is meant by ‘participation’, a second dimension is participation in the sense of social engagement. These two senses are brought together in the methodology of cooperative inquiry and participatory action research, which is predicated on a participatory worldview, and notably, is associated with the work of Reason and Heron amongst others.

According to Heron, cooperative inquiry, “is a form of participative, person-centred inquiry which does research with people, not on them or about them (and) breaks down

the old paradigm separation between the roles of researcher and subject" (1996, 19). This approach values empathy, critical subjectivity, dialogue, respect, knowing in action, co-creation and self-determination: (I have taken these keywords from Heron and Reason's various joint and separate writings). While inquiry may be 'informative about' something, say Heron and Reason, primacy is given to "transformative inquiries that involve action, where people change their way of being and doing and relating in their world - in the direction of greater flourishing" (Heron and Reason 2001, 180). Indeed, I suggest that such inquiry - if, as is argued, it is grounded in a participatory worldview (Reason and Bradbury 2001, 1) - necessarily implies a shift from an information orientation or search for knowledge, which is characteristic of the 'old paradigm' towards transformation. I agree then with Reason and Bradbury (2001, 10) when they suggest:

> Given the condition of our times, a primary purpose of human inquiry is not so much to search for truth but to heal, and above all to *heal* the alienation, the split that characterizes modern experience.

I find myself largely in agreement with the philosophical grounding of Heron and Reason's work and impressed by the practice that has emanated from, and been influenced by, their years of involvement in the field of inquiry and change. At the same time, I feel there are some valid questions to be posed to some examples of cooperative inquiry:

- is the overriding context of the urgent need to enact the sustainability transition sufficiently to the fore in cooperative inquiry with its regard to 'human flourishing'?
- how far is the ecological/participatory/co-evolutionary worldview or ethos explicitly informing praxis?
- is cooperative inquiry and 'research into the human condition' a little too anthropocentric in orientation? Whilst Heron (1996, 11) suggests the participative paradigm is "conceived as interdependent with the flourishing of the planetary ecosystem", the latter concern seems to be at best secondary in most of the literature.
- is there sufficient emphasis on epistemic learning and intention in designing learning experiences that assist such deep change?

As I write this, I am conscious that similar questions can be asked of much systems practice too. I suspect that a good deal of action research might satisfy Reason and Bradbury's five pointers towards quality and validity (see 2001, 454) and yet do rather

little to advance ecological understanding or systemic wisdom in relation to the larger (ecospheric) context beyond the immediate research context. Hence, in reviewing the chapters in their 2001 *Handbook of Action Research* compendium, Reason and Bradbury state (452-453): “we are struck that while all contributors are concerned with addressing questions they believe to be significant, few pay *explicit* attention to inquiring what is worthy of attention” and again, “we see few direct accounts of…transformation” (authors’ italics). This comes back to the issue of ‘purpose’, discussed above in 1.3. Despite Reason’s cogent essays which I believe reflect a similar epistemic ecologism to my own, my impression of some participatory action research is as a *methodology* that is still more informed by the Freirian or Habermasian emancipatory traditions than by ecological or systemic thinking, and that there is still work to do to bring the two (or three) strands together in a more integrated overall ecology of learning that is itself more whole and can therefore more effectively heal “given the conditions of our times” (see Reason and Bradbury quote above).

This said, and in brief, as regards methodology for transformative learning, the work and writing of such as Ison and Russell, Bawden and Packham, Heron and Reason, among others, represents an important and significant breakout and breakthrough from dominant paradigm views of research, education and learning. This thinking and practice is open-ended and tentative, for two reasons. First, that it is relatively new and still developing (witness for example the inclusion of the participatory paradigm in Denzin and Lincoln’s book between the first edition in 1994 and second edition in 2000), and secondly, by definition there is no (and can be no) blueprint. Contextual learning is intrinsic to the process. As Reason (1998, 19) argues:

> It is helpful to regard cooperative inquiry as an essentially emergent process. You can’t just set up a cooperative inquiry group, because cooperative processes have to be negotiated and re-learned by every group in every new circumstance.

This of course, means we have to let go of our mechanistic tendencies to construct and control every detail, and this includes the temptation to impose a ‘sustainability agenda’. It does not mean however, that we cannot try to design for deep learning. Ison *et al.* ask a critical question in relation to complex problem situations, but it applies equally to structuring learning contexts:

> Is it possible to design (non-deterministically) contexts in which improvements, as emergent properties, might be possible?
> (Ison, Maiteny and Carr 1997, 261)

The answer seems to be a cautious ‘yes’, and some of the shifts towards ‘viable’ learning systems that are conducive to engaged and deep learning have been discussed above. For example, Bawden has summarised what he sees - based on the experience at Hawkesbury - as the characteristics of a “self-organising critical learning system”. Without giving the whole description here, such a system will be able to:

- “connect with the environments about it, and learn about and from them
- create meaning both experientially and inspirationally
- design ‘meaning informed’ strategies for desirable and feasible changes
- deal with inherent tensions of difference both within and without
- deal with conflicts, paradoxes, complexity and chaos
- have requisite variety
- have requisite redundancy and
- be self-referential and critically self-reflexive.”
- (Bawden 1997a, 30)

Echoing learning level theory, Bawden (2000a, 20) suggests that such learning systems are self-relfective and adaptive at three levels of learning involvement: “(i) about the matter to hand (ii) about the process through which the matter to hand is being learned, and (iii) about the epistemological and ontological assumptions that frame what is being learned at (i) and (ii).” Bawden does not mention ‘edge of chaos’ conditions, but his learning system seems close to creating this state of ‘bounded instability’ where transformational learning is more likely to occur (Stacey 1996a). (The ‘edge of chaos’ metaphor for management and organisational change comes from complexity theory, and is returned to in section 3 below and Part D).

Bawden’s system is not a blueprint but a low-resolution recipe that might be applied, developed, re-learnt and adapted according to context and participant mix. Such a description or ‘image’ (to reiterate Banathy’s term) seems more appropriate to, or practicable in, non-formal adult learning situations than in formal ones, see for example, the methodologies that go under the title of Participatory Rural Appraisal (PRA) (Chambers 1997) or Participatory Action Research (Fals-Borda 1991). But the conditions for epistemic learning are possible in some more formal situations. A notable example of a systemic learning system is Schumacher College, in Dartington, and this is shown as a case study in the **Appendix II** (for reasons of space) as Box C.7 under Part D.2.4. At the College, there is significant evidence of - and an unusually high

incidence of - transformative learning compared to the quality of the learning experience in most formal mainstream institutions, and that such learning when it occurs has lasting impact. Here are some participants' quotes from an evaluation and review which I carried out in 2002, (and sampled participants on courses running from 1997):

> It made a profound difference in that it has enabled me to clarify my life purpose and begin to put in place structures consistent with this.
>
> One of the most intensive periods of my life, because a huge bounded energy was released in me, which involved a deep transformation.
>
> I am still experiencing the influence of Schumacher College in a deep and profound way.

The evaluation suggests this experience, which by its nature cannot be 'guaranteed', is facilitated by the College's both overt and implicit systemicity as regards most aspects of its operation (Sterling and Baines 2002). Hence a regular facilitator commented:

> The total evolved system of the staff/volunteers/student body/tutors is a truly remarkable presence which has enabled, on all ten of my courses, a life-changing experience for many of those present.

Schumacher College is of course 'not perfect' and in our evaluation we identified some real problem areas to be faced. However, in my own experience, the organisation, management and learning experience operating at the College is the closest exemplar I have known to the third position of 'Education as sustainability/sustainable education' outlined in the three part model above. Indeed, my direct experience of the College over a period of several years helped me elaborate this model.

Schumacher College and Hawkesbury College are, as far as I am aware, unusual exemplars, where in each case a measure of independence as well as visionary leadership allowed the development of innovative systemic learning communities. Certainly, some of their positive characteristics and principles are not unique to them, but the unusual nature of these exemplars raises the question of how far more 'ordinary' institutions and learning communities can facilitate transformative learning.

Here, I want to refer back to the adaptive relationship of education as a human activity system nesting within a wider social human activity system (see Diagram C.1). As noted above, the education system changes in response to change in social and political pressures and expectations. A striking example is the adaptive change that politicians have imposed on educational systems - a change which they have sought in response to their perception of a changing global economy and future skill needs. Yet the co-evolutionary relationship between education and society also suggests the possibility of more progressive change.

As outlined in Part B, there are significant social movements towards sustainability, and also burgeoning (if still peripheral) work and research in a wide range of fields which are seeking more sustainable modes of operation, such as energy, agriculture, design, architecture, production, and transport. Similarly, there is new thinking in relation to sustainability in such areas as politics, policymaking, economics and organisational change, and such change is evidenced in the growing catalogues of key publishers such as Earthscan. At a deeper level, as discussed earlier, there is some evidence of a change of fundamental metaphor and new interest in such concepts as relationship, emergence, and self-organisation. So *alongside* modernism and globalisation, such contrary movement is also part of the wider environment of the education system, and as such it is a force for progressive, more ecologically oriented, change in educational thinking, policymaking and practice. Often, as we have seen, the 'response-ability' and consequent learning response of education and of actors within it is limited; but there are always some individuals, groups and institutions and organisations that are able and willing to respond more deeply to significant change in society. My argument here is that it is the transformative learning of such actors that then can empower them and position them to develop learning situations that can, in turn, encourage transformative learning for their students or 'clients' - particularly where these actors can stimulate radical re-thinking and learning within their policymaking and teaching organisations at the same time. We can envisage then, the possibility of deep learning occurring contemporaneously at several levels (or *layers,* to distinguish between this and learning levels) - students, teachers, policymakers, social movements - (and indeed this was exemplified at Hawkesbury).

This exemplifies a transformative recursive relationship between progressive elements in education and in society - whereby change towards sustainability in wider society supports sustainable education, which in turn supports change in wider society both directly and over time. This brings me back to the critically important question which I

posed in Part A.1.2 and Part B.3.2: ‘how can education and society change together in a *mutually affirming* way, towards more *sustainable patterns* for both?’ Banathy (1991,129) suggests this signals a change from education focusing on maintaining the existing state and operating as a rather closed system, towards helping shape society “through co-evolutionary interactions, as a future-creating, innovative and open system”. This is a vision of on-going re-creation where both education and society are engaged in a relationship of mutual transformation and reflexivity which can explore, develop and manifest sustainability values. This is itself would be a transformative relationship characterised by positive feedback loops which drive the metasystem (society) and subsystem (education) to a new state - something Henderson (1993) would call a ‘breakthrough’ scenario. The initial driving forces in this process are less to do with education (that is, the effects of ‘education for change’), than increasing awareness in society - and therefore also, amongst some actors in education - of deep systemic crisis in the ecological suprasystem (see Diagrams C.1 and C.2).

- Keypoint: The stark argument here is that the need for change in society and education in relation to the challenge of achieving ecological sustainability is so radical that limited ‘adaptive change’, or ‘adjustment for error’ is not sufficient: positive co-evolution by transformation is necessary (Banathy, 1992).

The key to such change, as I have indicated, is sufficient awareness and conscious intent by sufficient actors to initiate and sustain the process. It is growing awareness of systems failure, including recognition of the inadequacy of current assumptions and values that is the current and potential spur to systemic change in education. As Chapman states (2002, 14) people:

> will not change their mode of thinking or operating within the world until their existing modes are proved beyond doubt, through direct experience, to be failing.

This perhaps gives equal grounds for pessimism and optimism as regards the probability of large-scale change in education. Meanwhile, one of the lessons of systems thinking is that small-scale radical change can sometimes affect the whole, and indeed change is more likely to be systemic and durable when it is energised in this way, than when it is imposed from the top.

I have given two examples of transformative change at an institutional level above. Such radical change at the national or international level is of course more difficult and less likely. That said, I have had some association with a remarkably visionary initiative

by an alliance of eleven governments that form part of the Baltic Agenda 21 Education group and which are seeking to reorient their whole educational systems towards sustainability (Baltic 21 2002, Sterling 2002). This can at least be seen as a second order learning shift among some policy-makers, but its impetus may be slowed by its being a top-down project.

At a smaller scale, an example which links change at institutional level and international level and also illustrates many of the points made above, is that of the EU AFANet network (first mentioned in 2.3 above). Between 1997 and 2000, the AFANet European network sought to explore the implications of sustainability by developing a number of projects that sought to integrate sustainability concepts and practices in a number European higher education institutions. An outcome of this project, the book *Integrating Concepts of Sustainability Into Education for Agriculture and Rural Development* (Van de Bor, Holen, Wals and Filho, 2000), indicates that a number of agricultural education institutions have started to re-think their role, curriculum and operation in fundamental ways. The on-going lessons learnt from this work are summarised below:

Box C.6: Six lessons about sustainability and transformative learning from AFANet

1. Integrating sustainability presupposes the re-thinking of institutional missions

"The integration of sustainability will never lead to anything fundamentally new if the institution is not prepared to re-think its academic mission."

2. It is no use crying over vague definitions

"Sustainability is a non-prescriptive concept, which needs to become meaningful in a specific context."

Its non-specific, imprecise nature can be seen as an advantage in stimulating dialogue on meaning and implications for curriculum, pedagogy, and so on.

3. Sustainability is as complex as life itself

"It is related to the social, economic, cultural, ethical and spiritual domain of our existence. It differs over time and space and it can be discussed at different levels of aggregation and viewed through different windows…it does not lend itself to unilateral, linear planning or a reductionist scientific paradigm and thus involves the systemic integration between theory and practice into systemic praxis".

4. Teaching about sustainability requires the transformation of mental models
It "includes deep debate about normative, ethical and spiritual convictions and directly relates to questions about the destination of humankind and human responsibility. In this way, it differs from a modernist and positivistic way of thinking."

5. There is no universal remedy for programmatic reconstruction
The possibility of innovation depends on the cultural and academic context. There is then, "no panacea for curricular reform", no blueprint for change in education towards sustainability. Therefore, change must be based on an inclusive, participative approach.

6. Programming sustainability demands a rethinking of teaching and learning
"Reorientation requires ample opportunity for staff members and students to embark on new ways of teaching and learning…(and).. the opportunity to re-learn their way of teaching and learning, and to re-think their mutual relationships."

(Based on Van de Bor *et al.* 2000, 314, *and* Wals and Bawden, 2000, 20 - which is a re-rendering of the same text. The six summary points in bold, and the accompanying sentences shown in quote marks are direct quotations).

I will summarise some of the key conditions, the recognition of make the design of transformative learning situations more likely:

- the importance of conscious intent and leadership
- assessment of the prior disposition of the learner
- the importance of a participative, inclusive, approach
- the importance of attention to the immediate and wider context
- the need for systemic rather than piecemeal change
- the importance of second order change - learning about learning - as a precursor to epistemic change
- the importance of a co-evolutionary rather than linear view of the relationship between education and society and hence the importance of community and real-world links
- the need for epistemic change towards a more systemic or ecological paradigm

These notions suggest that the fundamental issue is not so much the 'integration of sustainability into education' as the 'integration of education into sustainability', that is, working towards the systemic and co-evolutionary 'fit' discussed above.

This co-evolutionary sense is echoed by Roling's contribution to the AFANet book, which provides an example. He suggests that agricultural institutions in this "new century of the environment" must make a choice between different social/economic directions: either to link evermore closely to the commercial sector and biotechnology companies to become 'technology institutes'; or sell their expertise in agricultural and rural development to the South; OR develop green expertise and a "compelling vision on ways of escaping the human ecological predicament". In Roling's view, institutions have no other choice than take this third option if they want to survive. Thus by engaging in the concerns and processes of sustainability, Roling (2000, 43) believes, institutions are more likely to be sustainable themselves. In this role, he suggests, they will not only be "concerned with food production, but with the sustainable use of ecological services and natural resources in general". Through embracing social learning and collective action, as well as their existing concerns with economics and technology, universities will "help society develop adaptive management of eco-systems, and elaborate the institutional and social implications of this shift".

This is an expression of whole systems thinking which exemplifies the three-part shift that has been central to my argument, involving *extension/reperception, connection/re-cognition* and *integration/realisation.* This is my model of epistemic learning. There is evidence that such learning is taking place to some extent in the field of management and change. In section 3 below, I examine briefly this interesting development, some key ideas arising, and implications for intentioned change in education.

3 CHANGE AND MANAGEMENT

3.1 Theory of systemic management and change

In recent years, there has been a growing literature which seeks to interpret the implications of new paradigm thinking (Ray and Rinzler 1993), of complexity theory (Stacey 1996b), and the living systems metaphor for management and organisational change (Morgan 1982, De Geus 1997, Capra 2003). Such thinking parallels other work on organisational change (Argyris and Schon 1996) and the learning organisation (Senge 1990) and thinking on adaptive management in sustainable development (Carley and Christie 2000). (I look at adaptive management as an alternative to technocentric management in **Appendix I** subsection 3.3.) Whilst there are differences within this emerging field (Stacey, Griffin and Shaw 2000), and aspects remain controversial, it is possible to see this literature as representing an emerging paradigm

in thinking about management and change which, clearly, is relevant to educational change including change in educational institutions.

This is itself a big topic and I will only summarise and discuss some of the key ideas here. My own attempts to show the difference between mechanistic and ecological paradigms in terms of management are shown in the **Appendix II,** Part C, Table C.3 (Sterling 2001). In essence, the difference between 'new' and 'old' paradigm thinking as regards management and change is attention to 'systemics' rather than 'systematics', that is, the emphasis is on *systemic learning* as change, rather than *systematic control* in response to change. In Part B.3.3, I have already discussed the impact of mechanistic and managerialist thinking on education systems, and the growing influence of complexity theory and systemisism in some areas of business thinking and practice. Some of the key differences are outlined below (the terms 'old' and 'new' paradigms are employed for sake of brevity).

Box C.7: The meaning of management

Williams (1984, 1900) points out that the word 'management' comes from the Latin *manus* meaning hand, which is associated with handling, manipulation and direction. However, in the 17th and 18th centuries there was overlap between 'manage' in this sense and *menage* meaning careful housekeeping. Senge (1999, in Webber) has suggested that in current conditions of complexity we need to think less like managers (in the first sense), and more like gardeners (which invokes the second sense). Such a metaphor is perhaps best represented in education through the ideas of the 'nursery' and nurturing, but interestingly, this sense is abandoned after the early years.

Key differences in management paradigm

Metaphor - the foundational metaphor is key to understanding any theory-in-action of change, and its associated lexicon of change and management:

- The *machine* metaphor - applied to organisations, people and learning – tends to support a paradigm of instrumental rationalism, reductionism, control, hierarchy, determinism and predictability, unidirectional cause-effect and linearity, inputs-outputs, problem-orientation and problem-solving, first-order change and reductionism.
- The ecological metaphor of *living system*, by contrast, emphasises whole systems thinking, holism, self-organisation, holarchy and networks, uncertainty, non-

> linearity, feedback and complexity, emergence and synergy, appreciation and situation improvement, creativity, and second- and third-order change. This ecological orientation is deemed to be a more adequate and empathetic metaphor for the world as it appears to be, whilst recognising that mechanistic approaches have validity in specific situations.

The main problem, from the systemic point of view, is the pervasive and universal influence of mechanism beyond the limited situations and applications where it can be appropriate. The simple listing of these sets of keywords belies the very significant difference of ethos, eidos and praxis in these two paradigmatic approaches to change.

Learning levels - old paradigm thinking about learning tends to go no further than first order change, therefore giving rise to single-loop, adaptive learning practice, based on transmissive, information-based learning, within the recognised or formal curriculum. Double-loop learning can take place in organisational change, but this does not necessarily affect the cultural metaparadigm. However, in the ecological paradigm, double-loop learning is seen as a precursor to transformative or epistemic learning.

Learning layers - in the old paradigm, only one 'learning layer' is recognised, this being the formal curriculum and the student body. There may be training for staff, but a dualistic distinction between those who learn (students) and those who teach (teachers, lecturers, facilitators) is still maintained. In the new paradigm, different learning layers are recognised - students, staff, and the whole organisation as a learning ecology or learning system (see next point). Further, the interrelation between learning layers is recognised - for example, the role of students as teachers, and teachers as learners.

Learning organisation - old paradigm thinking tends to take a reductionist view of group learning, putting prime emphasis and focus on individual learning. Any group learning is seen as resulting directly from the learning of individuals in the group ('the whole is the sum of the parts'). New paradigm thinking, particularly since Senge's work (1990), has emphasised the importance of the 'learning organisation' whereby learning as an organisation is seen as an emergent property arising from the interaction between individuals within the organisation and between the organisation and its environment. Thus, the learning organisation can co-evolve a collective intelligence.

Patterns of organisation - in old paradigm approaches, institutions tend to be structured along hierarchical and compartmentalised lines with strong vertical lines of communication, and weak horizontal lines of communication and interaction. This reflects views of power and causality. Thus, control resides at the top and change occurs by a vertical command structure. Second, a fragmented view of knowledge results in separate departments, disciplines, and specialisms, with little or no horizontal integration. In the new paradigm, there is more emphasis on flatter structures, trust, empowerment and subsidiarity, fluid groupings, self-organisation, transdisciplinarity, and encouragement of positive synergies.

Management and intelligence - in the old paradigm, the intelligence of the organisation is seen as arising primarily from goal-seeking direction and vision from the top, and second, from people's response to these goals and outcomes determined from above. Required response to direction is seen in terms of 'performance' and 'delivery', and this 'effectiveness' is measured and monitored and relayed to the top as a feedback loop. Individual initiative may be encouraged where it fits into the ethos and theory-in-action, and negative feedback controls are employed to keep innovation within limits. In the new paradigm, intelligence and innovation is seen as arising from the self-organising learning of individuals and groups within and without the institution or organisation, and this process is 'cradled' and encouraged by the leadership.

View of people - in the old paradigm, people are valued instrumentally and viewed as resources, or operatives, or as outputs. They are there "to process information and obey the rules embodied in hierarchies and bureaucracies, in information and control systems" (Stacey 1996a, 347). There is an emphasis on integration, into the ethos, assumptions, and ways of working of the organisation or institution. Trust in people, whether staff or students or workers tends to be low, and their performance is regulated and controlled by systems of reward, competition and accountability through targets and sanctions. In the new paradigm, the health of the whole is seen as dependent on the well-being of the part, and vice-versa, and a dynamic balance between autonomic and integrative tendencies is sought. It is recognised that creative tension and conflict is part of this process. People are valued intrinsically rather than instrumentally, and there is an assumption of faith and trust in people. Space and time are maintained to encourage and allow self-organisation, self-motivation and creativity to emerge.

Management and complexity

The importance and distinguishing mark of whole systems thinking and approaches in management and change lies in the affirmation of emergence as the primary focus, rather than control. If we define sustainability as a relative emergent property arising from a set of interrelationships, rather than as a predetermined and fixed goal, then clearly, this quality is much more likely to arise from a management paradigm based on systemisism and a conscious aspiration for second and third order change, than one based on mechanism and tied into first order change. The former position is about embedding, embodying and enacting sustainability as a learning process - about 'learning as sustainability' or 'being the change we seek', to borrow Ghandi's phrase. The latter position, where sustainability is acknowledged at all, is likely to seek to contain it, and reduce it to another set of goals and outcomes, which may or may not conflict with existing aims.

My argument here finds support in Ralph Stacey's extensive work on strategy, management and complexity, which I now briefly review. Stacey suggests that "most managers think in terms of linear, unidirectional causality" (1996a, 275). Beyond this, he acknowledges the influence of cybernetic thinking and suggests that many organisations are goal-seeking, the goal being equilibrium adaptation to their environment. This is effected through decisions based on negative feedback which seeks progressive adjustment. In other words, adaptive, first-order learning and change. Such equilibrium behaviour is regular, orderly and predictable (262). Hence, he says, we think of organisational learning "almost always as a tidy process that produces progressive improvement and that somehow we can always be in control of" (309). This is a fundamental belief which is echoed in much simple strategic thinking and management, including in education, but which is often confounded by the nature of complexity. The world is not a tidy place, and managers and policy-makers tend to respond to its baffling complexity by seeking to exert still more control (Stacey 1997, Carley and Christie 2000, Chapman 2002). This has deeply problematic results. Stacey says that managers respond to increasing uncertainty by insisting on more control, output, and accountability, which raises stress and anxiety levels - a positive feedback loop, which puts policy, institutions and people in a classic double bind (1997, 3). So the response to anxiety and system failure is often "clinging even more closely to the inadequate frame of reference that is causing the trouble in the first place" (Stacey 1997, 8). Beyond, this, I would add, is the possibility of double-loop learning which transcends this bind, and the difference between belief and experience is recognised.

Stacey is critical of mechanistic systems approaches that support the myth of control (this echoes my earlier distinction between *mechanistic* and *ecological* systems approaches). Rather, he argues for management thinking based on the sciences of complexity. This is my understanding of some of the key points:

1. most systems - natural and human - are non-linear feedback networks ('complex adaptive systems') operating far from equilibrium
2. such systems exist within other such systems, and therefore it is more accurate to say that they co-evolve, rather than that 'a system adapts to its environment' in a Darwinian sense
3. learning occurs primarily through self-organisation rather than through direction and instruction
4. outcomes occur through emergence rather than through planning, and cannot be known or guaranteed in advance.

Stacey is not saying this is what *should* happen in organisations and institutions, he is saying this is what *does* happen - *but we do not recognise it* (Stacey 1997). Rather, our mechanistic approaches to learning and change, tend to distort a 'natural order'. Although, it turns out, it is not so much a natural 'order' but a dynamic state of order/disorder which has been called the 'edge of chaos' by complexity theorists. This "fertile suggestion" say Reason and Goodwin (1999, 286), "is proving to be a robust insight, despite the difficulty of pinning it down precisely, i.e. mathematically and logically", and despite severe criticism from some quarters.

Complexity theory suggests that non-linear systems can either tend towards the 'attractors' of stable equilibrium (driven by negative feedback) or explosive instability (driven by positive feedback). In addition, however, there is a third state, known as the 'edge of chaos', which is a state of limited or bounded instability far from equilibrium which continually flips between negative and positive feedback. This is achieved through self-organisation and it is the state in which the system is most creative. Complexity sciences have arisen from the study of natural systems, but according to Stacey, the edge of chaos "is a tremendously important analogy to use in thinking about organisational life" (1996a, 314) because it shows that "instability and unpredictability are essential to innovation and creativity" (315). Reason and Goodwin (1999, 297-298) reflect on whether it is reasonable to apply such a metaphor to social life and organisations, and suggest that it is, as: "metaphor is at the basis of all theory….(and) while of course complexity theory is a metaphorical construct…it is

helpful to see social and organisational life as a complex, self-organising process". If this is the case, the implication of this work is that the transformative learning (in individuals, institutions and organisations) that sustainability requires occurs at the 'edge of chaos' conditions, and that according to Stacey (1996a, 348), "the process of transformation is a spontaneously self-organising one".

Clearly, these ideas are extremely important. Most educational organisations or institutions, and particularly since the recent managerial revolution (see Part B), have been run on mechanistic 'control' lines. But as Stacey points out, keeping a system in stable equilibrium through negative feedback controls and 'ordinary management' traps it into endless repetition and destroys its creativity (1996a, 314). The same applies, I would suggest, to the effect on people within the institution too.

- Keypoint: The result of 'ordinary management', says Stacey, may be stability for a long time, but ultimately it will lead to the death of creativity and innovation and therefore ultimately, the system too.

This has huge implications, for the way educational institutions are organised, let alone other human systems. At the other end of the spectrum, characterised by instability and positive feedback, a system will tend towards further instability until it is limited by another factor (negative feedback). This constraint, says Stacey, has to come from outside the system (313). Echoes here then, of ecological limits, though Stacey has very little to say about these. This appears a weakness of his work which focuses on organisations rather than their wider environmental context. Similarly, companies may use complexity theory to help them assure their own sustainability or longevity, but their 'system of interest' remains limited to the company (De Geus 1997) rather than wider sustainability. It is very important to note this, because in our present times of ecological crisis, co-evolution has to be in the direction of overall ecological sustainability or survival of the whole.

In sum, we can say, the extremes of stability and instability are unsustainable states erring towards system breakdown - at one end ossification, at the other disintegration. By contrast, the 'edge of chaos' is a dynamic sustainable state - as long as, I would add, any system in this state is in coherence with (that is, it fits with or does not undermine the viability of) its sub and meta-systems. Sustainability is at the edge of chaos:

> If it is to survive, every human system must return to the edge of chaos, where outcomes are unknowable and no one can be 'in control'…(here, the system) will be controlled through the process of spontaneous self-organisation…unless

> we, in our desperate attempts to stay 'in control' cause it to tip over into the unstable zone.
> (Stacey 1996a, 346).

This is not just a question of organisational management, but - as Stacey argues - "a new frame of reference for understanding the whole world in a different way" (346). What is exciting here is a view of the world and a theory of change and learning that supports the core arguments of the Thesis. Thus, many of the ideas outlined in this Thesis are brought together:

- *Unity and dynamic balance* - the concept of 'edge of chaos' gives grounding to the systemic idea of 'bothness' rather than the 'either/or' of Western dualistic thought. The necessary dynamic *balance* - rather than *conflict* - between such pairs as 'autonomy and integration', 'structure and randomness', 'order and disorder', 'stability and instability', need to be recognised as intrinsic to life. Here, complexity theory echoes the idea of the cosmic dance which has been reflected in ancient mythologies and artistic traditions for millennia (see for example, Wade 1991).
- *Self-organisation* - as the fundamental learning process and key principle of system organisation and system health in both human and non-human systems.
- *Learning* - occurring most strongly in situations characterised by a balance between security and challenge, certainty and anxiety, stability and instability, and a degree of 'mess'. This is where creativity and innovation occur. Transformative learning happens in these conditions.
- *Adaptive management* - management as an iterative learning process, allowing and nurturing self-organisation, rather than goal-seeking behaviour through command and control.
- *Higher order change* - second and third order change (epistemic learning) as necessary to transcend mechanistic approaches and achieve an 'edge of chaos' system state of creativity in management and learners.
- *Sustainability as emergent property* - the quality of sustainability emerging from the learning process, such that it is difficult to distinguish between learning, self-organisation and sustainability, and between these and systemic health.

Stacey's work is powerful and enhances much that has been argued in this Thesis. However, with his focus on organisations and management, he largely misses the importance of epistemic learning and the nature of the postmodern ecological paradigm, and these omissions are also noticeable in other writers working the complexity vein. For example, new paradigm thinking has made significant inroads into

business management thinking, but while some leading companies are looking at the implications of complexity theory for management, they do not necessarily embrace ecologism. Similarly, there is some evidence that these sorts of ideas are beginning to be reflected in educational discourse. For example, Gunter (1997) argues against the burgeoning 'education management industry', using chaos theory and self-organisation as a basis for her proposed alternatives and drawing on Stacey's work. Similarly, Fullan (1999) reconstructs his earlier influential theories of educational change, using complexity theory and drawing particularly on Stacey. Whilst helpful, these books give little heed to the ecological metaparadigm which complexity supports and indicates, or for that matter to the foundational influence of mechanism. To borrow Orr's distinction (1994), Gunter's and Fullan's work address the 'crisis in' education, but not the 'crisis of' education, that is, the wider socio-ecological crisis.

Sustainable education has to look both ways, within and 'without' education, within institutions and without. Complexity theory applied to management and organisation affords insight which gives the notion of 'learning as sustainability' further substance, and this is taken up again in Part D.1.3.

4 SUMMARY

In this Part, I have used systems models, learning level theory and co-evolutionary theory to examine constraints on change in educational paradigm, and the possibility of such change. Antecedent and current movements have been examined - in research paradigms and in systemic critiques of the mainstream - and a framework elaborating an ecological educational paradigm has been outlined. The nature of transformative or epistemic learning as a condition of realising and enacting the ecological paradigm has been discussed with reference to individuals and institutions, and this has been underscored by a review of the implications of complexity for management, learning and sustainability. This sets a context for Part D, where I turn my attention to environmental and sustainability education, and explore further the status and potential of whole systems thinking and the ecological paradigm in this discourse. I address some recurring paradigmatic problems in the discourse, and argue that revisioning environmental and sustainabililty education through a whole systems approach helps it to be more transformative.

PART D – REVISIONING ENVIRONMENTAL EDUCATION THROUGH WHOLE SYSTEMS THINKING

Purpose: to explore the implications of whole systems thinking for the revisioning of environmental education within the context of wider systemic change in education and management.

Introduction

In this final main Part, the implications of whole systems thinking for environmental education and sustainability education are explored. In subsection 1, the influence of and tensions between paradigms operative in the environmental and sustainability education field is discussed (behaviourism, constructivism and critical pedagogy). The strengths and weaknesses of each paradigm are discussed. Then problems common to the discourse as a whole are outlined and positive recent developments that indicate a more integrative and systemic model are briefly presented. In subsection 2, I outline a whole systems participatory framework for environmental and sustainability education that seeks to address some of the existing paradigmatic problems in the field. In subsection 3, I look at design and strategy and argue that we need to think more in terms of design for emergence than planning for predetermined goals. In section 2, which concerns the practical implications of the Thesis, I discuss how the arguments and ideas reflected in the Thesis have been received and used by others.

1 ENVIRONMENTAL AND SUSTAINABILITY EDUCATION PARADIGMS

1.1 Reviewing the paradigm debate in environmental and sustainability education

> The challenge is to find the basis of an education capable of promoting integral human development, to which environmental education offers an essential contribution….from a reconstructive perspective, it is a search for meaning, for significance in a worthwhile human journey.
> (Sauve 1998, 53, writing for the ‘Colloquium on the future of environmental education in a postmodern world’)

In little more than three decades, environmental and sustainability education has emerged and evolved from marginal beginnings to claim the necessity, and indicate the possibility, of fundamental change in our collective view of the purposes and nature of education and learning - a change which, if made effective, might be critical to the quality of life of future generations. Yet it is clear that such deep change is by no means assured. Whilst the progress of environmental and sustainability education over the last three decades has been impressive, it also has been slowed by a degree of incoherence in the field and constrained by a largely uncomprehending and resistant mainstream. To help analyse this picture and indicate the 'basis for an education capable of promoting integral human devlopment' (to use Lucie Sauve's words), this subsection reviews the paradigm bases of the field and both problems and promising signs in the debate.

The term 'sustainability education' is widely thought to be a more inclusive conception than environmental education (EE), and covers 'education for sustainable development' (ESD), 'education for sustainability' (EfS) and 'education for a sustainable future' (see Box A.1: Clarifying sustainability education terms, in Part A.1.1). These terms have emerged particularly since the first Earth Summit of 1992, alongside and sometimes replacing 'environmental education'. There is a whole debate surrounding the difference and non-difference between the meaning of these terms which I have addressed elswhere (Sterling in Blewitt and Cullingford, in press) but here I will look at the discourse as a whole. Since around the time of the first Earth Summit in 1992, this discourse has become far more extensive and detailed than was the case previously. Drawing on my experience as a participant in this debate (see for example Hesselink, van Kampen and Wals 2000), and using a whole systems perspective as outlined above, I will review some of the main paradigmatic issues and tensions that result from environmental and sustainability education being a product of "both older *and* emerging worldviews" (Robottom and Hart 1993, 44, my italics). Such worldviews need to be seen at the contextual levels of both educational paradigms and cultural paradigms, of course. "How we ultimately shape the future of environmental education depends… on how we think of education itself", say the editors of the 1998 international colloquium on the future of environmental education (Jarnet, Jickling, Sauve, Wals and Clarkin 1998). As I have argued, this shaping also depends on how we think of the wider world and our view of reality.

For many years, the dominant position in the field has been to a greater or lesser extent, essentially *behaviourist.* When I began working in environmental education

some thirty years ago, first as a teacher, then as deputy director of the Council for Environmental Education (CEE), I shared a fairly simplistic notion of environmental education with most of the environmental education community as it then was (although I always had an holistic outlook). It was based on the assumption that people were insufficiently aware of the environment and understood little about it. Therefore we needed to raise awareness and increase understanding, and then, we believed, environmental issues were more likely to be resolved.

In all that has happened since in the environmental education debate, including the emergence of 'education for sustainability' (EfS) and 'education for sustainable development' (ESD), the idea of remedying environmental ignorance through education has remained strong, even though the argument has been presented in a more sophisticated way than it was decades ago. This view is essentially a realist position, resting on a materialist ontology, an instrumental and universalist view of education, and often implying an instructive, transmissive methodology. The guiding questions are behavioural and may be summarised as: 'how can education change people's attitude and behaviour towards the environment'? There is a linear and rationalist view of change: an idea that 'education *about* the environment' is sufficient to encourage personal change, and "a belief that if you can just find the 'right' thing to do, then change will happen" (Dillon 2002, 86) - and this is reflected in educational strategy. There is, therefore, an emphasis on communication, summed up in the phrase 'getting the message across' beloved of campaigners and government. (This relates to the linear view of the education-society relationship outlined in Part C.1.1.)

With mounting evidence over recent decades of environmental destruction, human misery and short-sightedness, catalogued by such regular reports as those from the Worldwatch Institute (*State of the World*), the World Resources Institute (*World Resources*), UNEP (*Global Outlook* series), and WWF (*Living Planet Report*), a driving urgency informs a good deal of the work of environmental educators and sustainability educators, many of whom consequently subscribe to an instrumental 'environmental responsibility' view of environmental education to some degree. As noted in B.4.1, this position has been reflected strongly in international 'high-level' endorsements for environmental education (which have been taken up as mandates particularly by NGOs), and resonates with the notions of ecological modernisation and ecological managerialism. I don't restate this instrumentalist position in order to demolish it, but to hold it up for later evaluation.

Meantime, and as I have suggested in B.4.1, a different view of environmental education has emerged in perhaps the last ten or so years. Many environmental educators are now concerned with the kind of learning experience that is necessary, if we are to nurture personal or social transformation towards sustainability through learning. This is essentially an idealist, *constructivist view,* which asserts the intrinsic value of education and learning. The emphasis is on the quality of learning, and often, on building the individual's capacity (for example, to think critically, systemically and reflexively), rather than encouraging particular social or environmental outcomes. It recognises the importance of the learning context and the prior experience, disposition and uniqueness of the learner. The guiding questions are developmental and may be characterised as: 'how can we facilitate learning, critical thinking and self-development in the context of the sustainability issue?' In terms of the sustainable development debate, this constructivist position is logically resonant with capacity-building, self-determination and autonomous development, although in my view, the constructivist position is often rather weakly linked to both to social critique and critical sustainability discourse.

Hence, I suggest that underlying the international sustainability education debate, there are two fundamental positions. In terms of worldview and ontology, this dichotomy reflects the *realism-idealism* tension; in terms of learning theory, it reflects the *behaviourism-constructivism* tension; in terms of methodology, it reflects the *content-process* and *transmission-transformation* tensions. In simple terms, the first orientation is more interested in the 'environment' part of environmental education, while the second orientation is more interested in the 'education' part of environmental education: a difference between 'education for the environment' and 'education for being'. In learning theory terms, the first orientation is more interested in the *corrective* aspect, while the second is more interested in the *meaning-making* aspect (see discussion on learning in B.1.3).

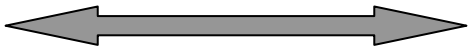
Yet, if we look at the environmental and sustainability education literature, it has been common to see the spectrum of paradigmatic positions represented as a *three*-part model, particularly in the early nineties. For example, Robottom and Hart (1993) (positivist, interpretivist, and critical), Fien (1993) ('vocational/neo-classical', liberal/progressive, socially critical), Sauve (1996) (rational, humanistic, and inventive). These models still have currency, and can be used to interpret positions within the debate. In more recent years, a wider spectrum tends to be acknowledged, reflecting debate in social science. Hence a range of methodological positions (such as positivist,

postpositivist, interpretivist, transformative, postmodern, poststructuralist, are distinguished (see Gough and Reid 2000, Denzin and Lincoln 2000).

At a deeper level, however, I suggest that the two archetypal positions or tendencies outlined above are operative, and these are represented simply in Table D.1. These are not peculiar to environmental education but influence it.

Table D.1: Fundamental orientations influencing environmental/sustainability education

Position	**Behaviourist**	**Constructivist**
Ontology	Realist	Idealist
Epistemology	Objectivist / Positivist	Constructivist / Interpretivist
Theory of learning	Behaviourist	Constructivist
Function of EE/ESD	Remedial	Developmental
Main emphasis	Goals / Outcomes	Learning experience
Focus	Knowledge acquisition(and values / skills)	Meaning-making
Seeks	Behavioural change	Capacity-building, self-development
Reflects	Instrumental values	Intrinsic values
Pedagogy	Transmission / Instructivist	Transaction / Constructivist
Desired change	Integration (environmental responsibility)	Autonomy - individual as decision-maker
Intrinsic problem	Objectivism	Relativism



It is important to note that these are not two simple ‘camps’ - the arrow at the base of the table indicates that there are a spectrum of possible stances based on these two platforms.

In particular, I have not shown here *critical pedagogy* which is a third key strand in environmental and sustainability education (reflected in the three-part models above). Before proceeding with the argument, I will comment on this important ‘third’ key position. With a basis in critical theory, it draws on elements of both the fundamental positions shown above, as does the ecological position. However, it also differs from

the ecological position in some important respects. Critical pedagogy is particularly reflected in development education, but has also been influential in the environmental education debate, especially in the UK and Australia. It is associated with participatory action research methodology, and in terms of sustainable development, relates to movements for self-reliance and alternative development models.

Critical pedagogy in some ways bridges the two main orientations above, as well as differs from them. Thus, it is a materialist philosophy in acknowledging a 'real reality', but also has a "subjectivist epistemology, where socially constructed knowledge is not considered to be a matter of deriving timeless, abstract principles but of…uncovering the historical, structural and value bases of social phenomenon as well as the contradictions and distortions within" (Robottom and Hart 1993, 11). Its learning theory is therefore *reconstructivist* rather than (simply) constructivist, and there is emphasis on place and local knowledge as opposed to 'scientific' universalism. It differs from both the main orientations because its primary interest is in emancipation and empowerment which can realise social conditions which, dialectically, can in turn favour these ideals. This position is often characterised as 'education *for* the environment' or 'for sustainability'.

For some years, the main tension in the environmental education debate was between the more positivist tradition, outlined above, and the socially critical theorists. However, in the early nineties, an important change in the debate occurred with a strong critique posed by constructivists of what they saw as a deterministic, 'destination view' of education propounded both by the socially critical 'education *for* the environment' school, and differently, by the behaviourist 'environmental responsibility' school. This 'destination view', the critics said, was represented by the emergence and uptake of the term 'education for sustainable development' (Jickling 1992, Jickling 1994, Jickling and Spork 1998, Sauve 1998). Jickling's 1992 paper (entitled *Why I don't want my children to be educated for sustainable development)*, helped open a 'pandora's box' in this debate.

I have felt somewhat apart from this debate, seeing the partial validity in both the socially critical and constructionist positions. However, I think socially critical environmental education was and is much less deterministic than Jickling and his supporters perceive it to be. From socially critical theory, I have learnt something about the relation between the dominant social paradigm and structural injustice, about the

relation between social context and distorted power relationships, and about the 'politics of knowledge', and I largely endorse its commitment to social justice and participative methodology. At the same time, I find critical theory too materialist in its conception of the world, too rationalistic, and too anthropocentric. The valid idea that nature is 'socially constructed' or mediated through "cultural meanings, discourses and representations" (Huckle, in Corcoran and Wals, in press) seems to take precedence over ecological realism, although the latter is acknowledged. Further, despite this constructivist view of nature, I also consider this stance too insufficiently cognisant of the powerful influence of worldviews at a deep level and of the mechanistic metaphor. Rather the emphasis is primarily on political and economic structures, and consequently critical pedagogy tends to be ideologically bound into the language and political economy of socialism, and a presupposition of conflict. Lastly, I have some difference (as explained in Part C.1.2) with the emancipatory agenda which tends to be characteristic of critical pedagogy. Meantime, the understanding (or misunderstanding) by socially critical theorists of the systemic ecological viewpoint is one where the latter is sometimes seen as potentially "romantic, utopian and reactionary" (Huckle 1998, 72).

I now return to the realist/instrumental position in environmental education. This is the stance that is most aligned with the dominant social paradigm discussed earlier in this Thesis. There are a number of problems with this orientation. It tends to:

- emphasise 'responsible environmental behaviour' the nature of which is often determined by 'experts'
- have a 'deficiency' view of the learner: education is seen as remedial of ignorance and thereby also of ecological 'ills'
- accept unquestioningly the mechanistic/positivistic/techno-scientific worldview which gives rise to this instrumental view of environmental education
- see itself as apolitical
- privilege scientific forms of knowing above others ways of knowing and thinking
- focus on the individual, and give insufficient weight to social and economic conditions and forces which constrain action, and to the possibility of social learning.

Further, it tends not to encourage critical and systemic thinking: rather it seeks to integrate the individual into a deterministic pattern of thought or behaviour deemed desirable by the programme designers. (See for example the critiques in Robottom and Hart 1993, Firth and Plant 1996, Wals, Albas and van Arcken 1999.)

More positively, as noted above, environmental educators sharing this viewpoint tend to point to the urgency of the state of the planet, and in this, I totally concur. I also consider that the environmental science that this view tends to propound is an important element of ecological literacy, a point which tends to be overlooked by constructivists who emphasise process over content. However, in terms of epistemology, the problems intrinsic to this orientation are objectivism and universalism and therefore insufficient cognisance of the participatory nature of knowing. Despite these problems, and considerable critical debate in environmental education circles in recent years, this orientation is still strong in environmental education, particularly in some North American movements - as has been evident in much of the discourse represented by the North American Association for Environmental Education.

Now to the constructivist position. This position is in some ways closer to my own, but as noted in Part C, there are problems with this stance too. As we have seen in the discussion on deconstructive postmodernism, human mediation is central to the constructivists' understanding of reality and nature, and in an extreme form, there is deemed to be no independent reality. In terms of environmental education and sustainability, this characteristic can translate into problems of relativism in evaluating truth claims with regard to the nature of sustainability issues, whilst scientific knowledge is devalued through its being seen as socially constructed. Thus, the validity claims of any curriculum content tend to be disputed, and at the same time, there is often insufficient ecological realism in the constructivist position - which can detract from accepting the urgency and necessity of the sustainability transition. A second key characteristic is the liberal view of the autonomy of the individual and the importance of choice for the individual. This valuing of the individual can divert primary focus attention away from critical thinking about society, economy and ideology (unlike in the critical theory tradition), and towards individual agency. (This is one of Bowers' key arguments against constructivism.) Robottom and Hart (1993, 10) suggest it "remains essentially conservative in terms of its imperative for social transformation". The problem in constructivism is that by seeking to transcend positivism and behaviourism, it has tended to weaken its grip on independent reality. Heron (1996, 163) suggests that it is "an unnecessary mistake" to "abandon concepts of validity and truth just because positivists and sociopolitical structures have misappropriated and abused them for oppressive purposes". Despite all this, I feel constructivism to be a more satisfactory position than the realist position.

In sum, and with regard to the international debate, it is not oversimple to suggest that much of the rhetoric and international documentation over the last two decades has reflected an instrumentalist orientation, whilst the professional community of interest - the theorists and practitioners - has increasingly moved towards a constructivist view of sustainability education. At the same time, others have pursued a socially critical, reconstructivist view of education and society.

This analysis helps account for the relative lack of progress of sustainability education, both in terms of take-up in national systems and at local and institutional level. The behaviourist view tends to provoke an *accommodatory* response from education systems, a tinkering with curriculum content or greening of the estate, which may or may not take place to any great depth and level of coherence. The constructivist approach suggests a deeper *reformatory* response, but one which education systems find hard to grasp, or to distinguish from 'good education' that they may claim to be providing already. Meanwhile, the reconstructivist approach often suggests a revisioning of education and society too radical or apparently ideological for most educational systems to accept or find starting points for.

Thus, it appears that environmental and sustainability discourse has been somewhat 'stuck' and therefore has had a limited ability to lead a shift to a transformative view of education as a whole, as argued for in this Thesis. Thus, I want to suggest how we might reconcile and subsume previous paradigms into a greater integrative whole - a fourth paradigm, which I have described as 'sustainable education'.

From a whole systems viewpoint, the two main paradigmatic positions of behaviourism and constructivism, and the third position of critical theory, have value but are of themselves insufficient. Like the allegorical tale of the blind men and the elephant, I suggest they are all partly valid, but also incomplete. And like the blind men each asserting their truth it is not hard to find environmental education writers ready to critique other positions, for example Wals and Jickling (2001) against what they see as behaviourism, Bowers (2001) against process-oriented constructivism, Walker (1997) against socially critical reconstructivism. To return, rather, to an appreciation of partial validity: positivism asserts a material reality but misses the critical importance of our participation in knowing, understanding, and shaping it. Critical theory is helpful in highlighting the importance of empowerment in the light of structural injustice and the role of dominant ideology, but is itself often too ideologically bound. Constructivism highlights the critical role of the knower in the known, but can fall into the trap of

relativism and lack theory in, and commitment to, social change towards justice and sustainability.

- Keypoint: After two more than decades of involvement in this debate, my view is that all these positions have some important value, yet that each of them is inadequate.

Further, that whilst contestation between them as evidenced in the pages of the environmental education research journals may be illuminative, it often misses a deeper level of insight and argument. As I have suggested in Part C, if these paradigms are arranged along a chronological spectrum (see Robottom and Hart 1993 for example), at one end, the environmental education community needs more cognisance at a meta level of the currency of mechanistic paradigm roots in our collective psyche, at the other, a greater sense of the postmodern ecological worldview. In other words, it seems we need a keener sensibility regarding where we have come from and where we might be going to.

At the same time, recent debate about the direction of environmental education suggests a questioning about its nature and role in postmodern times (see for example Jarnet *et al.* 1998, Hesselink *et al.* 2000) and I look at some positive trends below. Meantime, it is possible to outline some of the problems common to a good deal of the thinking and practice that goes under the environmental and sustainability education banner.

Box D.1: Common problems of environmental and sustainability education

- *Dualism* - despite the ostensibly holistic outlook, there is a significant degree of 'residual dualism' in the discourse, in strong distinctions made for example in educational aspects such as value-fact, theory-practice, content-process, teacher-learner, sciences-humanities *et cetera* but especially in the people-environment or culture-nature distinction (see next point).
- *Environmentalism* - most discourse reflects a dualistic environmentalism rather than a systemic ecologism, in other words, dualism rather than duality.
- *Scientism* - there is still a bias towards scientific experience and interpretations of the world, at the cost of balance with aesthetic experience and the 'inner dimension' of psychology, intutition, emotion and spirit, and other ways of knowing.
- *Missionaries and relativists* - there is a tension between those that wish to alter the thinking and behaviour of others specifically towards a view of sustainability, and

those that believe that education can and should go no further than encourage critical thinking. The former tend to lack sufficient philosophic and sociological grounding, the latter sufficient attention to context (see next point).

- *Autonomy* - the notion of the autonomy of the learner as rational decision-maker tends to underplay the social and political structural contexts which condition the possibility and nature of individual autonomy and responsibility.
- *Individualism* - as regards focus, there is still more emphasis on the individual learner than social learning, community and the learning organisation.
- *Territorialism* - the definitions of 'EE', or 'EfS' or 'ESD' raise the question of boundaries: what educational theory and practice lies within and without these boundaries, and why, and what the relationship is between education on the 'inside' and on the 'outside'. A tendency to maintain borders also tends to diminish the ability of environmental education to work for paradigm change in education as a whole, and to engage in a co-evolutionary way with sustainability movements in wider society (see C.2.4).

At a deeper level, these issues are consistent with the critical conditions I have suggested at various points in the Thesis, through which progress towards articulating and realising an ecological worldview at epistemic level might be judged. To reiterate, these concern how those subscribing to any education paradigm or subparadigm are sufficiently aware of and engaged in:

1. its own value bases at a deep level – in relation to the dominant worldview – and of the influence of the dualistic epistemological 'error' or inadequacy
2. learning levels and the need for epistemic learning
3. the postmodern ecological worldview
4. whole systems thinking
5. sustainability in relation to complexity theory

I will take stock at this point. A key argument in this Thesis is that:

1. the ecological worldview is emergent
2. environmental and sustainability education has an important role as a transitional agent in elaborating and spearheading a corresponding ecological educational paradigm, but that
3. this requires those involved in such education to become more cognisant of its own intermediary position with regard to roots in realism, constructivism and

holism, as a necessary condition for epistemic change in environmental and sustainability education, so that it is more able to fulfill the role outlined in (2) above.

If the argument that the ecological worldview is emerging is sound, we might expect that the environmental and sustainability education discourse - of all educational discourses - is already reflecting the ideas and tensions involved in its emergence. So what follows is a brief critical review of some of the literature to assess how far some key aspects of the ecological worldview are currently reflected. (In Part B.4.2 I have already pointed to evidence of an incipient ecologism in some writers' work.)

Dualism - Colwell (1997, 4) argues that the nature-culture distinction is a dualism that "contradicts the ecological vision of a unified world". If environmental education is to acknowledge the world as a unified system, he argues, "it needs to relinquish its outmoded dependency on words that represent it as a dualism". He suggests the dualism is addressed through the concept of 'earth system' which "expresses the relationships between human and non-human environments as *intrarelationships*"(my italics). This seems to be an interesting idea which is consistent with my own view about the need to transcend dualism in environmental education. Similarly, Smith and Williams criticise the dualism of most conventional environmental education, and seek instead to distinguish and advocate what they term 'ecological education' (1999). In addition, Thomashow (2002) suggests a developing a 'place-based perceptual ecology' and a 'biospheric curriculum' through which relational pattern learning is encouraged through 'interspatial', 'interspecies', 'intertemporal' and 'intergenerational' concepts.

Embodiment - Payne (1997, 134) also addresses dualism and is critical of the three main traditions in environmental education (positivist, interpretivist, socially critical) through all sharing "to different extents, a Cartesian view of 'I' and 'world'". Interestingly, Payne argues for (what I would term) a systemic conception, a 'critical ecological ontology', whereby "the locus of understanding, explanation and praxis 'for the environment' should be 'in here, with me and you' rather than 'out there', somewhere to be found, identified, studied and solved" (133). The focus of inquiry is how the experiencing body, in actions and interactions, might be used as a localised 'site' for understanding, explaining and acting on 'embodied' environmental problems or issues. I take Payne's located curriculum approach to be significant in attempting to address and reconcile the dualisms of: education 'for the environment' and education 'for being'; the inner and the outer dimensions; and constructivism and realism.

Epistemism - Wals and Jickling (2001, 4) welcome the notion of sustainability as a way of stimulating new thinking in education.

> Focussing on sustainability provides an opportunity for accessing higher learning (epistemic development) and new ways of knowing (the paradigmatic challenge)….serious attempts to integrate sustainability into higher education brings academics into whole new pedagogical worlds - experiential, epistemic, and systemic - which in turn brings them into whole new worlds of learning and indeed, researching.

They take far more space critiquing a modernist, deterministic approach to education for sustainability than they do either explaining why such determinism remains strong, or more importantly, exploring the meaning and grounding of systemisism. At the same time, I find their ideas on methodology and pedagogy largely in tune with my sense of what the ecological paradigm implies.

Revisionary postmodernism - Sauve suggests that environmental education "involves nothing less than the re-construction of systems of relationships among persons, society and the environment" (1998, 44) and states that postmodern education "has to be reconstructive" (44-45). I strongly agree, yet there is very little in her writing about the ideas of revisionary postmodernism that could inform such re-construction. Like Jickling, she is very critical of the notion of sustainability and sustainable development, and thereby of *all* 'education for sustainability' or ESD - which she associates with economism and instrumentalism. My comment on this is that if such critics interpreted and reclaimed 'sustainability' through the lens of revisionary postmodernism, ecologism and ecological design, they would better discover a basis for the "deep commitment and transformation" in environmental education they advocate.

Second-order change - Fien (2000) is one of the few established EE writers who explicitly mentions the need for second-order change if education is to respond to the sustainability challenge. Such reorientation requires, he suggests, a commitment to the reconstructionist tradition in education. Whilst he critiques modernist education and its "social and economic reproduction" (273), there is little basis explicated for second-order change other than critical reflection, and a process of educational reform and innovation. There is also no mention of third-order change.

In addition to the authors mentioned here and in B.4.2, one of the most interesting recent books in the field to my knowledge is Van de Bor *et al.* (2000). As noted in Part C, this looks at the issues of epistemic learning in a network of agricultural colleges, and touches on the nature of an alternative ecological epistemology. Further, Smith and William's book on *Ecological Education in Action* is based on the notion that most environmental education lacks "a recognition of the deeper cultural transformations that must accompany the shift to more ecologically sustainable ways of life" (1999, 3). Bowers is another important writer in the field, who has a strong sense of culture and ecologism, but who, in my view, is too dismissive of constructivism and seems to ignore the possibility of epistemic learning in the individual.

In the literature then, there are intimations of the educational and cultural worldview that is the subject of this Thesis, but few clear expositions. One (quite early) exception is Robottom and Hart in their 1993 monograph on environmental education research. Drawing particularly on the work of Skolimowski and of Reason, they argue for a "paradigm shift in educational inquiry" consistent with an emergent worldview which is "more organic, systemic, (and) holistic" (1993, 46). In a section interestingly titled 'Congruence of the emerging new worldview and environmental education research', they note - echoing Reason - that the shift involves a "move to participatory and holistic knowing based on a participative and dialogic relationship with the world", a shift from objective consciousness to "critical subjectivity" and to "knowledge about" to knowledge in action. (1993, 53). The chapter is disappointingly brief, and I feel, its significance has largely been missed in the general discourse that followed in the period following its publication (which was largely dominated by the Jickling-led critique of determinist forms of ESD). From a personal conversation with Paul Hart (July 1996, University of Bath), it was clear that it was he, rather than Ian Robottom (who strongly supports the socially critical view), who penned this section of their 1993 monograph. Yet strangely, Hart's later work makes little mention of this emergent worldview, and this absence is also reflected in recent discussions of environmental education research - see *Environmental Education Research* (*EER),* 2000, vol 6 no 1, for example.

In this special issue of *EER* on qualitative methods of inquiry, Hart almost invokes Ashby's 'law of requisite variety' (though Ashby is not credited - see my comment on this law in **Appendix I** section 1.2) regarding the necessity and validity of the existing variety of qualitative research paradigms. Each research path, Hart writes, "needs to be valued for its unique metatheoretical and methodological assumptions". I agree. These multiple paradigms of educational thought, he says (2000, 40):

> …require reconciliation not at the paradigm level but at the level of metaparadigms – for example, whether people can agree on the relationship of education to the goals and ideals of democracy or social justice.

Or of sustainability, I should add. There is an important point that Hart has raised here, which touches again on the *difference between paradigmatic levels*. It also echoes the point made in C.1.3 about Denzin and Lincoln's 'bricolage', and it concerns the nature of our metaparadigm, at the deepest level. The issue is whether we have - and can articulate - a metaparadigm that is capable of reconciling the research paradigms and putting them in a new light. Hart goes on to say that qualitative researchers will face many decisions which "go beyond quality criteria" and will deal with "larger questions of paradigm" which will govern the researcher's stance on what counts as knowledge and therefore what methodologies will be used. This internal questioning is vital because, he says (Hart, 2000, 44):

> …in the future, the postmodern turn will require that researchers address a crucial problematic in educational research, between the reconstructive project of the modern, and the deconstructive project of the postmodern, that has not yet been examined.

Similarly, Jarnet *et al.* (1998, 1) state "environmental educators must decide whether they will follow (postmodernism)…or remain anchored, overtly or implicitly to modernist traditions". What is sorely missing here is awareness of the grounding and possibility of the reconstructive *post*modern 'project' and metaparadigm. It has indeed "been examined", as the many sources referred to in this Thesis bear out, but - and this is key - it seems to have been largely missed by the environmental and sustainability education community. We do need multiple perspectives and approaches (Scott and Oulton 1999), and this is, paradoxically, intrinsic to the ecological/systemic view (see discussion of Bell and Morse's work on sustainability indicators in B.1.7, for example). Yet at *meta*paradigm level - as I have argued in this Thesis - we need to recognise the emergent and urgent shift from the mechanism, scientism, objectivism and reductionism of the dominant old paradigm, towards the ecologism, holism, participativism, and systemisism of the new. This is a task - as I have indicated in Parts B and C, that necessarily involves epistemic re-perception, re-cognition and realisation.

To summarise this subsection: environmental and sustainability education should not be limited to the realist/behaviourist position, which I have elsewhere characterised as the '*learning of ecology'* (Sterling, 2003). This has a partial role and validity, but also limits and weaknesses (as outlined above). Further, neither can such education be

restricted to individual agency and critical thinking, as important as these may be. Rather, a transformed view of environmental and sustainability education subsumes both these positions into a wider schema which may be termed the '*ecology of learning'*. Learning or teaching *about,* or *for* sustainability in some preparative sense has some value, and may be important, but ultimately limited, first steps. Deconstructing sustainability also has some - limited - value. But a deeper level, the issue becomes - much more - a question of *being* and *becoming.* That is, learning towards thinking, working and living ecologically and sustainably - the enacting, experiential, experimental 'learning as sustainability' position outlined in C.2.4. This transformed and transformative 'ecology of learning' orientation, wherever practicable, seems to me much more in tune with the way the world works, and in a real sense - taking all that has said above about sustainable systems and edge of chaos states - 'wishes' to work in a teleological sense. Here we have, according to Reason and Goodwin, "a postmodern paradigm of learning to participate in an unpredictable, but nevertheless, intelligible world" (1999, 287).

The articulation of whole systems thinking and an integrative metaparadigm, makes the transcendence of the fragmentational influences of our mechanistic paradigm legacy becomes much more possible. The concern here is not only that body of theory and practice we have chosen, reasonably, to call 'environmental education' over the last thirty years, nor is it just education as a whole. It is our fundamental view of the world, as individuals, societies and cultures, living in watershed and dangerous times.

In sum, I have outlined the three main positions that underlie environmental and sustainability education, and suggested that there are problems with each of them but also that each has a partial validity. I have mentioned some recent work which indicates realisation of the need for a more integrative and systemic paradigm. From this review of the field, I now look further at the nature of a whole systems paradigm for sustainability education.

1.2 Towards a whole systems thinking paradigm for environmental and sustainability education

Let me first comment on the tension involved in setting out a propositional theory. If I lay out a *detailed* picture of the implications of whole systems thinking it might be seen as:

- totalising, prescriptive and universalistic
- contrary to the participative ethos of the ecological paradigm

- exclusive of other views

On the other hand, if I paint a general picture, it might be seen as:

- lacking substance and meaning
- poorly defined
- lacking commitment and practical application

The challenge for anyone interested in 'change in education' and 'education for change', is to find a path between these dangers, one which is indicative and invitational rather than prescriptive and impositional. Part of the problem here is that the 'delivery' oriented educational culture is geared to implementation of, rather than critical reflection on, schemas and frameworks.

My aim then, is to suggest appropriate bases for the revisioning of environmental education and related educational movements, which others can, if they wish, interpret, critique, adapt or reject according to their own values, experience, and work context. To that end, I have already discussed some ideas regarding the 'vision' and 'image' of a change of educational paradigm and these are to be found in Part C and in **Appendix II**. Certainly, I would like others to engage in a debate and an owned epistemic learning process around this alternative paradigm, but I can do no more than lay out some ideas which may or may not resonate with others. (The success of my Schumacher Briefing (Sterling 2001) indicates that for some at least, such ideas have helped their re-thinking of theory and practice, and I exemplify this in more detail in Part D.2 below.)

What is most important, both to capture and convey, is the essence of the whole systems view. This is not an easy task. If the argument is valid (that it is indeed a whole cultural paradigm that is at issue), then clearly a short description - however well put - cannot encompass it. Such a description tends to render a body of meaning that is rather less than adequate. A key device throughout this Thesis has been to juxtapose the new paradigm against the old, and thus suggest its nature by contrasting against that which it seeks to both transcend and include. Another problem, discussed earlier in Part B, is that the paradigm is emergent, in flux or a state of becoming, and therefore cannot be viewed with the clarity of hindsight. This said, I will try to restate, summarise and re-mind us of some key ideas, using the triadic model of paradigm again.

Epistemology/Ethos

Re-perception. The realisation that we are deeply implicated in the (spiritual, ideal, and material) world, that we are co-creators in what it becomes, for good or ill, is uppermost. Because of this deeply systemic relationship we 'need to perceive that we need to perceive' in this way, and knowingly then, as far as possible, see the whole and work for the welfare of the whole. This is, as far as possible, a participative epistemology of recognising duality or di-polar unity rather than Cartesian dualism, and based on critical subjectivity and conscious co-evolution. The ideas of participative knowing, holistic and transpersonal ethics, the metaphors of wholeness, healthy system, and living system, and the concepts of self-organisation, and autonomy and integration are helpful in realising this epistemology. A further aspect is trusting our 'inspirational knowing'. As Glazer (1999, 2) states, 'Once we forget how to look to our inner experience as a resource for knowledge and understanding, we lose resourcefulness, connectedness, our sense of well-being, and confidence'.

Ontology/Eidos

Re-cognition. The ontology is both realist and idealist, recognising the dynamic 'given cosmos' and our part in interpreting and acting in, on and shaping, the reality we see. We are 'neither separate nor the same'. This ontology is also both material and spiritual. The shift here requires recognising pattern, process, connectivity, and wholeness - Bateson's 'pattern that connects' - and a primary orientation towards wholeness rather than 'partness' in cognition and description.

Methodology/Praxis

Realisation. The methodology is one that is appreciative, recognising the nature and value of 'what is', as well as transformative in working towards the realisation of 'sustainable systems' - 'what might be'. It is essentially cooperative, action-oriented and transformative through reflexive learning and lived experience. The ideas of integration, systemic coherence, emergence and synergy in design are guiding principles in this praxis, as well as sufficient time and space.

This three-part model is congruent with the familiar educational triad of 'values, knowledge and skills' but my concern here lies at the level of paradigm rather than provision. From this deeper basis, I will now comment on some of the implications for environmental and sustainability education, revisiting some of the issues and problem areas discussed above.

Commensurability of paradigms - this is key. As I have argued at several points above, I do not concur with the Kuhnian view of the incommensurability of paradigms, but share the Wilberian evolutionary view of the increasing adequacy or wholeness of succeeding paradigms, such that aspects of preceding paradigms become integrated and transformed within a new and greater whole (see earlier discussion in B.1.5). Interestingly, environmental education writers tend to reflect a Kuhnian view (Robottom and Hart 1993, Wals, Albas and van Arcken 1999, Wals 1999). The problem with this latter view, is that the partial validity of earlier paradigms becomes lost in a dualistic attempt to distance the advocated paradigm from the old, and prove the validity of the new. Further, followers of earlier paradigms then feel threatened and obliged to defend their stances, resulting in the so-called 'paradigm wars'.

Instead, I suggest that the new paradigm transcends and includes - it is "related but distinct" (Heron 1996, 10). Thus, returning to the fundamental positions (summarised in Table D.1), the new paradigm integrates elements of both, into a greater whole, thus:

Table D.2: Towards a participatory paradigm in environmental education

Position	Participatory
Ontology	Realist / idealist (relationalist)
Epistemology	Participatory
Theory of learning	Participative / systemic
Function of EE/ESD	Remedial → developmental → transformative
Main emphasis	Towards transformative learning experiences
Focus	Meaning-making and change appropriate to context
Seeks	Wholeness and sustainability at all system levels
Reflects	Intrinsic and transformative values
Pedagogy	Transformative
Desired change	Contextually appropriate balance between autonomy and integration (i.e. healthy, sustainable relationships) in and between systemic levels

Purpose - there is a sensibility of purposefulness in this paradigm which is neither crudely behaviouristic nor helplessly relativistic. This is based on the belief that we need to urgently work towards (and through a whole systems approach, we can reasonably know and distinguish between) 'more' and 'less' healthy/sustainable relationships and systems.

Environmentalism, ecologism and dualism - in the new paradigm, dualism is as far as possible transcended through conscious appreciation of the whole, and caution in the use of language. The pervasive notion of a separate 'environment' is downplayed in favour of integrative, systemic, concepts and approaches, whilst still fully recognising the 'more-than-human' world.

Behaviourism v. constructivism - beyond these two poles, there is a strong sense that people's behaviour patterns need to change to achieve more sustainable lifestyles, that the general direction of necessary change is known (as evidenced by successive global reports, for example Loh 2002), and that education and learning has a critical role in enabling such lifestyles. At the same time, this sense is also informed by awareness of the worldviews that inform both behaviour and the social structures that influence behaviour, and by a belief in the necessity and value of participative and epistemic learning in transformative change towards a more sustainable state of being.

Content and process - the ecological paradigm recognises the primacy of relation - as regards the nature of *content*, the quality of *process*, and the relationship *between* content and process. To take the latter first: content and process are not separate issues. It is not a matter of 'content versus process', but their systemic relationship and recognition that 'knowledge-making' emerges from their synergy. *What* we know, and *how* we know are mutually influencing. We need to be more aware of how and why we may value some knowledge above others, the importance of context to determining what is worth knowing or learning, and our constructive role in meaning-making. The 'content is everything' view is suspect because it does not respect the learner's needs, uniqueness, and participative role. In addition, the question of 'who decides' the content and on what basis, remains. At the same time, the 'process is everything' view is insufficient because there is a general lack of ecological and systemic understanding in society: and as a colleague has said to me, unless there is access to new ideas, we are stuck with the same conceptual frameworks no matter how good the process. There is a parallel here with Capra's view of the learning organisation - that "emergence of novelty is a property of open systems, which means that the organisation needs to be open to new ideas and new knowledge" (2003, 107).

For better or worse, the chosen learning process and learning situation influences both choice of content, and how learners perceive meaning and participate in its

construction. (Technical training in industry, and A.S. Neill's Summerhill school, might be two very different exemplifications of this point.) In a designed systemic/ecological learning situation (see for example the Hawkesbury and Schumacher College examples in Part C), there should be coherence rather than contradiction or tension between content and process. The prior knowledge, interests of, and values and disposition of the learners are very important, but not *all*-important: the contextual issues of their learning situation are also important in determining worthwhile content. A whole systems view of the socio-ecological context suggests that systemisism and ecologism has to be reflected in content and curriculum, whilst a whole systems view of learning and the learner suggests that the participation and full engagement of the learner is essential to transformative change. As Stacey says (1996a, 332) in a statement which equally applies to the individual, "no-one can make a group learn. Whether or not it does so depends on its own spontaneous behaviour".

Education should rarely be either a matter of fixing detailed learning outcomes in advance, or its opposite, which is seeing what spontaneously emerges from an unstructured learning situation. Rather, the new paradigm suggests that we need to engage with the meaning of ecological or systemic literacy, preferably through learning/teaching in real and localised contexts. The methodology therefore is one of participative inquiry and systemic coherence in the learning situation which should - where possible and appropriate - relate to and engage with real contexts, issues, and places (see also discussion on curriculum in Part C.2.3). This contextual and systemic view of content, of 'located curriculum' or 'situational understanding' (Elliott, 1998), avoids both the extremes of behaviourism ('this is what you should know/do – and because we say so') and constructivism ('the only worthwhile knowledge is that which a group generates'). Rather, a systemic view of content/process is 'curriculum as lived experience' which reognises emergence rather than predetermined outcomes, and involves all dimensions of knowing: propositional knowing, practical knowing, experiential knowing, and inspirational knowing, the latter including the affective and intuitive domains.

With this said, some have asked me what concepts I would include in any taught curriculum as regards sustainability. My work in this area has had some influence (Sterling 1998, Sterling and Ali Khan, 1998), particularly in the English national curriculum, and has been taken up internationally. Whilst it is important to address the issue of content, and justify its selection and presentation, I worry about the status of 'content lists' in a performance and delivery-oriented educational culture - particularly

when such lists are detailed, prescriptive and linked to predetermined and measured 'learning outcomes', rather than general, indicative and allied to open-ended outcomes that can embrace emergence and the generation of knowledge in the learning situation. Some authors (Firth and Plant 1996, Wals 1999) have sought to provide 'process indicators' for environmental education, in an attempt to both provide an alternative to and yet subtly address the demands of a 'performance indicator' oriented educational culture. Such attempts provide a useful way to think in more detail about the content-process relationship, and engage educators in reflecting on their practice. Plant and Firth suggest six indicators based on the learners' experiences (note that these are relevant beyond 'environmental education' per se). How does the learning process:

1. give meaning to the learner's sense of self and his/her everyday relations with others and the environment? (interconnectedness and subjectivity)
2. allow the learner to experience the environment? (complexity)
3. address the notions of change, uncertainty, controversy and risk? (change and uncertainty)
4. develop experiences that link local to global contexts? (relation)
5. develop capacities for intelligent, individual, collective and reflexive action that is transformative? (transformation)
6. generate advocacy through lifestyle that demonstrates commitment to others and a real concern for the environment? (advocacy)
   (Adapted from Firth and Plant 1996, and from Blewitt's adaptation 2002)

Such indicators imply the operation of a participative epistemology.

Domains of learning - in the dominant paradigm, most learning is seen as a process which is predominantly cognitive: education *about* sustainability. In the participatory paradigm, the existential, ethical and affective, and practical domains of learning are also recognised through a whole systems view of the learner and of the issues which are the subject of study. Not least, this more whole approach is necessary given the existential anxiety that characterises 'the risk society', and the sense of despair that can be engendered in students who only learn at the cognitive level 'about' environmental and global issues (Hicks 2002).

Disciplinarity - the validity and contribution of disciplines is recognised, but they are also seen as 'systems of interest' which are too often interested in defending relatively closed and narrow boundaries and specialisms. Interdiscipinarity and multi-disciplinarity is welcomed in generating multiple perspectives on complex issues, but

the danger of confusion between ‘map and territory’ can still remain. Transdisciplinarity, mixing as appropriate with local and indigenous knowledge, and giving rise to new knowledge as an emergent property is seen as a significant and necessary approach to many complex sustainability issues.

Methodology - here, I re-iterate the point about the commensurability of alternative methodological paradigms, and the further point about the distinction between the level of methodological paradigm and the deeper level of cultural metaparadigm. I am not seeking then, simply to assert a participative methodology instead of, say, empirical-analytic traditions, in an attempt to negate the latter and affirm the former. Rather, whole systems thinking values the range of available methodologies, while seeing the emergence of the participative methodological paradigm as a more whole approach which both subsumes and changes the nature of other traditions (through operating within the context of the emergent ecological paradigm at meta level, which itself is seen as subsuming the mechanistic paradigm). This answers Hart’s call (2000, see above) for reconciliation of methodologies at a metaparadigm level.

View of learner - the behaviourist view of the learner is one of deficit and uniformity: learners (or ‘target groups’) are seen as unaware and/or ignorant, and all such learners will benefit from ‘delivery’ of the same programme therefore. The constructivist view of the learner is one of contribution and difference: learners have their own personal/tacit/local knowledge and experience and will bring this to bear in their meaning-making, and each learner is uniquely different. Again, the systemic view attempts to heal this duality. There is faith in, respect for, and appreciation of the learner: he or she may be relatively unaware or ignorant, say, of sustainability issues, but will inevitably construct and contribute to meaning from their own perspective. Through a process of transformative learning (see Part C.2.4), the learner is increasingly able to both realise and interpret the complexity of the world and their own responsibility, within the context of the well-being of the whole.

Autonomy and integration - this refers to the self-assertive and integrative tendencies of living systems (see discussion in B.1.6). As argued above, behaviourists argue for integrative, i.e. corrective, behaviour in the system to fit in with larger systems (this may be in the family, in the classroom, or in the ecosphere, on integration into systems of belief, for example). Constructivists emphasise building autonomy in the system/individual. From a systemic viewpoint, there needs to be a dynamic balance between integrative and autonomic tendencies at all system levels, and between

‘corrective’ and ‘meaning-making’ interpretations of learning. Too much integration leads to Wilber’s pathological hierarchy and loss of individuality and autonomy, while too much autonomy leads to a loss of appropriate response to context or metasystem and social and environmental breakdown. Both situations are unsustainable. In educational terms, this means working for autonomy and self-organisation in relation to the health of the greater whole. This comes back to a systems view of sustainability and the nature of viable systems.

Territorialism - from a whole systems view, ‘environmental education’, ‘education for sustainability’ and ‘education for sustainable development’ are seen as coalescences of ideas and practices with a degree of internal coherence, not as distinct disciplines. Practitioners need to maintain indistinct boundaries which are necessarily permeable to allow influences to migrate ‘in’ and ‘out’ - that is, they should be open systems. As systems of interest, they should serve to help transform educational thinking and practice as a whole, rather than primarily seek to preserve and strengthen their separate identity and integrity. They should seek co-evolutionary change through alliance with parallel and related movements in formal education (such as development education, peace education, citizenship education, holistic education, *et cetera*) and non-formal (such as Participative Rural Appraisal and community development) and with sustainability movements in wider society.

Labels and ‘good education’ - labels both matter, and do not matter. They matter in as much as they carry and signify meaning. Labels like ‘environmental education’, ‘education for sustainability’, ‘education for sustainable development’, and similar others, are models. Like any model, they serve to simplify and communicate, but can also confuse through implying both more distinctiveness and shared understanding than may be the case. Intended connotation, and actual interpretation can differ markedly. So the undoubted utility of these names as shorthand in communication is countered by the possibility of misunderstanding between parties. Further, they can fragment: labels are banners around which acolytes gather and develop their common identity and often, an exclusive lexicon and literacy. Therefore, we need to look beyond the label, and it is here that in a deeper sense, labels do not matter. I am much less concerned about the label, whether any of those above, or ‘citizenship education’, or ‘personal and social education’, or ‘moral education’, or any other category for that matter, than I am about the manifested values and philosophy in any educational policy or practice. At the same time, the proliferation in recent decades of ‘adjectival educations’ - each concerned with some aspect of social change - seems ironic (if

understandable), given that many of those working in these areas seek a more holistic education than that offered by a compartmentalised and reductionist mainstream. This is why I have suggested 'sustainable education' - not as yet another adjectival education, but to suggest the need for and bases of a changed educational paradigm. (In doing so, I am aware of the communicative importance of labels, but also of the danger that this one may nevertheless be perceived as another adjectival education, or misconstrued as equivalent to 'sustainability education'.)

This raises the issue of whether 'good' environmental education is no more than, or can be equated with, 'good education'. This has been debated within the environmental education community (Hart, Jickling and Kool, 1998, Wals 1999, Scott 2000). To some extent this equation is justified: the recent emphasis in environmental education on the quality of the learning experience inevitably parallels discourse on learning in other 'non-environmental' educational fields. Thus for example, Hart, Jickling and Kool (1998, 220) imply that environmental education should be "interdisciplinary, participatory, critical, community-based, values-based, and inquiry-based", a methodology that most liberal educators would recognise as not belonging to environmental education, *per se*. Yet, seen against my notion of sustainable education, this is 'necessary but not sufficient'. There are two issues here, and the first we can dispose of quickly. Environmental education is *not* equivalent to good education where the latter is informed by unexamined 'old paradigm' mechanistic values. In this I would place much of the current debate and practice which is narrowly pursuing centralised curricula, 'standards' and targets (see discussion in Part B.3.3). This is not what Hart *et al.* mean by participatory education, of course. The second issue is that there is no equivalence if, in asserting 'it is all just good education', we lose our ecological context and the urgency of the sustainability transition - and in some forms of constructivism, as argued above (and in also in Part C), there is just this danger.

My view of environmental education is one that is predicated on the concept of *wholeness* as a normative, a descriptive, and a theory-in-action principle. It is not based on an idea of a *separate* 'nature' or the 'environment' as such, but on a whole systems view of human *and* non-human reality, which includes what we refer to as nature and environment. As I have suggested in Part A.3.1:

- Keypoint: an ecological epistemology suggests a conceptual meta-connective pattern which links sustainability, learning and ecology, based on such ideas as the development, creation and maintenance of potential through self-organisation and a balance of autonomy and integration between systemic levels.

Here we have an emerging philosophy of relation that is ethically tenable, scientifically supported, and practically indicative (the three dimensions again), such that we might learn towards a healing systemic wisdom.

An environmental education inspired by such a view is inclusive, systemically coherent and purposeful, and seeks to influence the wider context of educational thinking and practice accordingly rather than maintain a separate existence. Something of the synergetic nature of such environmental or sustainability education is reflected in Bawden's summary of the process of organisational and community learning and development at Hawkesbury College (see Part C), where he says the aim of the activities and outcomes of this process are (or were):

> …aesthetically acceptable as they are technically possible, as ethically defensible as they are economically viable, as culturally feasible as they are socially desirable, as spiritually compatible as they are practically manageable, and as ecologically responsible as they are politically supportable (Bawden 2000b, 300).

This manifestation of whole systems thinking in an educational context raises the issue of how such change is nurtured or facilitated, and the question of educational design and management. These issues are considered in the next subsections as way of drawing the main part of this inquiry to a close.

In sum, in this subsection I have attempted to look at some of the recurring issues in the environmental and sustainability debate, and comment on these from a whole systems viewpoint in order to indicate some bases of a whole systems or participatory paradigm for sustainability education that might help the field move forward effectively and be more transformative.

1.3 Design and the learning situation

A key question remains, one that has been touched on already in discussion on ecological design and on transformative learning. This is whether learning experiences and change strategies can be designed that nurture the ethos, eidos and praxis of sustainability.

Earlier, I have discussed *vision* and *image* from Banathy's model of systems design of education previously discussed in Part C (being vision, image, and design), and now I turn attention to *design.* As I have argued previously (see Sterling 2001), there is nothing intrinsically ecological about this triadic model, or my own triadic models, except when the parts are seen as an integrative and nested whole, and they are inspired by an ecological rather than mechanistic or relativistic vision. If the latter, design and strategy will be problematic. As individuals or institutions are guided by unexamined mechanistic or relativist assumptions and values, learning situations (particularly formal ones), are not likely to be designed well toward sustainability. Attempts to do so are likely to interpret sustainability in simplistic terms, and change in terms of goal-seeking strategy. But as Stacey and others point out, the usefulness of strategies based on corrective behaviour around fixed goals, is dubious in anything other than the very short term or simple situations, because of the uncertainty introduced by complexity. As Flood states: "…complexity theory casts doubt over the claims of traditional strategic planners" (Flood 1999, 129). The trouble with mechanistic strategies, management and design, is that, very often, they do not work - apart from perhaps, in the shortest time-scale and narrowest of contexts. The more detailed and long-term they are, the more likely they are to prove erroneous as time goes by. Instead, complexity suggests we have to "know within the unknowable, manage within the unmanageable, and organise within the unorganisable" (Flood 1999,129).

This means that, paradoxically, (and put simply) we are more likely to move towards sustainability by participative engagement, than by planning for it from the top - because it is an emergent property rather than a fixed goal. This does not imply we abandon design in education and learning, in policy and practice, but re-think it, paralleling the ecological design movement (examined in **Appendix I**). Echoing the idea of design as *intention*, it raises the question of purpose and fundamental ethos which guides our design and praxis, and this comes back to the question of 'vision'. If we are able to rethink our epistemology - that is the whole area of 'purpose/ethos/vision/metaphor/assumptions/philosophy' - then image and design change accordingly. Sustainable education does not imply planning for utopia but designing for healthy emergence, for what Smith has called 'sustainable learning' (2002). As we have seen, emergence happens 'anyway' - qualities such as trust or fear, buzz or boredom, collegiality or isolation, inclusion or alienation, innovation or stasis, creativity or rigidity, cohesion or alienation, arise depending on the total design and actuality of the learning situation. Stacey is wary of design if it means imposed vision or blueprints: rather, "any design consists of the basic design principles of the

system itself" (Stacey 1996b, 13), through which (I would add) healthy emergence and positive synergies arise. What he seems to mean - and this is a strong philosophic point borne out by chaos theory - is that in a real sense the design is 'there' already, order is immanent in chaos. We 'just' have to recognise it. As Stacey says, "we are a part of nature and so, not surprisingly, we are not all that different from it - we too are creative when we operate at the edge of disintegration" (1997, 21). In short, our understanding of complex living systems is providing us with new principles of ecological design and management. Mechanism, the idea that we *always* have to order, intervene and control prevents us from recognising and embracing this immanent design, and for this reason, paradoxically, we need 'design as intent' to realise, appreciate, and 'allow' living systems design.

Stacey stresses the role of leadership here (and this seems applicable to any educational situation, particularly in relation to trying to realise sustainability): "the true role of the leader of a creative system is, not to foresee its future and take control of its journey, but to contain the anxiety of its members as they operate at the edge of chaos, where they are creating a future that none could possibly foresee" (Stacey 1996a, 346). Similarly, Capra (2003) speaks of the importance of leadership to facilitating emergence, which he says means "facilitating creativity" (106). This requires openness and "a learning culture in which continual questioning is encouraged and innovation is rewarded" (107).

By contrast, the mechanistic, goal-driven, outcomes-oriented, performance-evaluated paradigm tends to suppress creativity and squeezes out the space where edge of chaos conditions can operate. Where then, are the design principles to be found that make a transformative learning situation more likely in any particular context, or bring us closer to the realisation of sustainable education?

There is no formula or blueprint of course, but many of the concepts and models outlined in this Thesis suggest ingredients and broad principles that any educator, institution or organisation might consider as they develop their own visions and designs. By way of summary and reminder, some of them follow:

- my model of *extension, connection* and *integration,* and of *re-perception, re-cognition and realisation* (discussed in Part C) and illustrative 'image' of sustainable education (**Appendix II**, Box C.3)
- shifts in purpose, policy and practice, suggested in Part C.2.3, Box C.4

- the conditions that support transformative learning suggested in Part C.2.4
- learning levels and the distinction between learning 'about', 'for' and 'as' sustainability, outlined in Part C.2.4.
- key ideas such as systemic coherence, synergy, and the difference between systemic and piecemeal change
- the meta-connective pattern: connecting learning, self-organisation and sustainability
- Bawden's characteristics of a 'self-organising critical learning system' outlined in Part C.2.4
- ideas on viable and resilient systems, and the principles of ecological design (outlined in **Appendix I**)
- work on process indicators, such as Plant and Firth (1995), Wals (1999)
- adaptive management and other management principles suggested by complexity theory outlined in Parts C.3.1 and by Table C.3 **Appendix II** (Sterling 2001)
- Banathy's ideas (1991, 1992) on systems design and co-evolutionary change in education
- conceptual schemes such as Capra's principles of ecology (Crabtree 2000) or Thomashow's biospheric curriculum (2002), and my own work (Sterling 1998, Ali Khan and Sterling 1998).

Leadership is key if we are to escape the lasting influence of mechanist and reductionist thought patterns in education on the one hand, and the rather vision-less influence of deconstructionist thought, on the other. Stacey points to the importance of systemic thinking to leadership (1996b), and of reasoning by analogy and intuition rather than by formula (1996a, 313). Similarly, Reason and Goodwin suggest that seeking to influence systems beneficially, requires the "cultivation of the intuition as a way of perceiving the integrity of healthy wholes and hence the capacity to see disturbances from health" (1999, 293). This applies to all situations, all systemic levels, and nesting relationships, and perhaps to all of us - given Meadows' (1992) exhortation that everyone needs to be a learning leader in the sustainability journey.

Essentially, revisioning education is about re-discovering or reclaiming our own humanity, wholeness and connectedness. The possibility and the influence of a new sustainable education paradigm is perhaps summed up in what Zohar and Marshall (2000) call 'spontaneity'. This, they say (drawing on the original Latin), means a deep response to connectedness - we are responsible because we know we are not

separate from others or the world. Thus, transformative learning - at all systemic levels - towards a greater responsibility, is paradoxically, a sort of coming home to that which we already know, to ourselves and our one Earth. “Real transformation”, state Zohar and Marshall (2000, 274) brings us “back to the place from which we started, only now to live it fully alive and aware”. This evokes the original meaning of education, *educare,* to draw out and realise our existing potential, and in relationship to the wider ecology of others and the Earth.

2 THEORY AND PRACTICE

2.1 Looking at feedback

How does this Thesis relate to practice? Unless it does so, its standing as worthwhile inquiry is open to question. Discussion about paradigm and paradigm change can seem very remote from dealing, for example, with class 4C on a wet Friday afternoon, or with a community group concerned with lack of facililties. Yet, following Bateson, I believe that our individual and shared paradigm positions directly influences the set of possibilities that we consider and use in any practice, whether or not we are conscious of this influence (see ‘Levels of systemic knowing’ diagram in Part B.1.3). As I have said in Part A, this is an informative inquiry about transformation, that I believe might help others engage with issues of transformative learning and paradigm change. This subsection presents some evidence that helps substantiate this belief.

As related in the Preamble, the Thesis has not arisen in a vacuum but from the basis of over thirty years involvement in the field of environmental and sustainability education, variously as a teacher, lecturer, researcher, writer and consultant. Hence, I have been involved in dialogue through teaching, speaking, reading, writing and listening for a good many years. So I have written papers, given workshops and seminars, and taught (particularly on the London South Bank University masters’ course since 1994) and all this time have been evaluating ideas and listening to others’ views and experience, including of course, those of my students. The extensive feedback I have received, personal, direct and indirect, is evidence of the validity and usefulness of the arguments I have been developing, but has also indicated that a significant minority of educators are thinking along parallel or similar lines. In short, I have been encouraged and invited to write and lecture because it resonates with people’s own thinking and experience, and, it appears, helps them to move forward. What follows is not intended as a laudatory piece, but evidence that the kind of ideas that I have presented in the Thesis have validity because they affirm and strengthen other’s thinking and

professional practice, from student teachers through to policymakers. Where communication has been personal, I have kept people's identity confidential. Most of what follows concerns feedback on my book *Sustainable Education,* or on invited lectures based on the book.

A selection of personal communications

- 'I was hooked...it was easy-reading and I was immersed in a world that echoed a lot of the things I have been saying and writing to environmental educators down here in Australia for the last couple of years! I couldn't put the book down and within a couple of days I had read every word, cover to cover. Ideas were swimming in my mind...and I was excited about the direction of EE (or, should I say, sustainable education). By early September, I was using Sterling's work to inspire others in a keynote to educators taking time out for an environmental education residential conference. I used much of Sterling's ideas to foreground many of my own ideas on how to integrate EE in the school community...the keynote (about 2 hours with questions from the audience) was a hit and got people talking and thinking beyond the boundaries! Anyway, the influence of Sterling has not stopped here, by early December 2001 I was/am sitting on an expert committee to support a Review in Environmental Education in Australia...which is looking at the aspect of sustainable education. At one of the early meetings I highlighted some of the ideas presented by Sterling...and a key member of the Council commissioning the work, has since read the book and has been inspired by its contents...' – email to Schumacher Society, 14/1/01
- 'A colleague at Kingston University says he is basing most of his thoughts on curriculum review on your book.' - email from university lecturer, Swansea, 24/6/02
- 'I need a copy of your book to write policy advice for the Dutch government - any chance you can send me a copy quickly?' - email from professor, Netherlands 5/11/02
- 'I am completing a PGCE in Northern Ireland and was recently given a summary of your recent lecture. Your message at the conference really struck me...sometimes I feel very overwhelmed at the work that needs to be done... but to know I myself can have a small role in this work is exciting.' - email from student teacher, 12/01/03
- 'I along with many other educators in South Australia have been greatly informed by Sustainable Education....' - policy officer, Adelaide, email 15/02/03
- 'Thank you for your inspiring talk which has generated a lot of interest. Best wishes for your thesis and work to bring a more enlightened understanding of what education can and should be'. - lecturer, further education college, Hereford, email 9/03/03
- 'We used the Briefing extensively in the working up of our curriculum within the organisation, particullarly as a supportive ideology. We've had a lot of discussion about how to shift our programme away from transmissive approaches towards transformative approaches. Your Briefing helped bring together a range of philosophies into one source' – director, wildlife NGO, UK, email 19/6/03.

- ‘You have brought forward many of the ideas which need to be considered before any environmental education program can be effectively implemented. Without consideration of such fundamental concepts, a program becomes the application of a procedure empty of meanng for both teachers and students. With consideration of the deeper issues you present, a program will be subtly altered so that it leads to expanded understanding and a greater heartfulness.’ - education academic and systems scholar, British Columbia, email 20/6/03.
- ‘We have used your book widely in New Zealand re sustainable education and with regard to the need to move from a transmissve paradigm to an ecological one...key aspects of your paradigm follow the directions we are trying to move education in New Zealand.’ – New Zealand Association for Environmental Education, email 12/6/03
- ‘In seeking to set up an ecological education centre that would address the sustainability issues and educational challenges of our times, I came across Stephen Sterling's outstanding publication 'Sustainable Education'. This Briefing facilitated such a profound transformation in my worldview, that I immediately changed the name of the organization to the 'Centre for Sustainable Education' (CSE). Stephen's analysis of the need for sustainable education using whole systems thinking has laid the foundation for the CSE business model. His methodology for design has been instrumental in the formative process of CSE. When CSE is up and running, Stephen's seminal work will continue to inspire and guide all levels of the organization: from structure to operations to pedagogy. His Briefing is a masterly work - the definitive handbook for a sustainable future.’ - centre founder, Devon, email 6/8/03.
- ‘Fostering the ability to empathise, to think critically, to imagine, to design and create must be central to a sustainable education, along with fostering a desire to love and care for one another and the environment...Thank you for your heartwarming and inspiring book which makes me feel optimistic that a sustainable education will be acheived’ - senior teacher, letter, 7/10/03.
- ‘Since the Austrian government ratified the national strategy for sustainable development in 2002, a number of working groups were established and one of them is dealing with education in the context of sustainable development. The FORUM Umweltbildung is charged to design and implement education in the context of sustainable development especially for primary and secondary schools in Austria. We came across your publications in this context and found them highly interesting and very useful.’ - FORUM, email, 5/12/03.

A selection of reviews

- ‘I’d like to refer to Stephen Sterling’s book as the most challenging book written so far this century...Sterling has brought theoretical coherence to values which many of us whol worry about the global future share and he has expressed this cogently and lucidly.’ - Professor Michael Bassey, *British Educational Research Journal,* vol 28, no 6, BERA.

- ‘This is one of the most important books to inform and guide any person or organisation in being effective change agents for ecological health. Sterling has given personal insight that is lucid and senstive to the ecological perspective, obviously earned through years of experience thinking, teaching and attempting to effect systemic change.’ - Andrew Eldredge, freelance educator, California, review on www.wwflearning.co.uk, September 2001.
- ‘I recommend *Sustainable Education..*it led to a lot of discussion among me and my friends about what education should be about....it made us more determined to educate for sustainability in school.’ - teacher member of WWF on-line debate on ESD, www.wwflearning.co.uk 10/02/03.
- ‘That often over-used descriptor “ahead of its time” is also eminently applicable to *Sustainable Education...*what most impressed me about this book was the balance it achieves between a critique of existing mainstream education and its offering of a vision of an alternative, post-materialist ‘sustainability’ paradigm which already has a number of practical precursors worldwide’ - Richard House, *Steiner Education Journal*, 36 (2), 2002.

It has not been possible to keep track of how the book has been used but some specific uses of which I am aware include:

- Use in the development of the Baltic Agenda 21 initiative whereby eleven Baltic States produced a strategy to reorient their educational systems towards sustainability. The lead policy officer in the Ministry of Education, Sweden, referred to the book as ‘my bible’. A book incorporating some of my work was sent to all schools in Sweden in 2002, as one outcome.
- Development of the curriculum framework of a major British wildlife NGO (Wildfowl and Wetlands Trust).
- Development of a strategy framework for sustainable schools in South Australia
- Uptake as a set course book in at least four institutions (University of Strathclyde, University of Plymouth, London South Bank University, Macquarie University, Sydney).

In my own work, I have used my whole system approach in extensive lecturing, teaching, seminars, particularly since publication of *Sustainable Education*, and in my consultancy. My approach is distilled in Unit 7 *Education for Sustainability* of the London South Bank University masters’ distance-learning programme, a unit which is consistently highly rated by students, and applied and adapted by them in their own work contexts. I will be updating this unit in 2004. Consultancy where my systemic approach has been central has included a research report on curriculum change for Project Carrot, whereby Holme Lacey College has sought to transform its role and work

as a land based college toward being a centre of excellence for sustainability (Baines and Sterling 2001), and an evaluation and review for Schumacher College which looked particularly at the nature of transformative learing experience at the College (Sterling and Baines, 2002). I have written two book chapters by invitation, based on the Thesis (Sterling in Corcoran and Wals, in press, and Sterling in Blewitt and Cullingford, in press).

Lastly, since 1998, I have taken the lead role in a curriculum development project for WWF Scotland, called *Linkingthinking.* Through this project, which seeks to demystify and introduce systemic thinking to educators and students, I have been able to develop practical professional development and teaching materials which nurture whole systems thinking capabilities and perspectives. The materials were successfully trialled in the first half of 2003 and will be available early in 2004. Professor John Smyth, an internationally recognised authority on education and sustainability commented:

> The complaint is sometimes made by the educational establishment that EE/ESD consists of more or less everything, capable of being all things to anyone, with no hard, definitive academic core. But acknowledging that systemic thinking is a valuable and even necessary skill which is still unprepared for in all but some specialised tertiary courses, we have here the answer in a form adaptable to every level of education.
> (WWF Scotland, 2003)

In sum, I have tried to bring together visionary, critical and practical dimensions in my work, and feedback from the field suggests that many find this approach meaningful and inspiring in their own practice. Further, there is evidence that sustainable education ideas have not just been helpful to individuals but assisted people feel part of a movement or wider network of educators involved or interested in more integrative and transformative education.

2.2 Towards the sustainable institution

A critic might say that much of the argument in the Thesis sounds idealistic, given the very real policy, structural and market constraints facing formal education. Yet there are still choices to be made, both long-term and day-to-day by all members of the education community. I have said that the sustainable education paradigm is, by definition, indicative rather than prescriptive - and the feedback above shows that practitioners inspired by such ideas are able to interpret and innovate within their own

professional contexts. But some indicative picture might yet be illustrative to the reader. I will take the example of the educational institution or organisation, and to finish Part D, suggest some brief indicators which follow from the principles of the paradigm. These should be regarded as interrelated and constituting a systemic whole rather than as a 'ticklist of separate boxes'. How far does the institution:

- review its fundamental ethos, purposes and mission on an ongoing basis in the light of the sustainability challenge;
- audit its curriculum in sustainability terms;
- review its purchasing, investment and local spending with environmental and ethical criteria in mind;
- audit its ecological footprint including transport, energy, water, and use of other resources;
- pay attention to the quality of its built and natural environment in aesthetic and environmental terms;
- engage in a participative and democratic management style involving all members of the community;
- engage all members of the community and their enthusiasms in situated real-world issues;
- promote cooperative and critical inquiry;
- recognise the spiritual, affective, imaginal, and practical aspects of learning as well as the cognitive;
- encourage and facilitate creative, critical and systemic thinking;
- experiment with inter- and transdisciplinarity;
- work with staff to develop varied and participative pedagogies;
- live an ethos of caring and inclusion;
- develop the culture and critical reflexivity of the learning organisation and pay attention to 'learning about learning' both within and without the formal learning situation;
- develop an ethical and responsible research agenda;
- encourage interaction with the immediate and wider community;
- value time and space for reflection and innovation:
- increase connectivity and communication in the institution to facilitate emergence and creativity;
- pay attention to emergence in the learning situation.

Whilst not exhaustive, such ideas indicate the kind of 'lived qualities' that a sustainable institution - that is, an insititution attempting to be a reflective 'microcosm of a sustainable society' - would aim towards. Such change requires the evolution of a collective intelligence and culture. It requires not a top-down, piecemeal or systematic response, but systemic and owned engagement, which may be small-scale and gradual at first.

The emergence of an appreciable number of national and international websites and networks on sustainability and education over the last decade is evidence that significant innovation is occurring, particularly among smaller institutions which are more flexible. Given that there is growing evidence of the sustainability paradigm influencing mainstream thinking, policy and practice in such sectors as economics, politics, agriculture, energy, resource management, transport, health, production, waste, engineering, construction, design, and business and the professions - all areas served by formal education - a commensurate response by education as a whole, based on the primacy of *relation,* is both necessary and timely.

3 SUMMARY

In Part D, I have been concerned to look specifically at environmental and sustainability education discourse, and suggest how the ecological worldview, articulated through whole systems thinking, gives rise to a participatory educational paradigm that helps the field move forward by addressing many of the issues that render the field problematic. I have looked briefly at the issue of design and noted that many of the ideas here have found resonance with others' views and practices.

In the concluding Part, I reflect on the Thesis in terms of remaining issues and research challenges. To round off the Thesis' argument however, I begin the Part by using the 'edge of chaos' model to suggest further patterns of connection. I have already suggested above the possibility of a meta-connective pattern that brings together learning, sustainability and management, centred around self-organisation. I now want tentatively to push this argument another step, and in so doing, bring together many strands of the Thesis.

PART E – CONCLUSION

Purpose: to summarise the argument, reflect on the Thesis, outline further research and provide a conclusion.

Introduction

In the concluding Part, I revisit the triadic model to suggest a meta-pattern of paradigm change and learning. This summarises the argument whereby epistemic learning is seen as giving rise to an ecological worldview which sets a context for preceding worldview 'moments'. In the second section, I stand back and reflect on some of the issues that arise from the Thesis and the argument therein, and outline avenues of further research. Lastly, an overall conclusion is drawn.

1 PARADIGM CHANGE, LEARNING AND THE META-PATTERN

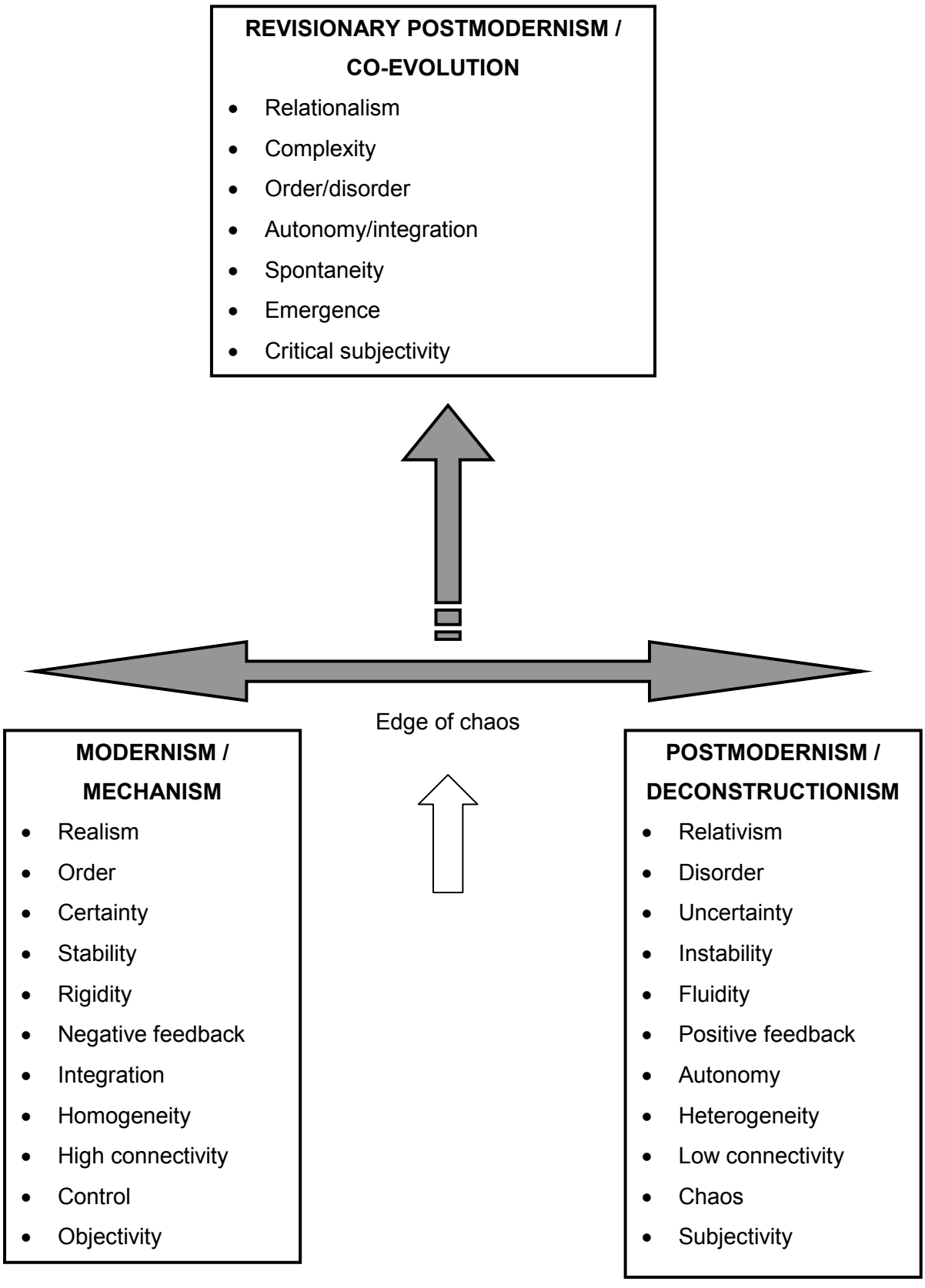
There seems to be a meta-pattern, which I suggest as a final and (rather dauntingly) whole integrative hypothetical framework for much of the ground and argument covered in the Parts above, building again on my triadic model.

With the work of such writers as Stacey (1996), Reason and Goodwin (1999), and most latterly Capra (2003), on living systems and organisation in mind, it seems valid to propose the following model. Here, I have cautiously but intentionally associated what such writers have said about the dynamics of any living system human and non-human, and set this with the fundamental pattern of three metaparadigms, being modernism, deconstructive postmodernism, and revisionary postmodernism, reviewed earlier as systems of thought or epistemologies.

There seems to be a parallel here between the dynamics of living systems and our own paradigmatic thinking (see Diagram E.1) below. Hence, the first, left-hand position, is the dominant paradigm, rooted in modernism, mechanism, and realism. The second, right hand position, is the deconstructive postmodern stance, embracing constructivism, idealism and relativism. The first position is associated with control, belief in and the assertion of certainty, determinism, structure, authority and so on. The second critiques this and asserts individualism and autonomy, and questions any final authority, certainty or validity. The horizontal double-arrow suggests a spectrum of belief here. Using complexity theory, the extremes of the arrow suggest *breakdown* of

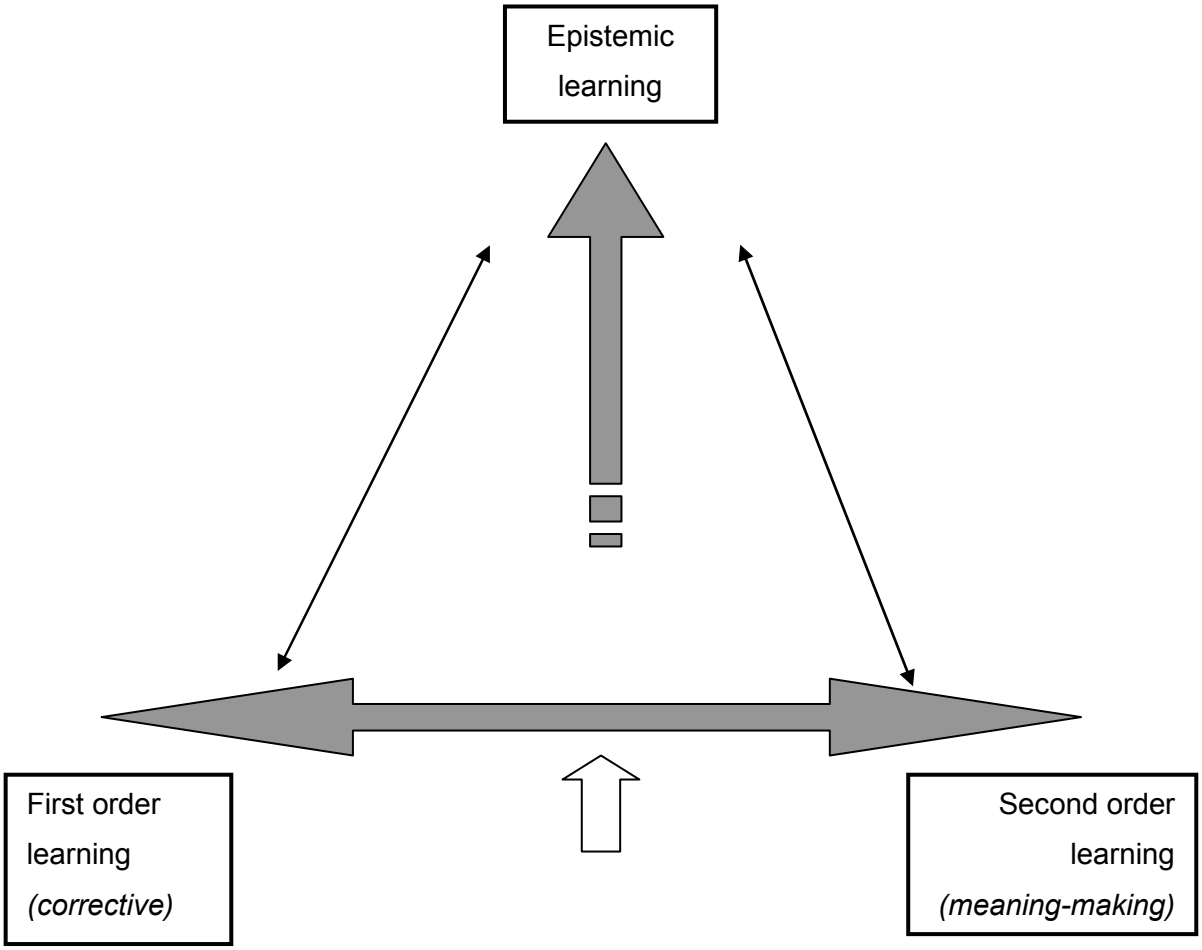
systems - through too much rigidity at one end or too much randomness and dis-integration at the other. This also applies to organisations, structures and communities which manifest these patterns of thinking at these extremes. This echoes the ideas examined in **Appendix I** (Holling, Gunderson, Peterson, 2002) about unsustainable systems being those that are caught in either a ‘rigidity trap’ or ‘poverty trap’. Rather alarmingly, and if valid, this model seems to illumine many of our human systems as lying perilously close to both extremes of this spectrum, characterised by too much control and mechanism at one end, and too much social, economic and ecological chaos at the other, with both states seemingly locked into a dangerous positive feedback loop. If this analysis is valid, we badly need to recognise the possibility and promise of the third state through transformative learning, before we experience large-scale systemic breakdown. Yet, at the same time, this crisis makes the possibility of breakthrough more likely.

Diagram E.1: Putting it all together – three metaparadigms



Taking this working hypothesis further, if I now overlay my work on learning levels (or orders of change), the following is obtained (Diagram E.2).

Diagram E.2: Orders of learning



This is another rendering of the triadic model which I have represented previously as nesting systems and in a Venn relationship, respectively. Here, I have used an upside-down 'T' to indicate 'edge of chaos' as a 'breakthrough' state from the main spectrum.

Echoing again my argument about evolutionary change in paradigms (rather than incommensurability), we can say that the dominant modernist paradigm is relatively 'stuck' - that is, not self-aware, or is unwittingly self-referent - within first-order, 'more of the same', change. Indeed, as Bawden (2000a, 9) states: "by virtue of its own epistemological, ontological and axiological foundations, it cannot be self-critical".Thus, the second position on the diagram, the postmodern deconstructionist position, has had a very important liberatory effect - it may be seen as second order change or

learning whereby modernism is deconstructed, yet its own constructs do not admit the possibility of progress beyond this position.

Now let us turn again to the meaning of learning. As noted in Part B, it is partly involves *correction* and partly *meaning-making*. The first position, as we have seen earlier, emphasises adaptive learning or correction (often directed). The second position puts far more emphasis on meaning-making and critically reflective adaptive learning (often owned).

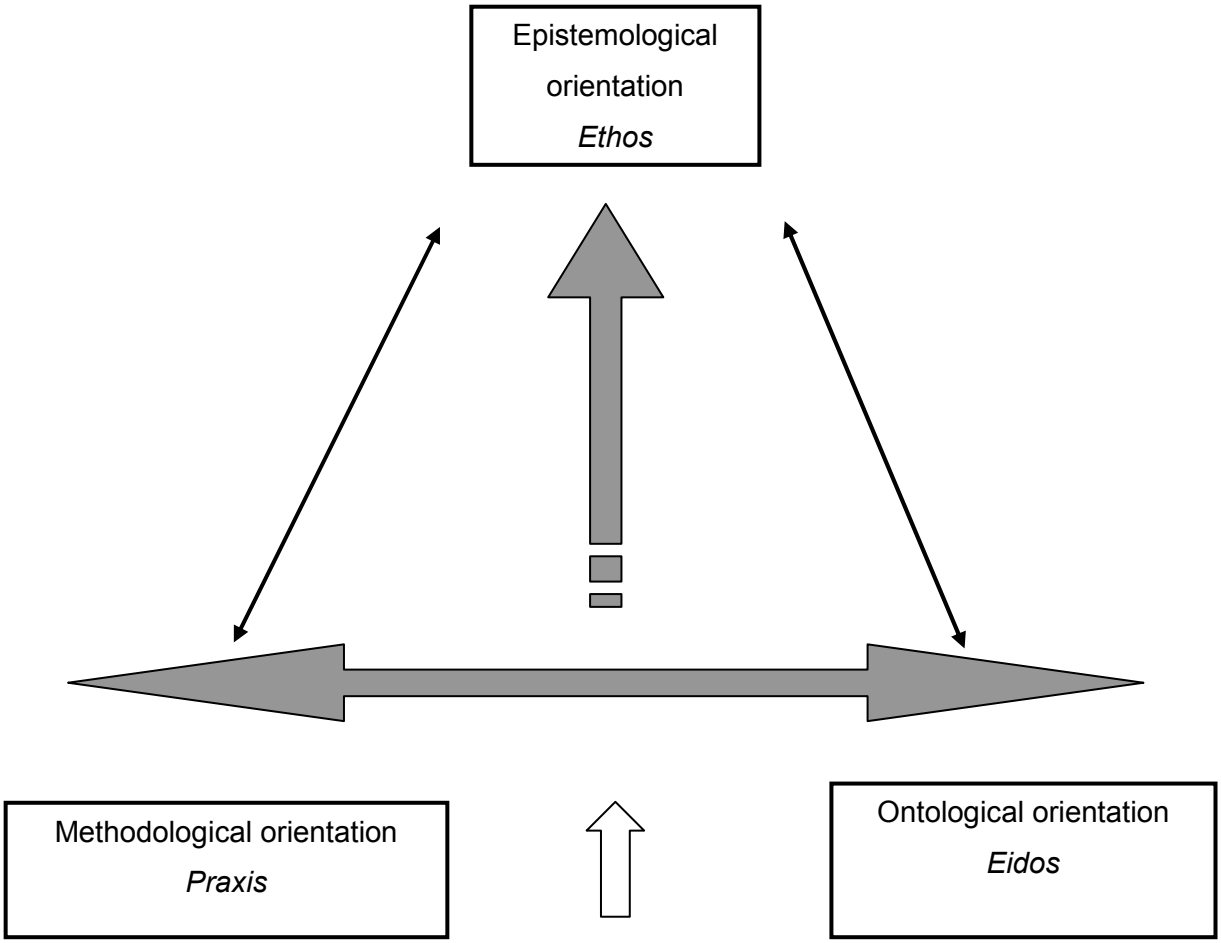
This brings me to a key point which has been touched on above, but I can now clarify further.

- Keypoint: These two paradigmatic positions both limit the extent of individual and social learning that our current world conditions urgently require. Modernism is unable to achieve sufficient correction necessary to move towards sustainability, deconstructionism is unable to generate sufficient meaning that gives us any guidance as to validity and worthwhileness. The result is that we have *a double crisis, of action and purpose.*

As the diagrams indicate however, we have a third choice, and this is epistemic learning which suggests a participative, ecological or relational worldview. This does not arise in isolation, but as third-order change, that goes beyond modernism and deconstructionism. At the same time - as its central position on the diagrams implies - it draws from both the previous positions, not least bringing together the corrective and meaning-making aspects of learning within a purposeful gestalt.

To complete the picture we can enter other key parts of our earlier triadic model (Diagram E.3).

Diagram E.3: Overlaying the three dimensions of knowing and experience



The black double-headed arrows indicate that third order change draws on the other two positions but also, as noted in Part B, feeds back to them, transforming and reorienting them in the process. Put more graphically, from the epistemic position, the whole view of the landscape below changes, including our ontology and our methodology. As I have argued, I believe that epistemic learning inevitably leads towards a relational or ecological worldview, wherein our Seeing, Knowing and Doing are more whole.

2 ISSUES AND REFLECTIONS

2.1 Issues

To assist clarity, I present these issues as a series of second-person questions and first-person answers.

1. *Is not the problem with all holistic approaches one of limitless boundaries? Have you not been in danger of saying rather little about detail?*

It is a matter of being aware that, although 'everything interrelates with everything else', we cannot capture or completely conceive the whole: it is about 'knowing that we don't know' and in Flood's terms (1999), attempting to learn and know within the unknowable. The argument in the Thesis focuses on paradigms, and this is where I have drawn my boundaries as regards subject matter. It is about the bases and possibility of paradigm change rather than about detail - about principles rather than specificity. If the argument is valid at this root level - and it is offered in a spirit of inquiry rather than certainty - it is for others (as well as myself) to evaluate and critique it, and if persuaded it is worthwhile, develop and investigate the detail and implications in their own contexts and circumstances.

2. *Is there not an inherent paradox here? You are critical of rationalism and have argued that rationality alone will not bring about the paradigm change you seek, yet this Thesis seems presented as a rational argument.*

I am critical of an instrumental and technocentric rationalism which denies the spiritual, intuitive and emotional aspects of knowing and of our nature. At the same time, I recognise that reason and intellect are valued in our society, albeit often to the exclusion of other ways of knowing. My argument has been that our inspirational knowing and our values inform our reasoning, and hence, that it is the quality of our underlying assumptions which is critical, whether or not these are recognised. This is a piece of academic writing which seeks to bring together - using Bateson's terms - both rigour and imagination. I have mounted an argument informed by deeper ecological values to deconstruct and critique instrumental rationalism, and suggest an alternative (whole systems thinking). At the same time, by using abductive thought (see Part A) I have used non-rational approaches to make intuitive leaps and discern pattern and connections which are reflected in the argument - and importantly also, in the structure which is not simply linear. While rational argument alone cannot bring about paradigm

change, or offer the experience of participative consciousness, it can help open perceptual doorways to more holistic and personal experience that accompanies transformative change, depending on the starting point of the learner. The task, as Kidner points out (2001, 37), is “not to reject the intellect permanently or completely, but rather to make it more accountable to those other faculties through which our relation to the natural order is sensed and expressed, so that it regains its consistency with these other faculties and so become integrated within a rediscovered whole”. I see the Thesis as a contribution to this end.

3. You seem to have a problem with the adequacy of language - can you comment on this?

The problem is one of language, meaning and communication. Our existing literacies and lexicon in this area offer limited potential to generate re-perception. So, the words:

- *ecology* usually connotes a narrow view of ‘ecology’, that is, most people think only about nature when hearing the term,
- *education* usually connotes a narrow view of ‘education’ and learning, that is, most people think only about schools, formal education and teaching when hearing the term. Similarly, people tend to think about learning as something that happens through ‘education’, rather than as a process intrinsic to life,
- *systems* usually connotes a narrow view of ‘systems’, that is, most people think either think about ‘education systems’ or ‘health systems’ for example, if they are unaware of systems thinking - or about ‘systems as discipline’ or methodology, if they are aware of systems thinking.

In each case, I have tried to develop and convey an expanded meaning. Further I have used the terms ‘whole systems thinking’ and ‘sustainable education’ to denote a quality of paradigm change in thinking and in education. There is evidence that my use of the latter term in previous work has helped many re-think their view of the purposes and nature of education. At some future point, with the benefit of hindsight, these might prove to have been inappropriate terms, but there can be little doubt that the right term or neologism can help perceptual change. Koestler’s invention of ‘holon’, or Kuhn’s use of ‘paradigm’ are excellent examples.

3. *If the Thesis stands up, then it has radical implications. If this the case, then - taking a systems view - it might be seen as too challenging to existing systems of*

thought and educational organisation. If so, this challenge might lead to retreat, consolidation and nil learning. Would not this be the opposite of what you believe is necessary?

Significant challenge to existing assumptions can either lead to retreat or epistemic learning. I think that a significant minority (to use Heron's term) - and probably a growing number - are sufficiently disenchanted with mechanism and deconstructionism to engage with a positive alternative and this itself is hopeful. Second, I believe along with Clark, Capra, Brown, Milbrath and others reviewed above, that we need consciously to accelerate learning towards sustainability, and I think that an argument which provides both a deep critique of currency and a constructive vision of possibility can only help this process. I am encouraged by the response to previous work (notably *Sustainable Education*) that such work can be inspirational and can engage with some people's own experience and sense of the need for deep change.

4. *Does your triadic model really have widely applicable validity, or does it just seem so because you have tried - too hard perhaps - to make phenomena fit the model?*

This is a concern, yes. I am reminded of this quote:

> Generality is desired - but is also to be feared…because once a theory is formed, once it seems to resolve paradoxes, and once it passes some empirical tests, proponents are sorely tempted to extend its application beyond its natural context.
> (Holling and Gunderson 2002, 19)

On the other hand, the triadic model almost seemed to 'suggest itself' and its richness to me. I did not force it. I make little claim for it other than it seems to be liberating in helping me, and possibly others, think about our thinking, our existing traps (to use Vickers' word) and our possibilities. Perhaps I have tried to make phenomena fit the model, but the extent to which this is quite easily possible seemed to me to help validate the model. And maybe this is enough for now - prior to any pragmatic application. Perhaps, borrowing Heron's thought about the validity of informational/propositional inquiry (1996, 169), it is "not true because it works, rather it works because it is true: its working does not establish its truth, it consummates it". Yet, however received by others, the model is still only a model: I would not like it to become some sort of restricting orthodoxy. It only has value if it helps those who find it useful to transcend the limits of the dominant paradigm.

5. *Isn't the whole argument here too involved for most educators to understand or at least bother with? Also, isn't there a conflict between the values of participatory learning and 'starting where people are' on the one hand, and the need for an historic and urgent shift of worldview on the other? In other words, aren't you 'telling people what to think ', and is not the whole argument just too teleological and universalising?*

In answer to the first point, I hope that the argument helps move the discourse on - but it is not meant for 'most educators' in this form. I think there is an important issue as regards the second point: I accept that, on the one hand, we need to start where people are and that any change must be participative, and on the other, that urgent change is needed. But these are not necessarily separate. We seem to be in a chaotic and transitory age - many people have a deep sense that something is wrong but also, it seems, often have a similar vision of what they want. There is "a growing consensus on what the future we need should be like" (Hicks, 2002, 67). Such ideas as health, community, connectedness and belonging, fairness, a sense of place and wellbeing have a common currency. I see the Thesis as a sort of contributory lubricant to the sustainability transition - it is not a blueprint or prescription in any sense. At the same time, the choice and debate should not be - as it seems to be at present - between sustainable and non-sustainable paths, but between different possible paths to ecological sustainability appropriate to different contexts and localities. Hence, the ecological paradigm implies diversity within an overall unity.

6. *So how would you reconcile the charge that whole systems thinking is simply seeking to replace one dominant epistemology with another?*

The paradox of systemic thinking is that at meta-level it is an epistemology that is inclusive rather than exclusive: it embraces and requires multiple epistemologies within this meta-view. Similarly, Ackoff states (1999, jacket), "It is in the nature of systemic thinking to yield many different views of the same thing, and the same view of many different things". Further, as I have argued, I am not seeking to replace or negate the key ideas of mechanism, modernism and postmodernism but suggest a more adequate relational worldview capable of subsuming them within a greater framework. But beyond this, it is also a matter of not being too attached to or precious about 'whole systems thinking' either, and to realise in Meadow's words (1997, 84):

> that NO paradigm is "true", that even the one that sweetly shapes one's comfortable worldview is a tremendously limited understanding of an immense and amazing universe. It is to 'get' at a gut level the paradigm that there are no paradigms, and to see that that itself is a paradigm…."

7. *But how can you be sure your version of whole systems thinking - that is systemisism and ecologism - is valid and sufficient?*

I can't be, entirely. The Thesis reflects a good deal of thought and reading, and my own 'experiential knowing'. But there is more identified reading I wanted to do and there must be much more good literature of which I am unaware. I think the Thesis is internally logical and coherent. It is bound to reflect my view of the issues surrounding and nature of the post modern ecological worldview, but any weakness in my argument does not invalidate the ecological worldview movement which is bigger than any one representation or account.

I believe that, following Reason and Torbert (2001, 14), I have gone beyond theory that is "merely descriptive, consistent and universalizable". I do think that I have developed a theory that meets Reason and Torbert's criteria:

> A good theory is *normative* (as well as descriptive), *analogical* (as well as inductive and deductive), *timely* (as well as universalisable) and *implementable* (as well as analytic).

At the same time, I am aware of further issues and these are reflected upon next.

2.2 Reflections

- It is such a big area of concern. Whilst working on the Thesis, and right up to the last section, I was often seeing new connections. On one hand this was exciting, on the other, it made me wonder what else I might be missing. I've been aware that at times I have been pushing my ability and thinking into areas where I felt less than confident, but believe that this is appropriate to a doctoral inquiry: to push one's own boundaries and limits.
- As a holistic inquiry, it necessarily has had breadth rather than depth (looking at Senge's 'dynamic' rather than 'detail' complexity). The cost of this, as I have been aware, is that in trying to establish the essence of some area, I have not always had time and space to go into the deeper grounding I would at times have liked. The Thesis is less strong on the affective and spiritual aspects of human

experience and transformation. I recognise the supreme importance of these dimensions of change here, but the intention, purpose and focus of this particular Thesis lies elsewhere.

- The problem of getting a systemic whole to conform to a linear order is a problem that anybody trying to write holistically about holistic subject matter encounters. I have tried to address this by using:
  -nesting systems in structuring in the Thesis,
  -summaries, iteration and building of key arguments throughout, backed up by cross-referencing,
  -the idea that the 'part is in the whole' and the 'whole is in the part' to inform my writing. Thus, I tried to write each Part so it could be read independently of the rest of the Thesis, whilst suggesting the broader argument.

  The writing process was a learning journey, and I did a good deal of checking back and revising as I went on.
- Frustratingly, there has not been enough time to properly consult all the sources I've gathered and filed over the years, but I hope that I have consulted sufficient material to give the Thesis real grounding in others' views and experience as well as my own. My other sources will still be useful in any postdoctoral research. Relevant material has mushroomed since I first registered in 1995, and it has not been possible to keep up with everything.

A good Thesis should raise more questions and indicate possible and necessary research paths. These are reviewed in Section 3 below.

3 FURTHER RESEARCH PATHS

A number of further research paths are suggested by the work in this Thesis. These include research into:

- how far the two key triadic models presented here - being 'learning levels' *linked to* 'paradigm, experience and knowing' - are valid and useful to others. If they are as significant and useful as I believe them to be, there is a strong case for having others use, test and develop them, both within and outside the environmental education community. I am aware that some work has taken place already along these lines.
- what sustainable education might mean in practice at different system levels and contexts, for example the institution, the community, the region, and the country, building on current work here in the UK and internationally. Again, there are examples of work underway.

- how far articulation and manifestation of the principles of sustainable education assists or accelerates its realisation and epistemic learning in any particular context. (Feedback on use of my *Sustainable Education* book (2001) indicates some ground for research here.)
- how systemic thinking can be made more easily accessible and comprehensible as a competence. This is already the subject of an innovative curriculum development project called 'Linkingthinking' (Sterling, Maiteny, Irvine and Salter *et al,* in press) that I have been working on with WWF Scotland since 1998 which seeks to demystify systems concepts and ideas, but there is huge scope for taking this further.
- how far people have an innate sense of systems irrespective of knowledge of systems concepts, and how this can be evaluated.
- how far systemic methods and tools in teaching and learning in both schools and higher education can assist epistemic learning.
- the nature of the epistemic/transformative learning experience, and the conditions of the whole 'learning systems' through which such change is made more and less likely.
- how far transformative learning necessarily leads to a more ecological consciousness. In other words, how far changing *how* we think leads inevitably to a change in *what* we think.
- the extent of ecologism and sustainability in the world of systems thinking, and the extent of systems thinking in the world of ecologism and sustainability, and how these can be brought into closer relation.
- how policymaking in education might be influenced towards whole systems thinking at any system level.

4 CONCLUSION

Learning can either reinforce the existing worldview, or precipitate the 'movement of mind' (Senge 1990, 13), the *metanoia* or profound re-perception of meaning that many commentators now advocate. In the end, transformative learning depends on the nature of the learning experience we have ourselves and can help assist for others. As a society and in the education sector, we can choose either to achieve it by conscious *design,* or have it thrust upon us by *default*, through the effect of mounting crisis. As Milbrath states, "resisting change will make us victims of change…it is absolutely essential to change the way we think" (Milbrath 1996, 188).

Yet one of the traditional roles of education has been to ensure continuity in society. The paradox that faces us now is that the more we try to ensure continuity by doing more of the same (first order learning), the more the future is likely to be discontinuous with the past, that is unsustainable and chaotic. Rather, by consciously embracing discontinuity in our learning systems - that is breaking through to a sustainable education paradigm - the more we will be able to ensure social, economic, and ecological continuity: and one hopes, secure a relatively smooth sustainability transition towards what Thomas Berry (2000, 55) has called the Ecozoic Era whereby "humans will be present to the Earth in a mutually enhancing manner". What I have attempted to do is show why this breakthrough is difficult but also how, and on what basis, positive movement is possible at any systemic level. This ecological basis sees s*ustainability*, (the ability for human and natural systems to self-sustain), as close to *self-organisation*, (the fundamental learning process), and this as close to *response-ability*, (the ability to respond to change), and these as close to *responsibility,* which is being accountable for the consequences of our attitudes and actions, which is close to *wisdom*.

In our times which are at once scaring and exciting, it perhaps is best to remain neither a hopeless pessimist, nor an unrealistic optimist, but a 'possibilist' (a term favoured by the founder of the Right Livelihood Award, von Uexkull, 1992). So - while we can learn our way to the future either by *design*, or by *default*, it is only the former that carries hope and creative possibility within it.

I finish with three quotes, which seem to sum up some of the key ideas of the Thesis. They illustrate the three themes of *reperception, reconnection* and *realisation* - in different ways touching on the need for humility and inner examination, the systemic nature of the world and our participative responsibility.

> *It is a mistake to try to reform the educational system without revising our sense of ourselves as learning beings.*
> Mary Catherine Bateson (1994)

> *No man is an Island, entire of itself.*
> *Any man's death diminishes me, because I am involved in Mankind; And therefore never send to know for whom the bell tolls: It tolls for thee*.
> John Donne 1571-1631

And lastly, the Jesuit Indian spiritual teacher, Anthony De Mello (Dych 1999) has a story of a spiritual master, who reputedly said:

> *Wisdom tends to grow in proportion to one's awareness of one's ignorance'. When asked for an explanation he said,' When you come to see you are not as wise today as you thought you were yesterday, you are wiser today.*

May we all 'come to see….'

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APPENDIX I - ELABORATION OF WHOLE SYSTEMS THINKING

Purpose: to further explore and elaborate the bases and nature of whole systems thinking as a basis for paradigmatic change.

Introduction

In the first section, I review succinctly some of the influences and trends, which, seen in relationship, may be viewed as informing bases for whole systems thinking. The four areas reviewed are systems thinking, indigenous worldviews, organicism/ecologism, and complexity. Whilst these areas are referred to in the main Thesis, this Appendix allows something of the provenance of whole systems thinking to be outlined in more depth. In the second section 'A Whole Systems Model', I further develop the triadic model of paradigm and experience (Seeing, Knowing, Doing) which is then used to help represent the dimensions of paradigm change, in parallel with the model of staged learning levels introduced in the main Thesis. In section 3 'Whole Systems Thinking and Sustainability', the model is employed as a framework for a discussion of a whole systems view of sustainability.

1 THE BASES OF WHOLE SYSTEMS THINKING

These four foundations are large areas in themselves - and the study of any one of them could easily constitute a separate Thesis. Thus, only a broad and concise review is given here, with an emphasis on the significance of these foundations rather than their substance. The areas chosen are those I feel to be most important: it is not to suggest that other relevant insights from, for example ecopsychology, sociology, and political economy would not also be relevant and fruitful. But boundaries have to be drawn here for reasons of manageability and coherence, and I am suggesting that these four areas reviewed below are fundamental and give substance to claims that whole systems thinking is an articulation of an alternative paradigm.

1.1 Systems thinking (and systemic thinking)

As noted in Part B.2, systems thinking has developed through a number of schools of thought over the last five or so decades, broadly stemming from two roots, cybernetics and General Systems Theory. These schools are often associated with key players who have developed their own interpretations and concepts in systems thinking. Flood (1999) for example, reviews von Bertalanffy's open systems theory, Beer's

organisational cybernetics, Ackoff's interactive planning, Checkland's Soft Systems Methodology (SSM), Churchman's critical systemic thinking - as well as Senge's 'Fifth Discipline' of system dynamics which is the book's key focus. In reviewing these contributions, and then looking at the implications of complexity theory, Flood is seeking a more whole conception of systems thinking, which has fragmented somewhat since von Bertalanffy's attempts to forge interdisciplinarity and a unified systemic 'general science of wholeness'.

Thus Flood appears to share my interest in (what has been called above) an expanded sense of systems that brings us closer to what I am calling here, whole systems thinking. So rather than review Flood's account or other accounts of systems thinking in any detail, I want to comment on change in the field that brings us closer to this idea. Thus, I am interested in aspects within the systems thinking traditions that help substantiate and give rise to whole systems thinking and ecological thinking.

The most significant point here is the shift of attention from 'hard' to 'soft' approaches (reviewed in B.2.1) where, as Checkland (1994, 80) notes, "assumed systemicity is shifted from taking the world to be systemic to taking the process of inquiry to be systemic". Put in more simple language, this might be summarised as the difference between the ostensibly *descriptive* 'how things are' approach which assumes real systems exist in the world, and the *interpretive* 'how things appear to be' (including reflexively, the nature of systems thinking itself). This is the difference between an ontological and an epistemological emphasis, and indeed Bawden (1991) suggests the terms "ontosystemics" and "episystemics" accordingly. In other words, systems thinking reflects the realism-idealism tension discussed in Parts A and B of the main study.

Flood (2001) distinguishes and labels these two approaches respectively 'systems thinking' and '*systemic* thinking'. While I am not aware that this distinction is widely employed, it serves my purposes here. Checkland and Scholes (1990) make the distinction by employing the adjectives 'systematic' and 'systemic' respectively. Ison, Maiteny and Carr (1997) helpfully suggest the two approaches can simply be distinguished by noticing whether the word 'system' is used as a noun (e.g. 'farming system' or 'education system') which implies the 'hard' approach, or as an adjective (as in 'systems thinking', or 'systemic') which implies the soft orientation.

The distinction is important because it is possible to surmise that systems field is experiencing something of a paradigm change, consistent with the arguments in Part B

which suggest that this occurs when a larger conception is required. Thus Checkland (1994), who himself developed SSM as a response to the limitations of mechanistic systems approaches, quotes Vickers who in rejecting both the goal-seeking (mechanistic) paradigm and the cybernetic paradigm, expressed the need for a changed epistemology. Ison (1993) quotes Atkinson and Checkland suggesting that the move in "new systems thinking" from thinking about models of parts of the real world, towards "models relevant to debate about change", has been liberating. Ison and Stowell (2000, 2) suggest that "new sites for development and renewal of systems theory are likely to emerge from moving beyond first-order cybernetics models upon which current systems theory are mostly based". My understanding of systems discourse is that some parts are moving away from this emphasis - towards a second order, understanding of systems as a necessary response to our 'postmodern' conditions of complexity, uncertainty and unsustainability - whilst still respecting diverse methodologies. At the same time, I feel that this constructivist emphasis can sometimes go too far and underplay 'first order' issues: if, as my colleague Paul Maiteny says, if all that matters is our constructions, then why is there so much concern about 'real world' sustainabililty issues?

Before continuing the argument, what follows is a fairly crude but necessarily succinct outline of key systems ideas contributed by some of the leaders of the field as it has developed over recent decades (alphabetical order):

Ackoff

- 'difficulties' and 'messes'
- 'plan, or be planned for'
- participative (interactive) planning and design

Bateson

- learning levels and higher order learning
- abductive and analogue thinking
- cybernetics

Beer

- viable systems

Capra

- paradigm

- emergence
- self-organising systems
- autopoesis (after Maturana)

Checkland

- Soft System Methodology

Churchman

- boundaries
- ethical systems improvement

Forrester

- system dynamics

Koestler

- holons and holarchy

Senge

- system dynamics
- dynamic complexity
- learning organisation

Vickers

- traps
- appreciative systems

Von Bertalanffy

- open systems theory
- feedback loops
- emergence
- organicism (rather than mechanism)
- self-organisation
- general systems theory
- learning through isomorphy
- interdisciplinarity

Such strands and other contributions are summarised in Ison's systems influence diagram of systems traditions which may be found in the **Appendix II**, under Part B.2.1 Despite the undeniable fragmentation in the systems field, there appears to be a growing interest in a fuller conception of systems thinking, which re-associates some of its disparate strands. It is a conception which has been given greater substance and confidence in recent years by the advent of complexity theory and the 'biology of cognition', and by a greater interest in and tolerance of cross-disciplinary and transdisciplinary thinking. Yet, although systems thinking presents a powerful and highly relevant and valuable approach to understanding and acting in the world, I feel - despite its concern with wholeness - that it is not in itself sufficient to offer a strong, persuasive and viable alternative to the dominance of mechanistic values, thought modes and practices, or more importantly, to offer a transcendent, more adequate paradigm within which - as Smuts hoped in the 1920s - mechanism would have its appropriate but subsidiary place. Flood's judgement (quoted in full in A.3.2) that systems thinking has, over recent years, remained "pretty much in the outback" lends credence to this view. Whilst 'systems as discipline' might need to maintain its boundaries in order to remain a discipline, an ecological epistemology requires a synergy between systems thinking and additional insights and areas, which might (at least) be listed as:

- complementary 'other ways of knowing' (including indigenous thought)
- organicism and ecologism
- complexity and holistic science
- revisionary postmodernism
- sustainability

If we take one critical area, that of ecology and sustainability, the systems thinking community has been slow to take this on board. For example, Critical Systems Thinking, an established school of thought in the systems field, is centred on 'five critical commitments' (Flood 2001):

- critical awareness
- social awareness
- human emancipation
- theoretical complementarity
- methodological complementarity

There is no mention of ecological awareness. To take another example: Checkland's criteria which help evaluate the success of any systemic transformation in a human activity system are the three 'Es' of *efficacy*, *efficiency*, and *effectiveness.* Checkland and Scholes (1990, 42) write that these criteria "cover only the most basic idea of transformation" and suggest they can be supplemented "if it seems appropriate". They suggest that considerations of ethicality and aesthetics would bring in *ethics* and *elegance* making '5 Es'. But this extension is hardly central to SSM as it mostly conceived and practised, and there is still no mention of a sixth 'E' which would be (arguably, should be) *ecology*.

At the same time, and to be fair, many of those working in the systems field are aware of its boundaries, and certainly aspects of the three under-represented 'E' areas listed above can be seen in systems literature. For example, the work of the Centre for Systemic Development at Hawkesbury College, Australia, was very influenced by one of the elders of systems approaches, Churchman, who in 1971 noted that an important feature of system approaches are not that they help the practitioner better achieve expected outcomes, but that such outcomes should be ethically defensible. (Hawkesbury's work is described in more detail in Part C.) Further, organicism has a fairly strong presence in systems thought, and in recent years a growing interest in complexity, and to some extent sustainability, has developed. (The subsections that follow in look at these areas in more detail, starting with indigenous thought).

Another limitation of most systems thinking as it is conceived and practised (as argued in Parts A and B), is that it is primarily oriented towards methodology, and despite some concern with ethics and aesthetics, is still fundamentally rationalist. Flood argues (2001, 141), that by contrast, when focused on human existence, "systemic thinking helps people to sense a deep holistic or spiritual quality". But only, I would suggest, if the idea of systems thinking can be supplemented and expanded to become part of - as argued previously - an encompassing 'systems as worldview', rather than (only) systems as discipline or methodology. Otherwise, there is always a danger that systems methodology is put at the service of mechanistic, instrumentalist, or economistic values (which is why, as we have seen earlier, in B.2.1, some environmentalists dismiss systems thinking as 'part of the problem').

The emergence and articulation of systems thinking, from the 1940s, was significant in the recent history of Western thinking, but it was hardly lacking precedence. It is possible to trace a lineage between this and antecedents of systemic thought in the

long tradition of organicist thought in western philosophy and science (see 1.3 below). Further, it is possible to argue that many indigenous cultures possessed or possess deeply systemic worldviews. Moreover, the roots of contemporary ecological thinking draw on, and find parallels with, these indigenous cultures - including those traditions in past Western culture which reflect a more integrated and relational view of society, culture and environment.

1.2 Indigenous worldviews and perennial wisdom

Amongst environmentalists, seeking sources to both attack modernity and offer alternatives, indigenous worldviews are often upheld as a paragon, and associated lifestyles an example of sustainability. At the same time, New Age followers tend to cite 'ancient wisdom' or 'perennial wisdom' as the key to transforming modern culture. Holroyd (1989, 98) notes that the term *philosophia perennis* was coined by Lebeniz and later taken up by Aldous Huxley to describe 'the highest common factors' of religions and spiritual and esoteric philosophies, referring essentially to the experience of oneness with a universal consciousness. But it is helpful to distinguish between 'indigenous culture' - which still persists if in embattled form in various parts of the world - from 'ancient wisdom'. Further - following Wilber - we can make a useful distinction between what he labels 'Ancient Wisdom' meaning ultimate reality, being, or 'Truth' as represented by such words as the Tao or Source, and 'ancient wisdom' meaning time-specific interpretations of this reality, through such expressions as the great religions and spiritual masters down the ages. Wilber's argument is the modern world badly needs Ancient Truth, but not ancient truths, for the reason that "modern culture is by and large incompatible with ancient culture" (1997, 65). He argues instead for "neoperennial philosophy" in tune with modern needs and problems.

This, I think, invites the elaboration of a contemporary ecological philosophy that can build on and acknowledge the insights and wisdom of the past, but is appropriate to the conditions of the present and probable future. It is here that the experience of indigenous peoples offer valuable insights both on the nature of sustainability, and in the kinds of thinking that support sustainability, if not directly transferable models.

A colleague recently argued in conversation that interest in indigenous thought is overplayed, and indeed, if the motivation for this interest comes from a romanticized disposition of the sort that Wilber attacks, then I would agree. But equally, such easy dismissal writes off the learning we might achieve from the 'triangulation' that the very different indigenous worldviews offer (in our increasingly homogenised global culture),

and the historical experience of living relatively sustainably that these cultures have largely demonstrated. As anthropologist Reichel-Dolmatoff (1996, 2) argues, the theoretical frameworks of modern scientific ecology have been developed only recently, but the Amazonian Indians have developed an "*intelligence du milieu"* over thousands of years, which has enabled them to live in "that state technically called 'sustained development' ".

However, the problem with gaining any insight from peoples who apparently perceive and think very differently to the Western tradition is that we, inevitably, use Western perceptions to interpret the difference. A key book which addresses this problem is physicist and science writer David Peat's *Blackfoot Physics – A Journey into the Native American Universe* (1995). Peat lived and worked with Blackfoot people and describes how his "Western scientific mind was opened to an alternative way of experiencing the world" (15). The book describes how profoundly different this is to the Western worldview, yet also reflects on the parallels between the Blackfoot and the recent emergence of a more holistic and qualitative science in the West. (This point is taken up in 1.4 below). According to a review of the book (Clarke 1999, 101), Peat's book "constitutes a far-reaching demolition of the notion that science is a discovery of pre-existing 'facts' independent of the cultural patterns of surrounding society".

Describing the impact of the indigenous approach to knowing and being, Peat (1995, 15) writes that he was "struck by the depth of its metaphysics and by the way in which Indigenous knowledge permeates every aspect of life, from education to healing, from sacred ceremony to an effective legal system, and the daily care of the environment….(and) struck by the way in which all aspects of life are based upon relationship and renewal, upon the balance of heart and head…upon harmony and balance…".

The predominantly informational Western view of knowledge as something that can be acquired, stored, and passed on is contrasted with the indigenous view where the "act of coming to know something involves a personal transformation. The knower and the known are indissolubly linked and changed in a fundamental way" (6). Peat explains that this worldview does not see a world of objects so much as a world of interrelationships. Similarly, categorisation is very different: "…a symbol is not an abstraction or reflection of reality, that a model in Western science is. Rather it is something that permits direct connection with the energies, spirits, and animating power of nature" (257). This is reflected in the nature of language. An Algonquin Indian

tells Peat that when he has to speak English instead of his MicMaq language, “he feels he is being forced to interact with a world of objects, things, rigid boundaries and categories in place of a more familiar world of flows, processes, activities, transformations and energies (231)”.

In this process view of the world, “every action is a spiritual act and has its effect on nature and the individual”. Therefore, in contrast to Western fragmentation, knowing, sacredness, action, society and nature are seen as being deeply interwoven. Further, unlike the value and possibility of abstraction and context-free meaning in Western science, in indigenous science, meaning is always context and place-dependent.

In some ways, it is difficult to get inside this way of viewing the world, yet somehow it also resonates with our own intuitive knowing, our non-verbal direct experience, and increasing awareness of the systemic nature of the world. Thus Heron (1996, 178) suggests that we experience a participatory ‘empathetic-imaginal’ “primary meaning in our lived experience…that is both prior to and continuously underneath and within our use of language”: whilst language is ‘secondary meaning’, a “partial and incomplete transformation” of our primary meaning (181). Interestingly, Peat achieved insight into the indigenous way of knowing by abandoning the stance of observer and “objective scholar of another society”, and instead entered “into its essence…in a spirit of humility, respect, enquiry, and openness (whereby) it becomes possible for a change of consciousness to occur” (10-11). Referring back to Bateson here, we might assume from Peat’s book that he allowed and went through a transformative ‘Learning III’ experience (at least in the pragmatic sense discussed in Part B): that consistent with the Indian view of ‘coming to knowing’, his knowing changed him. Indeed, we can further assume that he would have come away with a very limited understanding of the Blackfoot worldview if had not had this experience. Many earlier anthropologists’ accounts of ‘primitive peoples’ exemplify the more usual level of understanding from the Western perspective of ‘observer’.

Instead, in Peat’s account of indigenous knowing we find echoes of Bateson, of transformative learning, of participative knowing and participating consciousness, of a deep ‘systems sensibility’ and ecological worldview. Indeed, part of Peat’s argument is that currents in leading edge science in Western thought are now echoing and affirming the insights of indigenous knowledge. Thus, from indigenous thought and perception - so far as we understand them - we see parallels and insights that affirm, enrich and give historical legitimacy to the emerging postmodern ecological worldview.

The lessons from indigenous knowledge have an ‘inner dimension’ as outlined above, and an ‘outer dimension’. As indigenous knowledge emerges from time and place, there are similarities between indigenous cultures and Western locally-based cultures as regards the gradual evolution of knowledge, rootedness in place, and a relative social and ecological sustainability. In a book which seeks to analyse the ‘crisis of development’, Rich (1994, 287) argues that:

> Many community-based systems of environmental knowledge and management embody a historical co-evolution between particular local ecosystems and distinct human cultures. Some researchers suggest that since human societies have evolved until recently as subsystems of ecosystems, human communities all over the world have inherent self-organising capabilities to manage local ecosystems in a sustainable fashion, provided they are not dominated or destroyed by subsequently imposed top-down control and management…

Similarly, Dasmann (1984) makes a distinction between ‘ecosystem people’ who inhabit ecosystems or bioregions and depend on them for material support, and ‘biosphere people’ who occupy a geographical space but have little relationship to it as they draw on the resources of the wider biosphere. Arguably, modernity and ‘progress’ has seen the historical conversion of people from being primarily ecosystem people to becoming primarily biosphere people who often feel alienated from their immediate environment and whose ‘ecological footprint’ (Wackernagel and Rees 1996) is both great and not directly visible. This tendency is now accelerated by economic and cultural globalisation.

One lesson here concerns the relationship between systems and subsystems and the need to conserve the integrity, diversity and self-organising ability of subsystems if the greater whole is to survive. Rich (1994, 287) describes a concept of “critical importance”:

> local human communities and economies, while embedded in larger social and ecological systems, can be thought of as complex adaptive systems in their own right, evolving and creating their own conditions, within their environments, of order, feedback and adaptation.

This point is echoed and substantiated in Berkes and Folke’s study (1998, 429) “on the role of indigenous knowledge in responding to and managing processes and functions of complex systems” which give rise to what they term “a set of new or rediscovered

principles" for resource and environmental management oriented towards building resilience and sustainability. This topic is returned to in subsection 3.3 below.

As noted in Part B, a key part of the problem of our age is the dominance of and homogenising influence of the modern Western worldview, and its assumption of universal applicability (Marglin 1990, Norgaard 1994, Chambers 1997). By contrast, indigenous worldviews remind us of the existence and possibility of 'multiple epistemologies' (Berkes and Folke 1998), and provide insights for those who wish to develop whole systems thinking and sustainable design. There is a link here, it seems, with Einstein's dictum at the head of this Thesis, and with Ashby's 'Law of Requisite Variety' (1956) which states that to be successful the variety of methods, approaches or strategies must be as great as the variety of problems that are to be tackled.

We are also reminded - as implied in Berkes and Folke's use of the word 'rediscovered' above, that in the West, we have our own traditions of holistic and integrative thinking and practice and these are also bases for any resurgent whole systems perspective. This is my next topic.

1.3 The Western organicist tradition, holism and ecologism

While the Western organicist and holistic tradition cannot be adequately summarised here, it is critically important that these schools of thought are at least briefly acknowledged. As Marshall (1992, 6) has said, "Few in the green movement are aware of the deep-rooted tradition which underpins their beliefs" and therefore the tendency to talk about a 'new' ecological paradigm needs to be tempered with awareness of antecedents. The key point is that current ecological thinking has a lineage from philosophers and scientists over a long period. There are clear influences - for example in developing the ideas of 'deep ecology' Naess (1973) draws particularly on the 17th century philosopher Spinoza who in advancing an holistic, non-dualistic view of the world challenged Descartes' mechanistic philosophy.

Berman (1981, 73) gives a detailed account of alchemy and the Hermetic tradition which was "dedicated to the notion that real knowledge occurred only via the union of subject and object, in a psychic-emotional identification with images rather than a purely intellectual examination of concepts". This notion, "that subject and object, self and other, man and environment, are ultimately identical, is the holistic worldview" Berman suggests (77). This premodern participatory consciousness, and the Hermetic sciences, he says, lasted for millennia, but it took little more than 200 years to oust

them (73, 96). As I've noted above, Berman turns to Bateson to help reconstruct an holistic metaphysics for today which again has 'participative consciousness' at its heart. In parallel, Marshall (2001, 462), in his exploration and history of alchemy notes that "the world view of the new science is remarkably close to that of the ancient alchemists".

The profound paradigm change towards mechanism that the Scientific Revolution ushered in (outlined above in B.1.4) was not complete but always accompanied by critics, thinkers and visionaries who propounded alternative views. Yet the critical concept of 'holism' was not to emerge until 1926 with Smuts' classic work *Holism and Evolution,* where he described it as "the synthetic tendency in the universe…the principle which makes for the origin and progress of wholes" (Smuts 1926, ix). Smuts made a major contribution to holistic thinking, through his distinction between mechanism and holism, his promotion of the whole as a generic and unitary principle in the universe relating to "matter, life and mind" (1926, 2), and his description of the essential creativity of process in nature. Much of his work, including his explanation that the organic whole "is more than the sum of its parts" (a description of emergence), is now borne out by and extended by the new sciences of complexity, which is giving holistic science a new status and momentum. Yet Smuts' work was preceded, notably by Goethe who was also concerned with understanding the wholeness of phenomena, using a methodological 'science of qualities' that contrasted with the reductionism and positivism of his day (Bortoft 1986, 1996).

In the 20th century, according to Marshall (1992), three of the most important philosophers to contribute to an 'organic cosmology' are Henri Bergson (1859-1941), Alfred North Whitehead (1861-1947), and Martin Heidegger (1889-1976). Whitehead developed what he called the 'philosophy of the organism' which would contest what he saw as the inadequate philosophy of mechanism. This 'process philosophy' replaced the atomistic emphasis on discrete 'things' with a view of organisms that are defined by virtue of their relationship with their environment. Organisms and their relationships are seen as dynamic networks of events or patterns. In the 1920s, Whitehead proposed that the metaphor of organism could transcend the mechanist-vitalist divide. In this view, not only microbes, plants and animals, but atoms, molecules, crystals, societies, planets, solar systems and galaxies are treated as organisms (Sheldrake 1999, 70).

Whitehead was influenced by Bergson, another process philosopher offering a counter thesis to scientific materialism, and in turn, Whitehead's work influenced von

Bertalanffy's work on systems theory. According to Marshall, Bergson also introduced process into Western metaphysics, breaking down separation between observer and observed, between mind and body, and part and whole.

Heidegger's concern was with being, with ontology. He argued against objectification and rationalist metaphysics, and for what he called 'essential thinking', an appreciative listening to the voice of being, without analysis and interrogation. Pepper (1996, 49) states that Heidegger "proposed a non-anthropocentric relationship between humanity and nature" which "let beings be".

According to Tarnas (1991, 383) in his history of the Western worldview, despite the challenge that Bergson, Whitehead, and later, Teilhard de Chardin, mounted - which was "regarded as brilliant and comprehensive by many" - their ideas did not turn the tide against or beyond the conventional scientific orthodoxy. Although their theories "gained wide popular response and began to influence modern thought in often subtle ways, the overt cultural trend, especially in academia, was otherwise" (Tarnas 1991, 383). And yet this holistic and organicist current of thought has evolved into what is now termed ecological thinking or the 'participatory worldview'. In this view, according to Tarnas - and an increasing number of other writers (and notably Maturana and Varela (1987) who largely founded the 'biology of cognition') - nature is not separate so that the human mind can examine it objectively from outside, but "nature's reality…. comes into being through the very act of human cognition" (Tarnas 1991,434). So the mind does not just produce concepts that correspond to an external reality says Tarnas, and neither does it simply impose its own order on the world. Significantly, Tarnas suggests that, at a deeper level, reality is articulated through the human mind, quoting Hegel that "the evolution of human knowledge is the evolution of the world's self-revelation". Thus, the human imagination and mind "is itself part of the world's intrinsic truth". But for Tarnas, this potential and realisation depends on "a developed inner life" which is "indispensable for cognition" (1991, 434) and that nature brings forth its own order through the mind when (implication, only when) "that mind is employing its full complement of faculties". What Tarnas is implying here, in what seems to be approaching a mystical view of mind and nature, is that humanity, both individually and collectively, needs to attain some state of full awareness and knowing if both are to be realised. Another implication is that we are in a participatory relationship with the world, yet for the most part, do not fully recognise this relationship.

The argument here echoes a point I have made above (see B.1.5, and Diagram A.1), that the participatory worldview is 'larger' than and subsumes the modernist view. As Tarnas (1991, 435) suggests:

> The dualistic epistemology derived from Kant and the Enlightenment is not simply the opposite of the participatory epistemology derived from Goethe and Romanticism, but is rather an important subset of it, a necessary stage in the evolution of the human mind.

For Tarnas then, the separation and fragmentation associated with the modernist, mechanist worldview was not an aberration - as it is sometimes presented by ecological thinkers (including Marshall 2001) - but a necessary stage of human evolution. This evolutionary view is reminiscent of Elgin 1994, mentioned in B.1.7.

Another key figure in the evolution of ecological thought in the 20th century was Lewis Mumford whose writing sought to underline the importance of organicism against what he saw were the mounting threats of mechanistic thinking and values. Mumford (1964, 393) made a plea for ecological, whole systems thinking, as is evident in the following quote:

> All thinking worthy of the name now must be ecological, in the sense of appreciating and utilizing organic complexity, and in adapting every kind of change to the requirements not of man alone, or of any single generation, but of all his organic partners and every part of his habitat.

From the past threads of organicism and holism, contemporary ecological thinking derives some of its key bases for an alternative, and potentially transcending, holistic epistemology. In recent years, this philosophical basis has been extended and strengthened through what is sometimes termed 'new science', which can be seen as the inheritor of the organicist tradition and legacy. But before looking at new science (in 1.4 below) I want to look at the place and significance of environmentalism. The notion of 'environmentalism', I will argue, is both a foundation of and an obstacle to the broader idea of the postmodern ecological worldview and whole systems thinking.

Environmentalism and ecologism

Within recent years, several accounts have been written about the development of environmental and ecological thinking through the past (Thomas 1983, Bramwell 1989, Ponting 1991, Marshall 1992,) and in and recent times (e.g. Pepper 1984, O'Riordan

1987, Dobson 1990, Merchant 1992, Pepper 1996). It is not necessary to rehearse the detail here, but it will be useful to look at some key developments and distinctions.

There is a long tradition in what might be termed 'environmentalism' in history, but also considerable change in how environmentalism has been and is manifested, particularly in recent times, including strong tensions and divergences of view (Pepper 1996). Indeed, Schlosberg (1999, 3) argues that there is now so much diversity and difference in the environmental field, “romantic preservationists, efficient conservationists, public-health advocates…deep ecologists, greens, bioregionalists, animal liberationists…ecofeminists…social ecologists, steady-state economists…indigenous rights activists” and so on, that there is no such thing as environmentalism *per se.* Clearly, some examination of this landscape is needed to allow some further insight into the grounding of the emerging ecological paradigm, as well as providing context to understanding the position and relation of different paradigms in environmental education.

'Environmentalism' is defined by Button (1988, 156) as “awareness of and concern for the total environment”. It is thus used as a generic term to cover virtually all views of the environment which include some element of concern. So views which take no regard of the environment, or assign the environment no value generally are not seen as falling within the spectrum of 'environmentalism'. However, Dobson (1990) writing about green politics, makes a useful and significant distinction between environmentalism and what he calls 'ecologism'. The main difference between them is that, “ecologism argues that care for the environment...presupposes radical changes in our relationship with it, and thus in our mode of social and political life”, whereas he views 'environmentalism' as arguing for a managerial approach to environmental problems which do not necessitate deep changes in values or economic patterns (Dobson 1990, 13).

The latter orientation is sometimes referred to as ‘ecological modernisation’ whereby the structural character of environmental problems is recognised, but the assumption that existing institutions can internalise and address the issues, is maintained (Birkeland, 2002, 254). At the same time, Drysek (1997,152) distinguishes between ‘weak’ and ‘strong’ (i.e. more radical) forms of ecological modernisation, but regarding the latter, states that “however far it is stretched, ecological modernisation does not easily admit the idea that nature might have intrinsic value beyond its material uses”. By contrast, 'ecologism' in green politics is a deeper, more integrative view of the

environment which brings in human activity systems, worldview and philosophy. Thus Dobson quotes Porritt and Winner's (1988, 247) call for 'metaphysical reconstruction' as an ingredient of ecologism. While Dobson's linguistic distinction has not been taken up particularly widely, it is useful insofar as it indicates the fundamental difference between worldviews expressed in political ideology. In ecophilosphical debate, it echoes Naess' (1973) seminal distinction between ‘shallow’ and ‘deep’ ecology.

Dobson suggests that ecologism is historically specific; that while it relates to earlier influences, it can only be understood by the current context which, in part, provides its definition (1990, 33). He sees the Club of Rome's 1972 *Limits to Growth* study (which was, incidentally, the first world systems model) as fulfilling three conditions necessary for the emergence of ecologism: a description of limits to growth, prescription of the need for fundamental change, and the means to communicate the message to wide audience. Dobson (1990, 34) adds:

> We are provided with a boundary beyond which (in the past) ecologism could not have existed, and therefore any movement or idea behind that boundary can bear only an informing relation to ecologism as I think we ought to understand it.

The appearance of Naess' distinction the same year as the Limits to Growth (Naess' lecture was delivered in 1972) lends credence to Dobson's theory (although I judge ‘deep ecology’ to be overall more radical than Dobson's political ecologism). Clearly, however, current ecological thinking is strongly influenced by the past, and this is consciously invoked by environmentalists (now using the term in an inclusive sense) today, for inspiration and legitimation. Hence Marshall (1992, 6) comments:

> Ecological thinking is unique in that it draws on science as well as philosophy and religion for inspiration. In their search for ancestors, ecological thinkers have delved into Taoism and Zen Bhuddism, invoked the Greek Goddess Gaia and looked to the old ways of American Indians for a model of harmonious relationship with Mother Earth. Within Christianity, they emphasize the idea of human stewardship of rather than domination over nature…

Marshall also mentions the “minority tradition in Western metaphysics, represented by such thinkers as Spinoza, Whitehead and Heidegger”, and later in his book also includes the new science. But like other writers, Marshall does not think this rich tapestry yet constitutes Porritt and Winner's metaphysical reconstruction.

Differing environmental paradigms

The interpretation and significance afforded to 'environment' by any party is influenced by that party's worldview. As Cotgrove has demonstrated (1982 - see B.1.1), shades of environmentalism cannot be understood in any depth without reference to worldview. Like Cotgrove, it was through studying different views of the environment that led O'Riordan to realise that the environmental movement was not a homogenous social grouping, but was made up of subgroups with sometimes radically different visions of reality and of the human/environment relationship. His conclusions were first published in his work *Environmentalism* (O'Riordan 1987), and his model of paradigms within environmentalism has been much quoted since.

O'Riordan makes a fundamental distinction, which he also attributes to other writers (some of whom are referenced in this Thesis including Capra 1982, Cotgrove 1982, Milbrath 1989 and Pepper 1984). This tension is between "a *radical* or *manipulative* perspective in which human ingenuity and the spirit of competition dictate the terms of morality and conduct" and "a *conservative* and *nurturing* view of society-nature relationships, where nature provides a metaphor for morality", that is, affords a sense of normative ethics (O'Riordan 1989, 82). Thus, he states simply, that "environmentalism is the clash of two world views" (1990, 143). The terms O'Riordan chose to describe these modes were 'technocentrism' and 'ecocentrism', terms which have since entered the debate. The first is a human-centred (anthropocentric) view of the environment, giving rise to a manipulative, managerial or interventionist approach to resource use and environmental protection. The other orientation is 'ecocentric' and is based on an holistic nature/Earth centred view of the world which gives rise to a nurturing approach. Other writers, perhaps more neatly, make the distinction between 'egocentric' and 'ecocentric' (Merchant 1992). Both these orientations are further subdivided in O'Riordan's model, which can be summarised as follows:

Egocentric / technocentric / environmentalism

1. Optimism – 'business as usual'
2. Accommodation – managerialism/reformism: 'light green' changes in practice and policy

Ecocentric/ecologism

3. *Communalism* - radical change: localisation, appropriate technology, low-growth or no-growth with equity, etc.

4. *Gaianism* – deep ecology position, with nature given primacy, and a bioregional approach to human systems.

O'Riordan suggests that while many individuals' or organisations' views do not neatly fall within one of these suborientations, the model does allow a useful key to underlying shifts in the debate. The author has modified this map to reflect this change (O'Riordan, 1990). Thus, O'Riordan surmises that Western societies have shifted from the first optimist position to the light green reformatory position, and that this in itself "is a significant shift of attitude" (1990, 143). The real issue is whether a further shift, in the pursuit of 'the sustainability transition' is possible (see discussion in B.1.8) as it involves higher order or deep learning which challenges fundamental positions in the prevailing worldview.

Whilst O'Riordan's model is very helpful, the distinction between 'anthropocentric' and 'ecocentric' views is also problematic. As we are humans, the critics say, then we cannot have anything other but a human view of reality, even if we wish to give the non-human world primacy. This has been the argument of those who critique deep ecology such as Skolimowski. Part of the battle here is between deep ecologists (such as Devall) and social ecologists (such as Bookchin) and who "are at odds as to whether the priority lies with challenging the dominant worldview as the mode for initiating transformation or whether the pre-eminent strategy lies in the pursuit of social justice" (Merchant 1994, 237): that is, whether we should seek first to change fundamental values or social and economic structures. There is probably no 'right answer' to this 'chicken and egg' argument, but meantime, a more fundamental problem is our dualistic thinking, which maintains the illusion of separateness. I agree with Boulding, (an associate of von Bertalanffy, who did much to apply General Systems Theory to economics), who suggests:

> There is no such thing as an 'environment' if by this we mean a surrounding system that is independent of what goes on inside it. Particularly, there is no sense at this stage of evolution on earth in talking about 'the environment' as if it were nature without the human race.
> (Boulding 1978, 31)

Boulding's view is affirmed by the notion of co-evolution and co-creation, which I discuss in Part B.1.6. Thus, while the notion of 'environment' is very important, it becomes flawed if we consider it a somehow separate part of our reality - *as is so often the case*. Wilber's (1997) distinction between 'differentiation' and 'dissociation' (see

B.1.4) is helpful here, echoing Bohm's (1992) distinction between 'distinguishing something' (meaning 'to mark apart') and 'division'. We tend to dissociate and divide, when we should often do no more than make the distinction.

- Keypoint: A large proportion of the environmental discourse has been founded upon the flawed idea and perception of the essential separateness of the environment from people and from human systems - (for example, the perception of 'environmental issues' as somehow separate from economic or political or sociological issues).

Having had some involvement in the environmental ethics debate (Sterling 1990), I would also suggest that too much of this discourse also seems to reinforce the separateness of environment. A further somewhat intractable problem here is the linguistic structure of the subject-object divide which embodies and encourages dualistic perception (see discussion in subsection 1.2 above). Thus:

- Keypoint: a simple or narrowly conceived 'environmentalism', which regards the environment as 'a thing', does not necessarily contribute to the ontology of the postmodern ecological worldview which has a more process-based view of reality as a whole, whilst not ignoring ecological realism.

That said, much of the thinking that contributes to the ecological worldview has arisen from a prior concern with 'the environment' (however diverse, returning to Schlosberg's point, those concerns might be). In other words, a simple environmentalism can sometimes be a starting point for a participative worldview. I would argue that a more whole, more relational, perception of 'environment' inevitably leads to something like Meadow's (1982a, 101) position (first quoted above in Part A.1.1):

> The world is a complex, interconnected, finite, ecological-social-psychological-economic system. We treat it as if it were not, as if it were divisible, separable, simple, and infinite. Our persistent, intractable, global problems arise directly from this mismatch.

In an insightful essay which reviews the status of environmentalism, McKibben (2000, 3) makes a parallel point:

> Whereas in the past environmentalism has concerned itself with preventing degradation to nature, in the future it will have to….make a far broader argument. Whether we will still call it environmentalism, and whether it will still draw its strength from the same places, is open to question, but the animating

> spirit will need to be a love of the world…and the web of relationships, human and otherwise, that still survive here.

Thus, many people have shifted from a simple 'environmentalism' to a deeper 'ecologism' and from there towards an existential sense of the ecological, participative worldview - a different epistemology, that is a key theme of this Thesis.

1.4 Complexity theory and holistic science

The development of complexity theory is significant, perhaps on three counts:

1. it is providing new understanding of conditions of systemicity and uncertainty and how to work with them
2. it is at the forefront of forging a postmodern science which directly challenges the dominance of mechanism and reductionism through emphasising emergence
3. it offers new credence, legitimacy and knowledge to the relational (ecological) view of the world.

One of the books which popularised 'complexity' states that the science of complexity is a subject:

> So new and so wide-ranging that nobody knows quite how to define it, or even where its boundaries lie.
> (Waldrop 1992, 9)

Whilst in popular parlance, people use 'complexity' to describe nothing more than 'many parts' as in a difficult jigsaw, a watch or a car engine, the term is more appropriate to describe a state of many relationships which are in a state of unpredictable change. Whilst a condition of many parts is 'complicated', the condition of rich interconnection is 'complex' and herein lies the difference.

A unifying theme throughout this Thesis is the tension between the mechanistic worldview and the organicist worldview. The dominance of the machine metaphor, as we have seen, has been the norm for little more than the last few centuries: "by contrast all previous worldviews took organisms as their principal metaphor and myth" (Sheldrake and Fox 1996, 16). The rise of the complexity sciences promises a shift again towards organicism - but in a new guise. The problem however, as Sheldrake points out, is that there is a time-lag between the emergence of new ideas in science and their general take-up as part of popular consciousness. He suggests the new ideas

of holistic science will probably not enter this consciousness till around 2030 by which time “it might be too late” (Sheldrake and Fox 1996, 16).

However, ecological thinking is turning to (as well as arising from) holistic science and complexity theory as a source of ideas and legitimation - in a society where science is still largely regarded as a fundamental source of authority. Holistic science and complexity theory appeal to non-scientists (like myself) because they follow the organicist tradition, putting emphasis on relation, qualities, wholes, and the essential creativity of nature. The focus of explanation, most significantly, is on *emergence* rather than mechanism. This “new vision”, coming from the world of complexity, chaos and emergent order, started in physics and mathematics and is “now moving rapidly into the life sciences”, according to Sole and Goodwin (2000, *ix*).

Yet it is the life sciences, where mechanism has held particular sway, evidenced in modern times in molecular biology and its consequence, genetic engineering. Birch (1988) clearly sets out the difference between mechanistic and ecological models of life, in a paper ‘The Postmodern Challenge to Biology’. Hence, the methodology of mechanism is to regard the living organism *as if* it were a machine; but a second metaphysical step taken by many, says Birch, is to conclude that the living organism *is* a machine. One result is that only phenomena and issues that are amenable to this approach are ruled within its compass, while issues such as complexity and emergent properties remain unrecognised and inexplicable.

Birch explains the difference between the mechanistic and ecological models as follows. Mechanism recognises external forces operating on a living organism, whilst the ecological model recognises the importance of internal relations (as well). The former looks for building blocks or *substances* that exist independently of environment and that - aggregated - explain the whole, the latter emphasises internal and external *relationships* that can explain changing properties at each level of the whole. A distinction is thus made, writes Birch “between a biology that is *compositional* (substantialist) and one that is *relational* (ecological) (1988, 70).

It is the latter view that has been affirmed by the emergence of the new sciences of complexity, even since Birch was writing in 1988. The significance of complexity theory, according to Lewin (1992) is that it answers and goes beyond the centuries long tussle between mechanism which sees organisms as fundamentally machines, or machine-like, and vitalism which - following Bergson and others - argued that life was explained

by an outside and added vital force. The holistic maxim, that the whole is greater than the sum of its parts, is interpreted and understood newly. The question that the new sciences of complexity are beginning to answer, say Sole and Goodwin (2000, x) is, “How can systems made up of components whose properties we understand well give rise to phenomena that are quite unexpected?”. This, some 70 years later, is a re-working of Smuts’ question (1926, 162): “the great mystery of reality is…how do elements or factors a and b come together, combine and coalesce to form a new unity or entity x different from both of them?”. He goes on to say “the answer to this question will in some measure supply the key to all or most of our great problems”. While this might be an overstatement, the new sciences of complexity are, according to its champions, a major advance in understanding. According to Waldrop (1992, 13), complexity researchers believe they are “forging the first rigorous alternative to the kind of linear, reductionist thinking that has dominated science since the time of Newton - and has now gone about as far as it can go”.

One of the critical differences between the mechanistic paradigm and complexity is non-linearity. The former is based on Newtonian physics and focuses on linear causality, simple determinism and predictability (if A then B). Complex systems, by contrast, are characterised by high levels of non-linear interconnection. Until recently, and the development of computing power, scientists largely confined themselves to studying linear systems and equations, and if necessary discarding the non-linear parts in the description of the system. This, say Clayton and Radcliffe (1996, 39) has led to “a rather distorted and simplified view of the world”. Yet in natural systems, they say, “linearity is the exception rather than the norm”. The critical change in science over recent decades, according to Capra (1996, 122), is the recognition that nature is “relentlessly non-linear” and that also non-linear phenomena dominate much more of the inanimate world than had been previously thought. Indeed, Lewin and Regine suggest that “95 per cent of the world is non-linear, unstable and far from being in equilibrium” (1999, 28).

A key consequence is unpredictability. According to chaos theory, this partly derives from the existence of ‘bifurcations’ at which a non-linear system may take any one of several different paths or states, depending on the system’s history and external circumstances and “can never be predicted” (Capra 1996, 177). For the scientist, unpredictability also lies in the phenomenon whereby small errors in calculating initial conditions produce great errors in calculating expected outcomes (Capra 1996, Sole

and Goodwin 2000). This is why the weather, say, is unpredictable except over the short-term. A further source of unpredictability is the phenomenon of emergence.

Capra says that the philosopher Broad coined the term emergence in the 1920s to describe properties that emerge at levels of complexity that do not exist at lower levels (1996, 28). Reductionist and mechanist thought holds that the whole is *no more than* the sum of the parts, and that it is in principle, possible to predict the properties of the sum by knowing the properties of the parts. Complexity theory refutes this. As Sole and Goodwin (2000, 17-19) point out:

> Rarely can we can go from the properties of the constituent parts to a description of the whole…We believe that reductionism is inadequate as the primary explanatory framework of science…Progress in understanding natural phenomena involves grasping relevant aspects of whole systems.

Each level of organisation shows properties or behaviours which emerge at that level, and that cannot be explained by the properties of the parts - and as complexity increases, then further properties emerge. Yet, complexity science has discovered that - contrary to the long-held belief in science that complexity arises from complex processes - that complex systems often result from the basis of a few simple rules.

Because of the richness of interactions within a complex system, be it a cell, a brain, an animal, an organisation, a society, the system is capable of spontaneous *self-organisation* - that is, develop order and structure without central control or design, and as an emergent property of the whole (or of the sub-system, if large enough). Further, all organic systems, including social systems and organisations, can be seen as *complex adaptive systems,* made up of interrelated parts that through their dynamic interaction, generate novel behaviour. They are adaptive because as the external environment changes, so do the parts and the whole so that the system as a whole evolves in relation to its environment (Lewin and Regine 1999). However, the influence of the environment is not deterministic. According to Maturana and Varela's (1987) theory of *autopoesis* (self-making) (quoted by Capra 1996), which refers to the pattern of organisation in a living system, the system both maintains itself and changes through interaction with its environment, through 'learning'. Indeed, the organism and its environment co-create one another (Goodwin, 1999), or co-evolve.

This is a very brief outline of complexity, but we can now revisit the three points above which summarise the significance of complexity theory:

providing new understanding of systemic issues

As society has moved from conditions of relative certainty to increasing uncertainty, from 'difficulties' to an increasing state of 'mess' (in Ackoff's sense), old forms of management, strategy, and command and control have become increasingly ineffective. Complexity theory is underpinning new forms of organisational change, management, and research (and this theme is discussed in Part C).

forging a postmodern science

Many of the pillars of mechanistic science - objectivism, positivism, materialism, reductionism, determinism, prediction - are modified or replaced by the concepts and methodologies emerging from postmodern science and complexity.

supporting the process (ecological) view of the world

The new concepts of complexity such as self-organisation, complex adaptive systems, and emergence, give substance to and new ways of thinking about living systems and human systems.

In science as a whole, there has been a movement away from extreme positivism and reductionism. In sum, there is a shift from a fragmented and mechanical conception of the world toward a holistic and organicist conception, accompanied by a shift from concern with objectivity, towards the notion of critical subjectivity including the role of perception and cognition in the process of scientific inquiry (Harman 1994). This science lacks a widely accepted name but 'holistic science' (Briggs and Peat 1985), 'a science of qualities' (Goodwin 1999) and a 'science of wholeness' (Harman 1994) are some contenders. Consistent with my argument regarding paradigm change, such a science would "contain most of present science, but in an expanded context" (Harman 1994, 377). Similarly, Jencks (11, 1992) notes that the Newtonian "simple sciences are now seen to be special cases of the more elaborate sciences of complexity".

This shift is often described as a *participative* view of science, and of human interaction with the world. The increased understanding that complexity theory is affording does *not* mean that we now have a better means of controlling processes. On the contrary, paradoxically 'knowing more' has underlined a position that has gained in strength since the formulation of Heisenberg's uncertainty principle - that we 'know that we do not know'. As Goodwin (1999, 8) remarks, the complexity sciences suggest: "why we cannot control the processes that underlie the health of organisms, ecosystems, organisations, and communities. They are governed by subtle principles in which

causality is not linear but cyclic, cause and effect are not separable and therefore not manipulable" and only apprehensible by careful attention to 'qualities'. Goodwin makes a plea for a shift "from control to participation", from trying to manipulate and change things, to appreciate 'what is', to allow things to be, to respect and value self-organisation as a principle of life. This brings us back to our central concerns with perception, participative knowing, and co-evolution (as outlined in Parts A and B), and links with our view of indigenous science (above). Yet it is as well to be reminded that the 'new science' and the 'participatory worldview' is still - as yet - very much a minority view:

> Nature controlled by human thought is the essence of the reductionist dream. It is a dream that persists even in the face of its evident failures.
> (Briggs and Peat, 1990, 201)

Summary

The four bases of whole systems thinking outlined above reflect some of the intellectual concepts and frameworks that can help us expand our consciousness to embrace a broader spectrum of reality, recognise the limits to our own thinking, and construct more whole ways of perceiving and thinking. In sum, as argued at the outset of the Thesis, such whole systems thinking may be seen as a syncretization of:

- the methodology of systems thinking (emphasising inclusive and integrative approaches)
- a co-evolutionary ontology (emphasising duality, pattern and relation) and
- the worldview of ecological thinking (emphasising extension of boundaries of concern and compassion)…

…whereby each is strengthened through the synergy of the whole. This convergence suggests a three-part model of paradigm and experience, and this is explicated in the next section.

2 A WHOLE SYSTEMS MODEL

This section elaborates on the origin, validity, detail and use of the whole systems model of paradigm and of knowing that was introduced in Part A. 'Seeing, Knowing and Doing' are suggested as the domains of human knowing and experience, and this model is used to represent and illustrate the key qualities of *re-perception, re-cognition* and *realisation* that are discussed as fundamental to the emergence of the postmodern ecological worldview. This paradigm change is illustrated further through aligning the Seeing, Knowing, Doing model with the learning levels model (elaborated in Part B).

2.1 A triadic whole - Seeing, Knowing, Doing

During the years I worked on this doctorate, a triadic model or conceptual framework gradually came to mind. This is summarised in Diagram A.4 ‘Domains, aspects and dimensions of experience’ in Part A.3 of the main Thesis. As I read many sources and reflected further, it seemed to become increasingly valid through echoing and representing much that I read. Further, it seemed to offer a way of thinking about issues that was helpful and insightful. While I have seen parts of this model represented in different sources, I have not seen the model presented as below and I would claim the model as an original contribution. I see it as an attempt at a whole systems model of paradigm, and of human experience Like all models has strengths and weaknesses, and I would not claim that it should be *the* model to the exclusion of others. Nevertheless, I have shown it to a number of colleagues who agree it has power and validity. True to the philosophy of soft systems thinking, it is not offered as a representation of reality but a lens through which we might gain insight on human experience.

This model (or framework) extends the three-part description of systems thinking, which I first derived from reading a paragraph in Senge (1990), and which is summarised in A.2.2. To quote from that section:

> The first is the *personal knowledge* aspect, which relates to perception, awareness, intuition and values. (This corresponds to Senge's 'sensibility'.)
>
> The second is the *propositional knowledge* aspect, which relates to theoretical constructs and concepts. (This corresponds to Senge's 'general principles'.)
>
> The third is the *practical knowledge* aspect, which relates to methodology, tools and skills. (This corresponds to Senge's 'tools and techniques'.)

This model can be shown simply as:

Table App I.1: A framework for systems thinking

Sensibility	*or* Awareness	*or* Perception	*or* Normative/ purposive dimension
General principles	*or* Concepts	*or* Theory	*or* Descriptive dimension
Tools and techniques	*or* Methods	*or* Practice	*or* Applicative dimension

This also corresponds with Flood's suggestion (1999, 126) that systemic thinking suggests three necessary and fundamental learning modes:

- how things ought to be
- how things might be (i.e. how they seem to be)
- how things can be changed…

and Banathy's (1991) idea that systemic change requires the three components of

- vision
- image and
- design…

and Gallopin's (2002) idea that sustainable development requires

- willingness
- understanding and
- capacity.

Further, there seems to be a parallel with Reason 1988 (and Heron's) notion of 'extended epistemology' consisting of

- experiential knowledge
- propositional knowledge and
- practical knowledge.

This pattern of triadic models seems to confer validity to each and all, and I develop the notion of triadic pattern further below.

A problem, as I have suggested, with a number of schools of systems thinking is that they have appeared over-concerned with methodology, (that is, the third aspect above) at the expense of attention to other areas of experience, not least 'ethical defensibility', as Bawden (2000a) points out. Not only that, but in a technocentric culture, a particular methodology tends to prevail. Take Schratz and Walker's comment::

> The significance of the use of the term 'methodology' is that it requires an argument to connect the choice of particular methods to the way that the problem is conceived and the utility and limitations of the outcome.
> (1995, 12).

The technocentric culture tends to be manipulative, managerial or interventionist. Values such as efficiency and effectiveness are to the fore, and our focus is often problem-centred. Operating within this culture, systems thinking has - understandably - often been oriented towards problem-solving methodology. But the uses to which any methodology is put is very important, and therefore we need to look critically at the role of ethics, of worldview or what might be called our 'sensibility orientation'. At the same time, environmentalists who think holistically tend to be strong as regards awareness and values (first dimension), but weaker on methodology (third dimension). The model thus helps map the under-represented dimensions both in systems thinking, and in environmentalism. In addition, I believe it helps us understand something of the difference between mechanistic and ecological worldviews, and this is discussed below.

I will now elaborate on the three key parts of the model. In Part A.3.1, I outlined the whole systems triadic model which attempts to map three interrelated *aspects* of human experience (cognition, knowing, and paradigm or belief), each of which could be said to have three *dimensions*. The table in Part A.3.1, summarising these aspects and their dimensions, is repeated below for convenience.

Table App.1.2: Aspects and dimensions of Seeing, Knowing, Doing

ASPECTS ⇩	***Seeing domain***	***Knowing domain***	***Doing domain***
Dimensions of cognition:	Perception	Cognition/conception	Practice
Dimensions of knowing:	Epistemology	Ontology	Methodology
Dimensions of belief:	Ethos	Eidos	Praxis

Overtime, the validity of this model seemed to me to become more affirmed through the realisation of a list of linked 'triads' which describe human knowing and experience. From an original list of thirty-five sets, I now *tentatively* suggest the following descriptors of the three domains identified:

Table App.I.3: Domains of human knowing, experience and learning: a tentative list of descriptors

'Seeing' domain	**'Knowing' domain**	**'Doing' domain**
Epistemology	Ontology	Methodology
Ethos	Eidos	Praxis
Ethical	Theoretical	Technical
Experiential	Propositional	Practical
Knowing	Being	Becoming
Aesthetics	Science	Craft / art / technology
Philosophy	Theory	Practice
Intuition	Intellect	Capacity / ability
Feel	Think	Act
Spirit	Mind	Body/matter
Metaphor	Theory	Tool
Purposive	Descriptive	Participative
Affective	Cognitive	Conative
Value	Knowledge	Skill
Imagination	Rigour	Relevance
Heart	Head	Hands
Insight	Hindsight	Foresight
Vision	Image	Design
Why	What	How

It would be a lengthy exercise to comment on all these sets of descriptors. What is important here is the *pattern* rather than the detail, that is, the overall sense that is conveyed by reading down or across the columns. I now summarise these three interrelated domains of experience, which together shape our being:

- ***the Seeing domain***

  This is to do with how we know and how we see. This is our sensibility or sentience, which relates to our inspirational knowing as well as our experiential

knowing. It is the *perceptual* domain - how we see the world, make sense of it, and how our filters affect this experience. In more detail, I include under 'inspirational' the *affective* and *imaginal* dimensions, because I believe that our perception is affected by our spiritual grounding and awareness, our belief system, our creative imagination and intuition, as well as by habits of thought and by our experiential histories. Thus, while Harman (1994, 378) notes an inner knowing in an "intuitive, aesthetic, spiritual, noetic and mystical sense", Milman (1998, 145) suggests that experience is coloured, shaped, informed and often distorted by interpretations, expectations, assumptions, beliefs, associations, fears, desires and opinions,

- ***the Knowing domain***

  This is to do with our ontological view of reality, and related to that view, our interpretation of the world, the meaning we ascribe and express through our stories, our constructs, theories, heuristics and concepts. This is the *conceptual* domain - how we conceive the world and represent the world to ourselves and others.

- ***the Doing domain***

  This is to do with how we actively participate in the world, which relates to capacities, skills, tools, methods, designs, communication and utility. This is the *practical* domain – how we act on and in the world, and with others.

I find this simple model helps me understand our own way of thinking and experiencing. It also helps indicate the meaning of the more 'integrative consciousness' that arises from epistemic learning . A first observation perhaps, is that in Western culture, while all three areas of knowing are inevitably operative, they tend to be *dis-integrated* in our consciousness rather than mutually informing. Second, that different groups tend to focus on or in one area, or two areas, rather than all three. I make these claims on the basis of observation of pattern, which I now suggest in more detail.

In the dominant Western paradigm, the focus is primarily in the second and third domains. So intellectual knowledge (second domain) is valued, to the extent that other forms of knowledge are often regarded as having less value - such as 'intuitive knowing' or 'spiritual knowing' (first domain) or 'practical knowing' (third domain). Similarly, 'spirit' and 'emotion' (first domain) and 'body' (third domain) tend to be

undervalued. This pattern tends to be reflected in the way that knowledge is regarded and relayed in educational institutions. Most education privileges propositional knowledge at the expense of both personal and practical knowledge ('head' rather than 'heart' or 'hand'), or academic strands are separated from vocational. Further, the scientist who pursues 'pure knowledge' without reference to his/her inner knowing or conscience, and without regard to the use to which the research might be put, has often been upheld as the model for objective scientific research.

Yet - and paradoxically - our culture at the same time gives emphasis to the Doing domain in terms of emphasis (as we have seen above) on intervention, manipulation and managerialism, particularly through technology. This might be seen as an instrumental emphasis on *techne* rather than praxis. Indeed, Bawden and Macadam (1988, quoted in Ison 1990), make a distinction between my dimensions second and third domains by using the terms *scientia* and *techne* respectively, and distinguish the latter from *praxis*. People who regard themselves primarily as practitioners (and this includes many teachers) tend to have disregard for theory and for theorists (second domain) or philosophy (first domain). Meanwhile, spiritual followers sometimes deny both reason (second domain), and the body or worldliness (third domain). By contrast, ardent consumers are very interested in material things but often appear to have lost touch with their inner selves or sense of deeper human purpose (first domain), and this material view of the world tends to be reflected by the mass media.

Similarly, technocrats typically have high interest in both theory and practical application, but often little interest in ethics. It has often been stated that our scientific knowledge and technical skills have outstripped our capacity to make ethical judgements (for example Peccei 1982, Capra 1982), and this tension has every prospect of being exacerbated with the new technical advances in biotechnology and nanotechnology, and the ability to change life forms (Ho 1998). A further example of the divorce between domains is the lack of aesthetic sense (first domain) reflected in so many examples of material goods, architecture, townscape, and landscape, where functionality and utility overrides beauty or elegance (Papanek 1995). In philosophy, the fundamental conflict between 'idealists' and 'realists' may be seen as a tension between those who focus on the first and second/third domains, respectively.

These examples indicate an endemic imbalance. The three areas of knowing tend to be *dis-integrated* in the person and in our culture, resulting in little sense of wholeness

in either. Further to this dis-integration, the focus of consciousness tend to be *disproportionately weighted* towards the second and third domains, whereby:

- the key role of the Seeing domain is under recognised or undervalued
- rationality is seen as sufficient to understand and address the world
- an 'external' material reality is seen as the prime or only reality
- consciousness tends not to be aware of itself, that is, its role in colouring perception
- perception, cognition and action are believed to be a linear process.

This locus of consciousness in the Knowing and Doing domains, helps explain our focus on our outer rather than our inner worlds; why indeed, there is the crisis of perception described earlier in Parts A and B.

A further problem with the dominant mechanistic paradigm is not only that the domains of knowing are fragmented, and unevenly weighted, but that they tend to be *narrowly drawn.* Referring back to the discussion in B.1.4, the paradigm and its knowledge system (Marglin 1990) tends to narrow what counts as legitimate ways of knowing, ways of conceiving, and ways of doing. This argument indicates that a fundamental difference between the ecological and mechanistic paradigms is that the former represents or attempts:

- *an extension* of each domain
- *connection* between areas of knowledge within each domain
- *re-integration* of the three domains, and systemic coherence of the whole.

I suggest that re-integration is conducive to wisdom. Consider this example and quote from Daly (1996, 43) which suggests that wisdom arises from integration of the three domains (represented here by 'purpose', real world 'limits', and 'techniques'):

> Wisdom involves a knowledge of techniques plus an understanding of purposes and their relative importance, along with an appreciation of the limits to which technique and purpose are subject.

So the necessary shifts from mechanistic thinking towards ecological or whole systems thinking, in individuals, groups and wider society, can be represented and summarised by three keywords: *extension, connection*, and *integration*. The next table follows on from Table App.1.3 above, and attempts to summarise the nature of this three-part qualitative shift using keywords:

in *assumptions* - leading towards greater compassion

in *distinctions* - leading towards greater understanding of connectivity
in *intentions/actions* - leading towards wisdom and action which is more integrative and ecological.

Table App.1.4 Shifts in the three domains of knowing associated with whole systems thinking

Seeing domain	**Knowing domain**	**Doing domain**
Assumptions	***Distinctions***	***Intentions / actions***
Extension	Connection	Integration
Re-perception	Re-cognition	Realisation
Compassion	Understanding	Wisdom

This change is explicated in more detail in Box B.4 'Fundamental shifts towards an ecological paradigm' in Part B of the main Thesis. As noted there, I argue that

- extension/compassion,
- connection/understanding and
- integration/wisdom

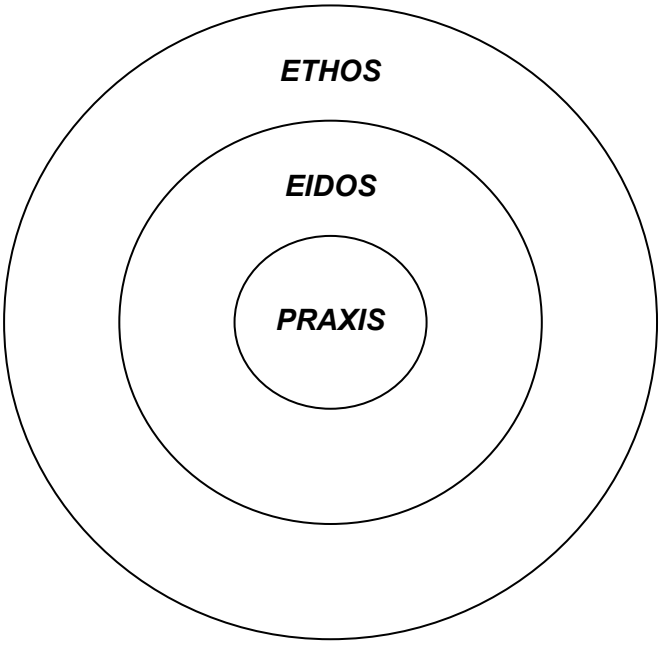
are - respectively - needed to heal the *narrowness of perception*, *disconnective thinking,* and *disintegrative practice* so often manifested both in education and society. The guiding principle here is *wholeness* ('heal' and 'whole', having the same semantic root in the Greek term 'holos' meaning whole or complete). Thus:

- wholeness in *purpose*, that is, wholeness as an ethical idea and invoking integrity
- wholeness of *description* as regards such things as multidimensionality, multiple perspectives and emergent properties, and
- wholeness in *practice* which is more integrative and coherent.

A key point to make about this recurrent three-part model, is that the domains are mutually informing and illuminating, which is illustrated by the key Venn Diagram A.4.in Part A.3. It should not be seen as a linear model - that we perceive something through our senses, then we conceptualise it, then we act on it - but as a systemic model of knowing and learning where each aspect of knowing continuously informs the others. For example, as Reason and Bradbury suggest (2001, 11) practical knowing (equivalent to my Doing domain) derives its validity from its grounding in experiential knowing (equivalent to my Seeing domain), while practical knowing consummates experiential knowing in worthwhile action. However - and echoing my systemic levels of

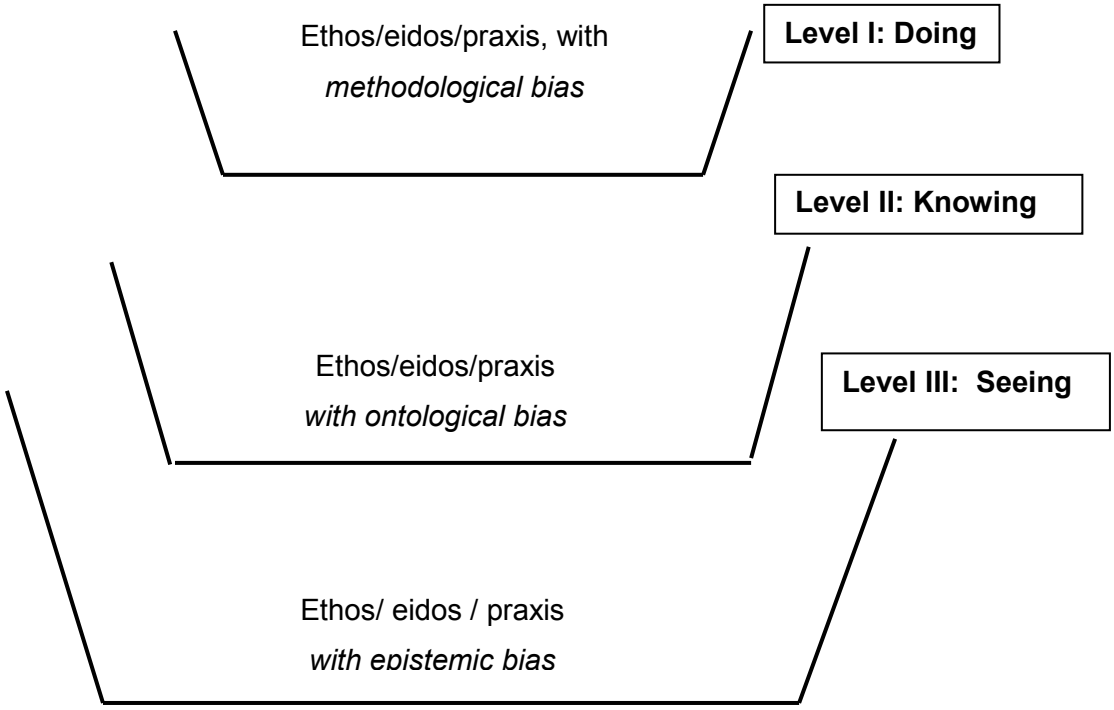
knowing model (Part B.1.3) - we can suggest the Seeing domain is the most fundamental level, and this can be interpreted in terms of ethos. (As introduced in the Thesis and above, paradigm is one aspect of the domains of knowing, and paradigm can be said to consist of the three dimensions of ethos, eidos, and praxis.) The relationship between these dimensions can be shown as a nesting systems diagram:

Diagram App I. 1: Paradigm components as nesting systems



So I'm claiming that the 'Seeing' domain, or ethos aspect of paradigm is the most fundamental aspect of knowing, and therefore is the key to change. If we now superimpose this triadic model of domains of knowing and experience onto the model of learning levels, it helps illustrate the nature of paradigm change. I think it is possible to discern correlations between these two models both within and ascending (or descending) the nesting levels as shown in the following diagram.

Diagram App.I. 2: Combining the model of learning levels with whole systems model of knowing



Clearly, *within* each learning level, there is an operative paradigm of *ethos/eidos/praxis*, which is influenced by the operative paradigm in the contextual learning level below. Using my interpretation of learning level theory (see Part B), I suggest that:
Level I is a *subparadigmatic* level, corresponding primarily with *Praxis/methodology.* The 'Doing' domain is dominant: 'knowing how'.
Level II is the *paradigm* level, corresponding primarily with *Eidos/ontology* (with implications for changed praxis). The 'Knowing' domain is dominant: 'knowing what and how'.
Level III is the *metaparadigm* level, corresponding primarily with *Ethos/epistemology.* The 'Seeing' domain is dominant - knowing why, what and how, and giving rise to a changed operative paradigm at Level II (a changed view of reality), and a changed operatiive subparadigm at Level I (a changed set of practices). Level is epistemic learning.

If these are seen as nested levels (as noted in B.1.3), we can see that the deeper levels subsume and influence the higher. The following App.I.5 suggests that the three

part model of learning and change that I have developed here is echoed and validated by others' models which are shown alongside. I am not suggesting strict equivalence but a pattern of similar views of learning and change.

Table App.I.5: Orders of learning, orders of change - some triadic schemes

Note: the second part of the table is a simple continuation of the first but the two parts cannot be fitted together across one page.

Learning I	Reflection in action Single loop	First order learning	Basic learning	Functional, maintenance, adaptive	Accommodative	'About' sustainability	Learning as maintenance	Praxis
Learning II	Reflection on action Double loop	Second order learning	Learning about learning	Reflective, critical, adaptive	Reformative	For' sustainability	Learning for change	Eidos (Praxis)
Learning III	Contemplation Triple loop	Third order learning	Learning about learning about learning	Creative, systemic, epistemic	Transformative	'As' sustainability	Learning as change	Ethos (Praxis / Eidos)
Bateson	*Agryis and Solon*	*Bateson Watzlawick Ison*	*Bawden*	*Banathy/ Sterling*	*Sterling*	*Sterling*	*Sterling*	*Sterling*

Methodology bias	'Doing things better	Design	Integration	Practice Dimension	Wisdom
Ontology bias	'Doing better things'	Image	Connection	Conceptual Dimension	Understanding
Epistemology bias	'Seeing things differently'	Vision	Extension	Perceptual Dimension	Compassion
Sterling	*General currency*	*Banathy*	*Sterling*	*Sterling*	*Sterling*

Essentially, the shift towards whole system thought and the ecological worldview involves a move from first and second-order change, towards third-order or epistemic change. But profound change *starts* with second-order change, the attainment of a meta-view, without which further paradigmatic change is not possible. In this shift, the role of the first domain of knowing - that is, Seeing: 'epistemology/perception/ethos' - is critically important, because this is at the heart of epistemic change.

A critical point to clarify here is that currently, the dominant worldview reflects levels of learning, but within the context of and from the basis of the mechanistic/modernist epistemology or paradigm. This, as I have argued, is largely unexamined yet deeply influences the other levels of knowing, learning and experience. Logically then, an ecological epistemology would also deeply influence the other levels of knowing, presenting and manifesting - as discussed in Part B.1.3 - *different sets of possibilities and practices* through the hierarchic 'systemic levels of knowing'. Indeed, I would suggest that the emergence in recent years of ecologically-informed management, ecodesign and participative inquiry methodology (examined further below) is evidence of such manifestation.

In this section 2, I have used the triadic model to elaborate the ideas of *re-perception, re-cognition* and *realisation* in the domains of our individual and collective Seeing, Knowing and Doing. I have argued these are qualities of change that are essential to the emergence of the postmodern ecological worldview The historic challenge is how we can accelerate a shift towards the ecological worldview in the three domains of knowing reviewed in this section. The next section looks at some of the implications of this shift in the three domains in more detail, beginning with epistemology. Not least, this provides further grounding for thinking about transformative learning, which is a key theme of Part D in the main Thesis.

3 WHOLE SYSTEMS THINKING AND SUSTAINABILITY

In this section 3, I use the model of three domains of knowing 'Seeing, Knowing, and Doing' to look at whole systems thinking in relation to sustainability. At the same time, the learning dimension of sustainability is discussed. Whilst these three domains are mutually informing, they are dealt with consecutively here. It may seem a little reductionist to deal with these separately, but in fact their interrelatedness is apparent in what follows. In subsection 3.1, I look at perception in more detail, and bring together the idea of a relational ontology, participative consciousness and epistemic learning. In section 3.2, the nature of sustainable and healthy systems is examined. I suggest parallels between educational values to do with self-realisation and autonomy, and sustainability values to do with self-organisation. In subsection 3.3, I look at ecological design and adaptive management as applied theories consistent with the ecological worldview, wherein learning plays a central role.

3.1 Seeing - epistemology and perception

I have argued that the sustainability transition is contingent on the emergence of an ecological worldview and culture. Whereas section 1 above has looked at the bases for a change in epistemology, and section 2 above has looked at my whole systems model of knowing and experience, I now want to focus briefly on *epistemology* as the key domain through which knowing and experience as a whole is framed. If we can better understand our dominant epistemology, we are more likely to be able to achieve or attain a profound shift of worldview or epistemic change. As Keeney states (1983, 7): "A change in epistemology means transforming one's way of experiencing the world". This may described as a change in perception, but this term underplays its significance. To echo Bateson's learning levels again, if Learning II is perceiving the bases of our perception, then Learning III appears to be a deep level of realisation or 're-perception' (Harman 1988) (as introduced in Part A.2.1).

As suggested in section 2 above, if the domains of knowing are disintegrated, a first step in changing our perception is to examine it, to re-perceive it. An emerging ecological view of perception and consciousness is helpful here. But first, we need to look at the mainstream debate, in order to distinguish the ecological view of epistemology.

The main tension in ontological debate has been between *'idealists'* who assert the primacy of the non-material world, and *'realists'* who assert the primacy of the material world. The first position is associated with naturalism, the second with positivism. Clearly, the dominant mechanistic/modernist paradigm that has been discussed in this Thesis is a materialist one.

As we have seen in B.1.5, the materialist paradigm has been under considerable attack from deconstructive postmodernism, an idealist position which holds that reality is largely (or even entirely) a human construction, and language the medium by which it is constructed or mediated. The problem here, as noted earlier, is one of validity: if everything is fundamentally text, then everything is relative. While deconstructionism exposes the values and constructions underlying mechanism, and is therefore liberating in this regard, it offers little to help us address the problems that mechanism has created. It clarifies the critical role of construction in our view of reality, but in extreme form denies the independent existence of the 'more-than-human-world' (Abram 1996). In other words, for some postmodernists a subjective epistemology

becomes a subjective ontology. From a whole systems viewpoint, as noted in B.1.5, it is not the important and valid notion of cultural construction that is the problem with deconstructionism, but as Spretnak says (1991,5) the belief that there is "*nothing but* cultural construction in human experience" (her italics) - despite our everyday experience of body, nature and place. Hence, deconstructionism makes the error of presenting a partial truth as a complete truth.

An ecological epistemology needs to go beyond the inadequacy of modernism, and the incompleteness of deconstructionism, beyond their respective metaphors of 'machine' and of 'text', and beyond the limits of their respective beliefs in universalism and relativism, whilst recognising their partial validities. Such an epistemology builds from these partial validities and - echoing Wilber (see Part B.1.5) - seeks a more adequate *weltanschauung.* Hence, my point in C.2.1 above about the need for perceptual extension.

An ecological epistemology agrees with materialism regarding the actuality of the independent world (this is Spretnak's 'real' - body, nature, place, or Heron's 'given cosmos'), while rejecting objectivism. It agrees with deconstructionism regarding the important idea of human construction in perception (constructivism) while rejecting the notion that 'this is all there is'. Hence, ecological epistemology stresses our systemic role - our participation - in the interplay between the ideal and the real, and beyond this, our participation in the sacred whole (Reason, 1993). The crucial point then is the need for a shift (of perception about perception) from one of *universalism*, and from *relativism* (characteristic of deconstructionism), to a *'relationalism'* (participativism) which can accommodate both previous positions. I shall now discuss what quality of perception this might involve.

Philosophically, a key foundation of ecological epistemology is 'phenomenology', which seeks to understand relation and is associated with such thinkers as Husserl (1859-1938), Heidegger (1889-1976), and Merleau-Ponty (1908-61). This method of enquiry is concerned with the nature of phenomena as they are experienced through human perception and consciousness. Thus Merleau-Ponty asserted the 'primacy of perception' (1964) as the foundation of human experience. Abram has summarised Merleau-Ponty's key ideas as:

- perception is an inherently participative event, a reciprocal interplay between perceiver and perceived

- perceived things are encountered by the perceiving body as animate, living powers that draw us into relation
- this relationship both engenders and supports our more conscious, linguistic reciprocity with others. Language is rooted in the non-verbal exchange always going on between our own flesh and the flesh of the world
- human languages are informed not only by the human body and community but by the shapes and patterns of the more-than-human terrain. (After Abram 1996, 90)

The problem, as Abram notes - drawing on Merleau-Ponty – is, if immediate perception is so basic to our experience, and so participatory and animistic, how come we seem to inhabit a non-participatory "inert and determinate" world? (90). Part of the answer, suggests Abram, lies with language which can influence "our sensorial experience".

Another reason (related to the linguistic problem) that the world appears non-participatory is our mode of consciousness. (This of course relates to the whole issue of the Western worldview, and associated beliefs and habits of thought reviewed earlier.) Bortoft, a Goetheian philosopher of science, suggests that humans have two major modes of consciousness, the action/analytical and the receptive/intuitive modes. Whilst the latter mode is dominant from early infancy, the analytic mode becomes dominant through interaction with our physical environment, where we learn to discriminate, to perceive boundaries and to manipulate objects. This mode, he says, is strengthened by the subject-object structure of our language (and, one might suggest, our educational norms). The receptive mode, Bortoft suggests is very different:

> Instead of being verbal, analytical, sequential, and logical, this mode of consciousness is nonverbal, holistic, non-linear, and intuitive. It emphasises the sensory and perceptual instead of the rational categories of the action mode (1996, 16).

This mode, in Bortoft's terms is based on 'taking in', or I would say 'appreciating', the environment, while the former is based on manipulating it. This picture of two modes of consciousness is also reflected in O'Riordan's distinction between nurturing and manipulative approaches to the environment (subsection 1.3 above). The analytic mode, Bortoft suggests, has become dominant in human experience. It corresponds with the object world, and we tend to see the object world as the only reality. Further, through empiricist method, we tend to think that we know of the world directly through the senses. Bortoft points out that empiricism makes the error of not recognising the

role of mind in cognitive perception. Purely sensory experience, (he suggests in an earlier paper), would be a state of difference without distinction, diversity without differentiation, “a state of awareness without meaning” (1986, 23). Instead, the world we see “exists in an ocean of mind” - physical objects are not simply physical objects but “condensations of meaning” (23). It is not just a matter of interpreting experience, that is, the meaning *of* what is seen (or heard), but the meaning which is brought to the act of perception, “the meaning which *is* what is seen” (24). This is the difference between the reflective mind, and the constitutive mind, says Bortoft. It is our ideas that organise - find pattern and meaning in - our sensory perception. But, because of the deeply-held Cartesian notion of the separation of subject and object, or consciousness from world, we tend to overlook that which we bring to perception, i.e., consciousness tends not to be aware of its participation in making or bringing into being the world it sees. In other words, we have a limited perception of our perception, and of our participation - illustrated for example, in the realist idea of objectivity.

Bortoft’s view of perception echoes Heron’s (1992, 12) point about the culturally endemic separation of 'intellect from affect' (Part B) and Bateson’s concern to balance rigour with imagination (A.2.2). An integrative consciousness appreciates that reality is, as Heron (1996, 164) suggests, “subjective-objective, that is, always dependent on personal mind and never exclusively dependent on personal mind because of the presence of the cosmically given in which the mind participates even as it shapes it”. This parallels Heisenberg’s statement that “What we observe is not nature itself, but nature exposed to our method of questioning” (quoted in Capra 1996, 40). The problem of course, is how we collectively can come to see (or perceive) that this is how we perceive. In sum, the argument here is that the world is participatory but largely we do not perceive it or think it to be participatory. This is why I have argued the necessity of journeying through the Batesonian learning levels, of growing realisation, and transcendence of the realist-idealist divide. Thus, Reason (1994a, 327) suggests that, “critical subjectivity”, a state of consciousness which neither entertains “naïve subjectivity” nor “attempted objectivity”, involves “a self-reflexive attention to the ground on which one is standing and thus is very close to what Bateson describes as Learning III”. This deeply systemic view is of course a defining characteristic of the participatory worldview that has been discussed above (see Tarnas in C.1.3 for example).

This discussion illustrates some possible conditions for, or descriptors of, epistemic learning that gives rise to a participatory worldview. These appear to include:

- reconciliation of our analytic and intuitive modes of consciousness,

- recognition of the role of our perceptual outlook in filtering and interpreting experience, and
- realisation of the spiritual, intuitive, affective, and imaginal (as well as sensory) bases of our perception.

This is a question of the individual and collective learning experience, and the nature of that transformative journey (paradigm change) is discussed in Part C of the main Thesis.

3.2 Knowing - the connective meta-pattern

An ecological epistemology recognises the link between perception and our consciousness. It recognises that 'the way we see' and 'what we appear to know' are intimately linked. This subsection is about the adequacy of the latter, and looks specifically at what we appear to know about sustainable/healthy systems.

The journey towards an ecological worldview, building on old and new bases - as sketched out in Part B and this **Appendix I** - is affording a more integrative view of reality. As a relational view of the world, it sees pattern and relationship as the primary reality. The ecological view of reality then, is of a connected material/non-material world, characterised primarily by process and dynamics, rather than discrete things. This view thinks less about 'things-in-themselves' like objects, artefacts, or organisations, and much more about 'things-in-relationship'. Indeed, living systems like families, communities, businesses, schools, are seen essentially as *networks of relationships* rather than 'things'. This subsection suggests some key insights that are emerging from this view.

As noted in Part A, Bateson was keen to discover and appreciate 'the pattern that connects' diverse phenomena. Earlier (in Part A), I posed the question, 'What is that mutually illumines learning, education, systems thinking and sustainability - is there a pattern that connects these areas?' Employing what Bateson called 'abductive thinking' or search for pattern and metaphor, I believe we can begin to address this question more fully. But this whole area is characterised by tentativeness because of its newness.

Complexity theory and our emerging knowledge of living systems is confirming a widely-shared intuition: that healthy, sustainable systems are those which are self-organising, self-healing, and self-renewing, and that are able to learn in order to

maintain and adapt themselves. They exert autonomy but in relation to and as integrative parts of larger systems. They maintain a dynamic balance between structure and flexibility, between order and chaos, in a state of bounded instability known as the 'edge of chaos' where creativity is able to flourish (Stacey 1996a and 1996b). These are said to be 'complex adaptive systems'.

From a systems point of view, the health of any living system - be it a family, a community, a farm, a local economy, a school, an ecosystem, *etc.,* - depends on the health of its subsystems, and they on their subsystems and so on, as well as its metasystem or environment.

- Keypoint: Sustainability can be seen as the ability of a system to sustain itself in relation to its internal and external environments, given that all systems are made up of subsystems and are parts of larger meta-systems.

So a system that either undermines the health of its own subsystems or of its meta-system can be said to be unsustainable.

Thus, a critically important aspect of this integrative pattern principle is the relation between systemic levels. As we have seen, in the discussion on Koestler's holons, it can be said that living systems display both integrative and self-assertive tendencies. In terms of sustainability, a sustainable state occurs when there is a dynamic balance between these tendencies within and between systemic levels. According to Gunderson and Holling (2002, 76), such a holarchic view affords insight on 'sustainable development':

> Sustainability is the capacity to create, test, and maintain adaptive capability. Development is the process of creating, testing and maintaining opportunity…sustainable development is not an oxymoron but represents a logical partnership.

But what can we can construe as a sustainable system? It is not as simple as some environmentalists seem to believe. Gunderson and Holling's book (2002) represents some of the latest thinking on sustainable systems and managing for sustainability, and much of the text underlines how new and tentative this thinking is. One theme that emerges is that we have a more sure idea of what constitutes an unsustainable, maladaptive system than a sustainable, adaptive one (Holling, Gunderson, Peterson 2002, 95). Unsustainable systems, are those which show:

- low connectedness

- low potential
- low resilience

at one end of the spectrum. These are said to be in a ‘poverty trap’ whereby their self-sustaining and adaptive abilities are compromised. Yet other systems are also unsustainable but for different reasons. These are systems which show:

- high connectedness
- high potential
- high resilience

These are said to be in a ‘rigidity trap’ such as some bureaucracies or organisations where resilience and stability is so high that the system is unable to adapt to changing conditions even when it needs to. One might suggest that the whole global economic system is in such a state, or even in both states at the same time. This ‘too little, too much’ spectrum appears to accord with the ideas of ‘edge of chaos’ from complexity theory. The first state perhaps, can be said to be one of ‘can’t adapt’, the second is one of ‘won’t adapt’. The first shows low resilience and too much integration into the greater whole, the second too much disconnection with the greater whole and individualistic autonomy. This perhaps gives us some insight as to the state of unsustainability in the world today - we seem to have a mix of system states that too often operate at either end of this spectrum, rather than the healthy, creative, adaptive systems at the ‘edge of chaos’ that suggest sustainability. (The ‘edge of chaos’ in relation to learning, management and sustainability is looked at in Parts C and D of the main Thesis.)

Wan Ho (1998, 231) sees the organism as an ‘ideal sustainable system’, and suggests that the organism should be seen as the pattern for human attempts to work towards sustainable systems. A healthy organism, she suggests, is “an irreducible whole, that develops, maintains and...renews itself, by mobilising material and energy captured from the environment”. She emphasises the need for “nested sub-cycles….the more there are and the better they are coupled, the longer the energy is stored within the system and the less is dissipated as entropy” (233). However, she suggests, our global money system is depleting our real wealth at local level and increasing entropic costs. It seems that a natural order, of high connectedness locally and low connectedness globally, is being reversed, and the whole system is highly vulnerable and unsustainable as a result. Another way of seeing it is as an imbalance between global integration (too strong) and local autonomy (too weak) - the whole is losing its

necessary parts, while the parts are losing their wholeness. This is prejudicial to the whole: as Holling, Carpenter *et al* point out (2002, 403), “sustainability is maintained by relationships among nested set of adaptive cycles arranged as a dynamic hierarchy in space and time”.

Such thinking suggests sustainability is about developing or maintaining *self-sustaining, adaptive abilities and wholeness at different systemic levels in the holarchy.* (Incidentally, Holling, Gunderson and Peterson, curiously, make no mention of holarchy but instead coin the neologism *‘panarchy’* to “capture the adaptive and evolutionary nature of adaptive cycles that are nested…across space and time scales” 2002, 74.) Thus any strategy for sustainability seems to involve appreciating and respecting what is already there, with developing and maintaining inherent creative potential, with assisting self-reliance, self-realisation, self-sustaining abililties and resilience. Bossel (1998, 294) sums up this perspective as the four ‘S’s: “sustainability, sufficiency, subsidiarity, and self-organisation”. Seen this way, it is possible to see connections between sustainability discourse and educational discourse: to see an integrative pattern of thought that connects ecologically sustainable development practice and an ecological view of education: that connects sustainability and learning.

Instead of an ethos of manipulation, control, and dependence, the ecological paradigm emphasises the value of 'capacity building', that is, facilitating and nurturing self-renewal and self-organisation in the individual and community as a necessary basis for 'systems health' and sustainability.

The insight that whole systems thinking affords us here is extremely useful and widely applicable. There is a dynamic principle here which applies differently but similarly to the way sustainability applies, say in relation to soil or wildlife management, or developing local economies, or trading relations with Southern countries, or children in the classroom. Such principles as diversity, relative autonomy, resilience, community, and integrity have an echo in both natural and human contexts. It is only a very short intellectual jump to see how long-held educational values such as differentiation, empowerment, self-worth, critical thinking, cooperation, creativity and participation are resonant with this systemic perspective.

What is emerging is an integrative theory linking human and natural systems in relation to sustainability: what I am calling here the ‘connective meta-pattern’. In sum, whole systems thinking and ecological sustainability give us bases for envisioning an applied

ecological paradigm in many fields, including health, education, economics, land management, architecture, organisational change, community regeneration, and many others. This brings us to the field of methodology and design, which is the next topic.

3.3 Doing - Sustainable development: design and management

This subsection is about the third domain of human knowing and experience, that is, how we should or might act in the light of our epistemological insights and knowledge arising from an ecological sensibility and orientation.

I am concerned with three interrelated aspects of methodology. I believe all three are mutually necessary to an holistic approach, and are relevant to the development of a sustainable education paradigm:

- ecological design (or sustainable design)
- adaptive management
- participative inquiry and learning.

The last aspect is discussed not here but in Part C, in the main Thesis.

Ecological design

The relatively new field of 'ecological design' is much more than natural landscaping: it is an emerging philosophy, theory and methodology which seeks both to fit 'human activity systems' within the limits of the ecosphere, and to use nature's patterns of organisation to design human machines, structures and organisations.

As argued above, the sustainability crisis is one of faulty *perception*, and of an incomplete *ontology,* but it is also one of inappropriate *design* (the three domains, again). As Van der Ryn and Cowan suggest, design manifests culture, and culture firmly rests on the foundations of what we believe to be true about the world (1996, 9). Thus design expresses epistemology, and, I would argue, a mechanistic epistemology is indeed manifested in human design in agriculture, land use, industry, organisational structures and so on. (It was Le Corbusier, for example, who expressed the view that houses are machines for people to live in.)

Change can happen in one of two ways, by *default* - where change happens to us, or by *design* - where change is intended (or both ways at the same time). Design in this sense then, equates to *purposeful intent.* Van der Ryn and Cowan (1996, 8) suggest that design is:

> the intentional shaping of matter, energy, and process to meet a perceived need or desire.

The sustainability problem arises, the authors suggest, because our patterns of agriculture, architecture, engineering and industry are "largely derived from design epistemologies that are incompatible with nature's own". This, the authors call 'dumb design' - standardised solutions, vastly replicated, which require huge amounts of energy and resources to implement. This is contrasted with 'ecological design' which is:

> Any form of design that minimizes environmentally destructive impacts by integrating itself with living processes.
> (1996, 18)

The term 'ecological design' (Todd and Todd 1994, Wann 1996, Van der Ryn and Cowan 1996, Zelov and Cousineau 1997) largely equates to 'sustainable design' (Papanek 1995) or 'regenerative design' (Lyle 1994).

Papanek notes the paradoxical challenge that this new aesthetic and ethic presents to designers: "to design things that will last, yet come apart easily to be recycled and renewed" (1995, 238) as opposed to (one might argue) things that are not sustainable but yet become lingering waste! This gives rise to an important distinction. Sustainable design and permanence is more about designing for elegance and conservation of regenerative ability, capacity and potential than preservation - more about persistence than monolithic perpetuity. This links perhaps with Whitehead's process view of the world - of events rather than things, and with 'edge of chaos' ideas where, paradoxically, a degree of redundancy is the price of creativity. I do not want to delve too deeply into the principles here of ecological design, but there is broad accordance between its proponents (Todd and Todd 1994, Wan 1996, Van der Ryn and Cowan 1996, Zelov and Cousineau 1997, Birkeland 2002) who seek to close the gap between human design and the design immanent in natural systems. For the sake of illustration, the Todd's ideas which they have developed in evolving 'living machines' (designed natural systems that meet human needs) are summarised below.

Box App. I. 1: Emerging precepts of ecological design

1. The living world is the matrix for all design
2. Design should follow, not oppose the laws of life

3. Biological equity must determine design (the just access and distribution of resources)
4. Design must reflect bioregionality
5. Projects should be based on renewable energy resources
6. Design should be sustainable through the integration of living systems
7. Design should be coevolutionary with the natural world
8. Building and design should help heal the planet
9. Design should follow a sacred ecology

From Eco-Cities to Living Machines, Nancy Jack Todd and John Todd, 1994

We think of 'design' as something we apply to material things like machines, tools, houses, and roads. But arguably, sustainability requires design in all areas and all levels. Inevitably, this extends the meaning and scope of ecological design*:*

> Our machines, our value systems, our educational systems will all have to be informed by this switch, from the machine age when we tried to design schools to be like factories, to an ecological age, when we want to design schools, and families and social institutions in terms of maintaining the quality of life not just for our species, but for the whole planet.
> (M C Bateson, in Zelov and Cousineau 1997, 84)

In relation to education, Banathy (1991) has written extensively on re-designing educational systems to meet current needs and the societal context, and Banathy's work is examined further in Part C.

In terms of systemic learning, ecological design may be seen as a corrective response - a correction strategy in response to the threat / opportunity of unsustainable / sustainable development. In terms of the autonomy / integration model (discussed in Part B.1.6), it may be seen as a realisation of the need for the integration of human systems into the matrix of the greater biophysical/ecological system.

From an ecological viewpoint, this corrective response needs to go far beyond making adjustments in existing systems (a first order learning response). This brings us back to the discussion on the need to replace our notion of 'controlling complex systems' with that of 'conscious participation'. The idea of control, that is, being able to predict, plan and control outcomes is replaced with design, management and reflexive learning

towards healthy emergence. Such work cannot be achieved through ‘command and control’ but through a reflective dialogic approach with the subject of concern or ‘problem’ . As Rapport (1998, 12) suggests:

> It is not control that is needed, but rather an understanding of these complex systems’ natural dynamics and a strategy that works with, rather than against these dynamics.

Or as Bossel (1998, 274) comments:

> Omniscient design of the sustainable society is not possible. The task is rather to determine and apply…principles which lead to self-organising evolution of sustainable human systems (of whatever shape) in a sustainable environment.

This is not a matter of imposing order but working with, or restoring, patterns of self-organisation through a co-evolutionary approach, where learning plays a central role. Instead of the convention of developing blueprints and faithfully implementing them whatever the consequences, ecological design is essentially an iterative learning process - and one which is particularly sensitive to the phenomenon of emergence. An ecological view recognises that all actions have consequences, and that emergent properties in a system might be (said to be) relatively healthy or unhealthy to the wellbeing of the whole. There are no ‘side-effects’, no ‘externalities’, no ‘by-products’ in ecological design, but evoked synergy and emergence. There is no optimisation or maximisation of single goals, but integration of multiple goals such as is demonstrated in sustainable agriculture or ecoarchitecture.

According to Papanek (1995,7) ecological design means our design questions need to change. We need to go beyond ‘how does it look?’ or ‘how does it work’ to the critical question, ‘how does it relate?’ - (a question which appears to me to subsume the first two). This of course is a question with temporal, spatial and dynamic aspects - and indeed ethical aspects - and this brings us to the idea of *adaptive management*.

Before looking at this, it is as well to be reminded that ecological design is in its relative infancy. As Kelly neatly suggests (1994, 3), while “the logic of Bios is being imported into machines” (and human systems through ecological design and biomimicry), “the logic of Technos is being imported into life” (1994, 3). While Kelly is sanguine about this and believes in the benefit of the growing congruence ‘of the made and the born’, I am unconvinced. Of these two trends, arguably the second, evidenced through bio- and genetic engineering, backed up by corporate interests and informed by a

mechanistic worldview and a reductionist science unable “to take account of complexity, interconnectedness and wholeness” (Ho 1998, iv) is the more powerful. It is also, in my view, antipathetic to whole systems thinking.

Adaptive management (and resilience)

The ideas of ecological design have clear implications for management, both of natural resources and of human systems. A starting point is to question the traditional division in Western epistemology between natural and social systems, and the separate schools of management theory that have grown up around this distinction. Thus Berkes and Folke’s important book *Linking Social and Ecological Systems* (1998) is based on the idea that the distinction is “artificial and arbitrary” (1998, 4). In most of human history, they suggest, this distinction has not been reflected in ‘traditional ecological knowledge’ systems (TEK) that have always seen humans as part of nature. Gunderson and Holling’s more recent book on *Understanding Transformations in Human and Natural Systems* (2002) takes the view that human and natural systems are different but closely coupled. This requires a theory of what they and others (Berkes and Folke 1998, Carley and Christie 2000) call ‘adaptive management’ or ‘integrated management’ which recognises that “the wellbeing of social and ecological systems is closely linked”(Berkes and Folke 1998, 21).

In the face of complexity and uncertainty, this model of management (that is now emerging) is concerned with “the unpredictable interactions between people and ecosystems as they evolve together” (Berkes and Folke 1998, 10). This differs from conventional management because it emphasises iterative learning in response to feedback, and does not share conventional assumptions of “controllable nature, predictable yields, and exclusion of environmental perturbations” (1998, 21). So at a more profound level, adaptive management represents a break from conventional methodologies associated with Western resource management science which emphasises the role of the expert, universally applicable and decontextualised knowledge, and control. In other words, adaptive management appears to be a different management paradigm. As such, it represents a considerable challenge. According to Pritchard and Sanderson (2002, 163), most bureaucratic management is currently focussed mainly on ‘problem-solving’ - on how to reduce uncertainty. If management is to be adaptive they say, “it should be focussed on how to handle irreducible uncertainty…test hypotheses about system function and resilience…and maintain the productive capacity of the ecosystem” or organisation. Part of the solution they suggest, is to move towards “participatory adaptive management”.

At this point, I want to look further at why this adaptive approach is necessary, and to do this, I will look at the 'big picture'. The ecological viewpoint affords a systemic view of sustainability, whereby it is possible to discern patterns in the effect of the whole modernity project on the world. This may be making big claims, but thinking holistically, we need to consider the effects of the whole system - the dominant worldview and its associated economic system, management approaches *etc*, - on social/economic/ecological sustainability.

In general, if we take the key annual reports on the status of sustainability such as those from the Worldwatch Institute, the World Resources Institute, or WWF, a pattern seems to emerge which has broad application - as regards local economies, communities, landscapes, and ecosystems. From a systems reading, the following trends commonly appear to be in evidence, particularly at local level:

- reduction of diversity (e.g. cultural, biological)
- increase in incidence of negative 'surprise' (inadvertent unhealthy emergence)
- reduction in self-organising and self-renewing abilities
- increase in dependence on exogenous support and inputs
- reduction in closed coupling and local cycles, and in systemic integrity
- lower connectedness at local level, and increased but disparate connectedness between distant and local level
- erosion of readable signals/feedback, and
- reduction in resilience and increase in vulnerability.

Thus Chambers (1996, 173-179) argues that the "normal paradigm tends towards global homogenisation through the interlocking effects of the market, communications, technology and professionalism" and argues for 'paradigm reversal' towards the 'three D's' of decentralisation, democracy and diversity.

In sum, Western development patterns are tending to reduce sustainability in local ecological/social systems. The global elite's belief that the global ecosystem can be rationally managed (Sachs calls this elite the "ecocracy") tends to aggravate this problem (Sachs 1999). (Similarly, Togerson 1998, 110 notes that what he calls 'the administrative mind' with its emphasis on rationalism and fragmentation is "itself an environmental problem".)

A critical idea here is *resilience* - how it can be eroded and how it can be enhanced. But it is important here to define resilience and stability, because there are two very different interpretations in scientific ecological literature, associated with different views of science, and different methodologies. Berkes and Folke (1998, 12), and Gunderson and Holling (2002, 28) make the following distinction:

- *engineering resilience*: concentrates on stability near a presumed steady state, resistance to disturbance and speed of return to equilibrium state. The focus is on efficiency, control, constancy, and predictability. It is appropriate where uncertainty is low, but inappropriate for dynamic and evolving systems. This is the conventional cause-effect view of predictive science. In resource management, it leads to assumptions about maximum yield, relatively fixed carrying capacity and the possibility of predictive management. (This is the ecocracy's view.)
- *ecosystem resilience:* emphasises conditions far from any equilibrium steady state, where disturbances can flip a system from one state to another. Here, the measure of resilience is the scale of disturbance that can be absorbed before the system changes structure. The focus on persistence, adaptiveness, variability, and unpredictability. This is "a fundamentally different view of science" (Berkes and Folke 1998, 12) where systems are seen to be complex, non-linear, multi-equilibrium and self-organising. (This links with 'edge of chaos' ideas on management, which are looked at in Part C.)

The former approach is frequent and ubiquitous, and reflected in fragmented approaches to environmental management that derive from models from economics, engineering, human health, and ecology, "with little attention being paid to the pressing need for integration" and resultant "simplistic solutions that are generally based on the belief that all powerful technologies can deal with the problems after they have occurred" (Rapport 1998, 9).

These two views of resilience remind me of the distinction between 'difficulties' and 'messes' (Ackoff 1980) and the qualitative difference between hard systems and soft systems approaches, and indeed between mechanism and organicism looked at earlier in this Thesis. Thus, what is at stake here is the appropriateness and adequacy of worldview, and indeed by association, a new understanding of science, of management and of politics.

Gunderson and Holling argue that worldviews - as 'representations of reality' - are valuable because temporarily they offer sufficient certitude to allow action, but often their "partial nature ultimately exposes their inadequacy" (2002, 10). Consistent with the argument of this Thesis, these authors make the case for a dynamic, evolutionary and adaptive view of nature which they call 'Nature Evolving', and they point to complexity theory and interest in non-linear systems and self-organisation as evidence of the emergence of this view. This is contrasted with what they see as the more static views of nature that often prevail: four are identified and labelled as 'Nature Flat' (no feedbacks recognised, no real limitations to human activity given human ingenuity), 'Nature Balanced' (nature forgiving and existing at or near equilibrium, maximum sustainable yield can be identified), 'Nature Anarchic' (nature is fundamentally destabilised and therefore minimal demands must be made), 'Nature Resilient' (multiple states of stability and seemingly able to cope with human activity). All of these views are, in their words, "not wrong - just incomplete". As I have argued all along, what we need is a more *adequate* worldview.

As regards methodology, Gunderson and Holling state (2002, 28):

- Keypoint: "sustainable relationships between people and nature require an emphasis on the second definition" of resilience and suggest that this shifts the emphasis in management and policy from command and control to modes that allow or build capacity for adaptation in systems.

Thus, they state, "the challenge is to conserve the ability to adapt to change, to be able to respond in a flexible way to uncertainty and surprises…maintaining options in order to buffer disturbance and create novelty" (32). Hence, perhaps, the movement towards localisation as a response to globalisation. By increasing resilience and integrity at local level, it improves the local system's ability to respond to and adapt to feedback.

The difference between the ecological and mechanistic approaches elaborated by Gunderson and Holling as regards management and sustainability might be summarised in the following table which I have devised to indicate the key shifts of 'extension, integration, and connection' reviewed in section 2 above.

Table App.I.6: Differences between mechanistic and ecological modes of thinking

Ecological mode of thinking	Mechanistic mode of thinking	Negative effects of mechanistic mode	Appropriate shift involves
Relatively open system	Relatively closed system	Conceptual boundaries (closed where should be more open)	EXTENSION
Integrative	Dis-integrative, fragmentary	Disintegration of local systems / subsystems (opened where relative closure/autonomy should be maintained)	INTEGRATION
Located/rooted	Dis-located, decontextualised	Dislocation. Loss of diversity and resilience	CONNECTION

However, it is clear is that there are no blueprints, no set strategies and no templates. But if there are no directives, there *are* directions (O'Riordan and Voisey 1998, xv), and I would argue that those who contend that sustainability is so vague that we can do nothing, misunderstand the nature of the problem/opportunity. It is worth summarising here Berkes and Folke's (1998, 429-430) general principles and patterns for building resilience and sustainability:

- using management practices based on local ecological knowledge
- designing management systems that 'flow with nature'
- developing local ecological knowledge for understanding cycles of natural and unpredictable events
- enhancing social mechanisms for building resilience
- promoting conditions for self-organisation and institutional learning
- re-discovering adaptive management, and
- developing values consistent with resilient and sustainable social-ecological systems.

The recent - and current - research and thinking from which such principles are developed imply radical re-thinking of many norms in many sectors and at many levels of scale from local to global. Such thinking then, is profoundly significant in my view. It appears to lend legitimacy, rigour and validity to the alternative and oppositional arguments and discourse that has surfaced in recent years, for example in economics, development, and community regeneration, (see, for example, Goldsmith 1992, Sachs *et al.* 1998, Sachs 1999). Rich's (1994,287) assertion is perhaps representative of this line of argument:

> …increasing humankind's freedom entails conserving different futures; it means living and working in the present in such a way as to conserve and create as many future options as possible….Making possible different futures… must start with, must be based on, the conservation and enhancement of existing natural and social diversity…Moreover, the existence of self-organizing capacities in human societies (at different, interconnected levels from the local to the regional, national and international) implies the possibility of an alternative global order - or rather, set of orders - to the one based exclusively on centralized nation-states, multilateral organizations like the World Bank, and transnational corporations.

Adaptive management emphasises the participative nature of living (as opposed to the detachment of the rational manager); it is a co-evolutionary view emphasising the importance of continuous learning, of appreciation, and of multiple perspectives. This brings us to the third aspect of ecological methodology, which is inquiry and learning. This is of course, key to the whole Thesis, and looked at in Part D of the main Thesis.

3.4 The whole systems thinker

To end this **Appendix I**, I employ the triadic model again, to look at some characteristics of whole systems thinking, not so much in terms of assumptions and values, as general outlook. Box App.I.2 below is such a summary, based on a number of sources and my own interpretation. It is organised roughly according to the three domains of knowing and experience outlined in the model above and suggests not just 'a way of thinking' but more deeply, a way of being. The validity of this outline is perhaps affirmed by considering the prevalence of its opposite in society and discourse.

Box App.I.2: Some qualities of the whole systems thinker

Systems thinkers tend to:

Seeing

- try to recognise their own assumptions, beliefs and influences at all levels from deep to immediate
- value multiple perspectives
- look at the bigger picture (spatially, temporally, culturally)
- be concerned with systems health (whole systems)
- be open-minded: their thinking is a relatively 'open system'
- appreciate what *is*, before thinking what might be

Knowing

- look for connections and patterns
- have a keen sense of emergence and relationship
- look for multiple influences and feedbacks rather than linear 'cause-effect' relations
- be wary of narrow, simplistic, 'obvious' or majority explanations in the face of complexity
- recognise and are comfortable with uncertainty, ambiguity and 'mess'

Doing

- look at 'relationships' and 'purpose' first rather than blame components of a system
- suspend judgement
- ask different questions (deeper, more inclusive)
- be critical and synthesising
- work for self-organisation, capacity and healthy emergence
- have most regard for the local, the human-scale, the bottom of the system
- anticipate consequences, and ask 'what then?'
- be critically reflexive learners

Similarly, in a paper on 'Whole Earth Models and Systems' Meadows (1982a) suggested how policies would look if they were consistent with a systems view of the world, and it is worth including here. They would be:

- *Respectful* - designed to assist and encourage the system to run itself, rather than impose from the 'outside'
- *Responsible* - for what happens rather than trying to blame outside influences
- *Experimental* - recognising that nature is complex beyond our ability to understand, and that therefore careful experiment is required, rather than undeviating directives
- *Attentive* - to the system as a whole, and to total system properties, rather than trying to maximise the performance of parts
- *Mindful* - of the long term, recognising that actions taken now might have effects for decades to come
- *Comprehensive* - recognising that no part of the human race is really separate from any other part or from the global ecosystem. We all fall or rise together.

  (based on Meadows 1982a, 108)

Further, Flood's (1999, 192) main conclusion from his review of systems thinking is the need for humility: "an awakening to the realisation that really we don't know very much about anything and actually never will".

Such dispositions suggest the (necessarily complementary) 'inner' and 'outer' dimensions of whole systems thinking, the bases of which I have attempted to explore in this **Appendix I**.

4 SUMMARY OF APPENDIX I

In this major Appendix to the Thesis, I have sought to:

- elaborate some of the intellectual and historical bases which inform the substance, nature, and case for whole systems thinking
- further develop the triadic model of paradigm, knowing and experience (Seeing, Knowing, Doing) to help clarify the dimensions of paradigm change, in parallel with the model of staged learning levels introduced in the main Thesis.
- Use 'Seeing, Knowing and Doing' to organise a discussion of the application and implication of whole systems thinking in relation to sustainability.

APPENDIX II (FOOTNOTES AND DIAGRAMS)

N. B. Diagrams, boxes and tables are shown under the relevant Part / Section / Subsection headings, and are numbered and cross-referenced in the main text.

PART A

1 RATIONALE

1.1 The focus and scope of the inquiry

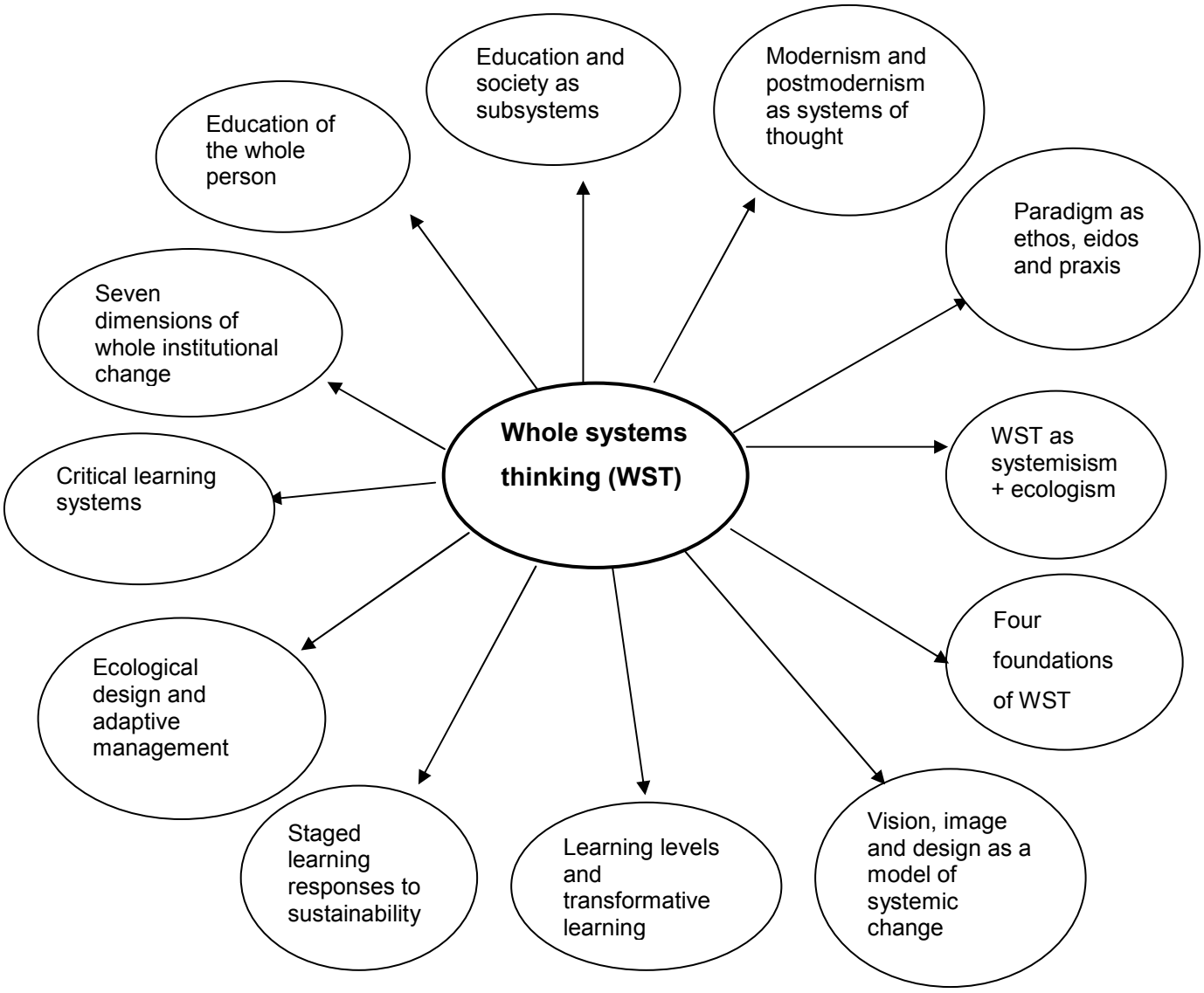


Diagram A.1 (b) The use of whole systems thinking to explore interrelated subtopics in the Thesis

PART B

1 THE EMERGENCE OF THE POSTMODERN ECOLOGICAL WORLDVIEW

1.6 The postmodern ecological worldview – looking at essential ideas

1.7 Evidence of the postmodern ecological worldview in cultural change

B.2.1 Evolutionary change in systems thinking

Diagram B.4 Traditions of systems thinking

Ison, R. Maiteny, P. and Carr, S. (1997), 'Systems Methodologies for Sustainable Natural Resources Research and Development', *Agricultural Systems,* vol 55, no 2, Elsevier, 257-272.

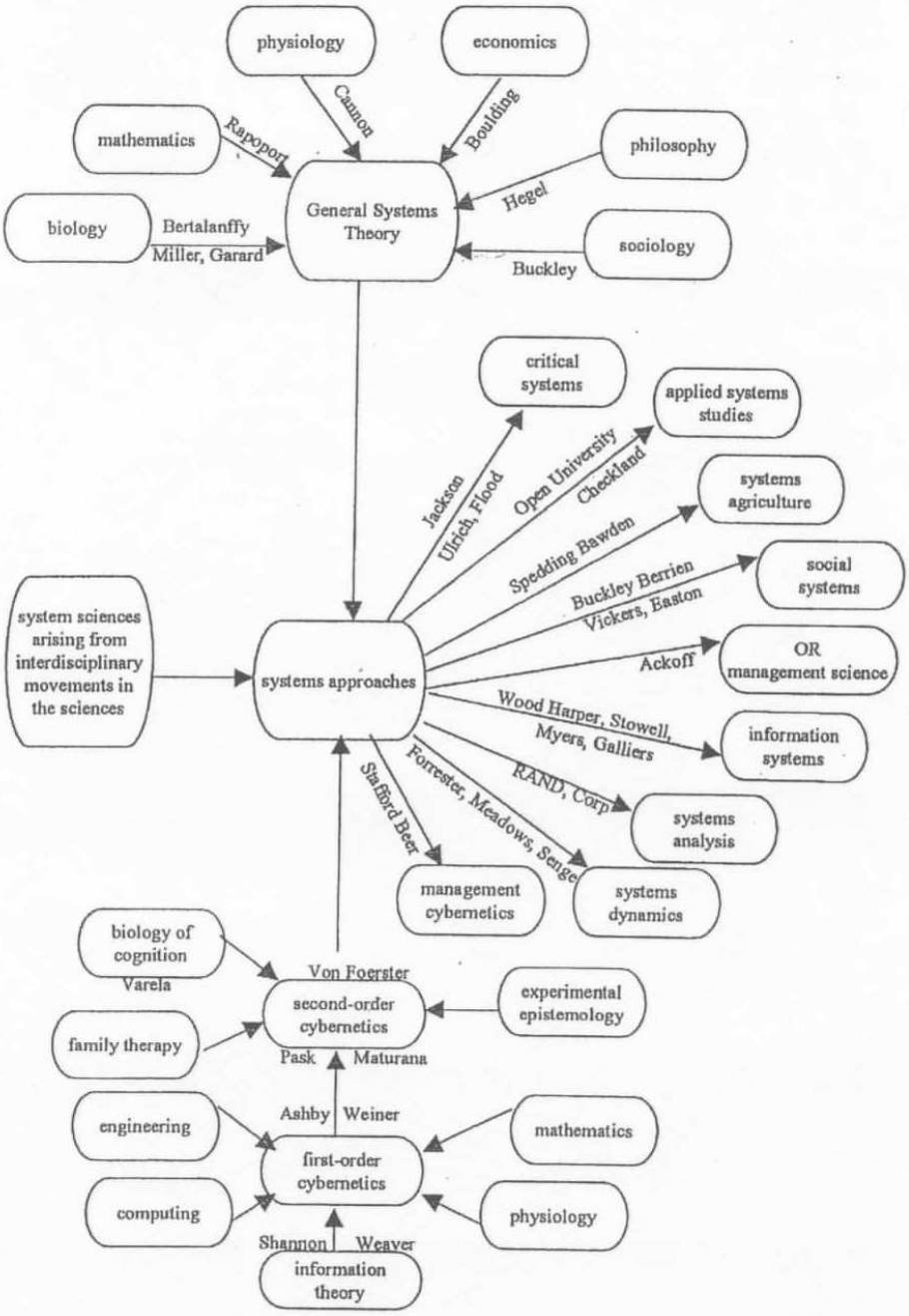


Figure 2. A spray diagram mapping some of the different influences within systems scholarship that have given rise to a range of systems approaches for managing complexity, and some key researchers associated with these influences. (Adpated from Ison, Carr & Maiteny 1997).

PART C

1 THE EDUCATION PARADIGM DISCOURSE

1.1 Educational paradigm: modelling, maintenance and movement discourse

Viable systems

A systems perspective on sustainability looks at certain qualities in a system. These checklists are based on Ravetz (2000, 17-18) and Bossel (1998, 99).

- *viability* – does it work?

Does it show self-organising behaviour?
Is it resilient to short-term change in its environment?
Does it effectively use a throughput of resources to maintain itself?

- *integrity* – is it a recognisable, integrated whole?

Does it maintain itself through feedback loops and communication?
Is it compatible with the viability of its subsystems (internal coexistence)?

- *longevity* – has it lasted? Is it likely to last? How does it relate?

Can it change, adapt and innovate in relation to a changing environment over time? (external coexistence)
Is it compatible with the viability of the larger systems within which it exists (its environment)?

OR:

- *robustness and resilience* – how far it can retain stability in the face of change
- *effectiveness* – using energy and resources effectively in maintaining itself
- *adaptability and innovation* – how far it can adapt to long-term changes in its environment
- *co-existence* – with its subsystems and with its larger environment

2 EVIDENCE OF AND ARGUMENTS FOR A MORE SYSTEMIC EDUCATIONAL PARADIGM

2.3 The ecological education paradigm

Box C.3: One image of sustainable education

Here is my image of 'sustainable education', drawn at very general level. It is an elaboration of the three-part model discussed in Part D in relation to education.

Sustainable education is:

Extended…
Appreciative – aware of the uniqueness and potential of each individual and group, of the qualities of any locality and environment, and sees personal and local knowledge as foundational to learning.
Ethical – extends the boundaries of care and concern from the personal and the present, to the social, environmental, non-human, and future dimensions.
Innovative – draws inspiration from new thinking and practice in a variety of fields, relating to education, learning and aspects of sustainable development.
Holistic – relates to the learning needs of the 'whole person' (including spiritual and emotional), of differentiated individuals and groups, and to the range of human intelligence.
Epistemic – aware of its own worldview and value bases, which are critically examined and reviewed. Second, and even third, order learning is facilitated.
Future oriented – concerned with creating a better future, from now on.
Purposeful – critically nurtures sustainability values with the intention to assist healthy change.

Connective…
Contextual – in touch with the real world, particularly sustainability issues, and grounded in the locality.
Re-focused – particularly on social development, human and natural ecology, equity, futures, and practical skills for sustainable living.
Critical – ideologically aware, deconstructive and constructive.
Systemic – pays attention to systemic awareness of relationships, flows, feedbacks, and pattern in the world.
Relational – connects patterns of change: local-global, past-present-future, personal-social, environmental-economic, human-natural, micro-macro etc.

Pluralistic – values different ways of knowing, and multiple perspectives.
Multi and transdisciplinary – regards disciplinary borders as fuzzy and puts greater emphasis on new ways of seeing complex issues.

Integrative…

Process oriented – constructs meaning through an engaged and participative learning process, reflecting different learning styles. Everyone is a learner, including the teacher/leader.
Balancing – embraces cognitive and affective, objective and subjective, material and spiritual, personal and collective, mind and body etc.

Inclusive – for all persons, in all areas of life and extending throughout their lifetimes.
Synergetic – deeply aware of emergence, and designs curriculum, organisation and management, culture to be mutually enhancing. Energy, material, and money flows are organised on sustainability principles and are reflected in the whole curriculum.
Open and inquiring – encourages curiosity, imagination, enthusiasm, innovation, creativity, community, spirit, to arise. At ease with ambiguity, and uncertainty.
Diverse – allows for variety, innovation and difference of provision and ways of knowing within a coherent framework.
A learning community – institutions promote learning through themselves engaging in reflexive learning (learning organisation).
Self-organising – balancing autonomy and integration through different system levels and practising subsidiarity and democracy.

Such an education and learning situation would be intrinsically transformational, of itself and of its community members, and would have systemic coherence.

From Sterling, S (2001) *Sustainable Education – Re-visioning Learning and Change,* Green Books, Dartington, 84-85.

Table C.3: Summarising the contrasting paradigms

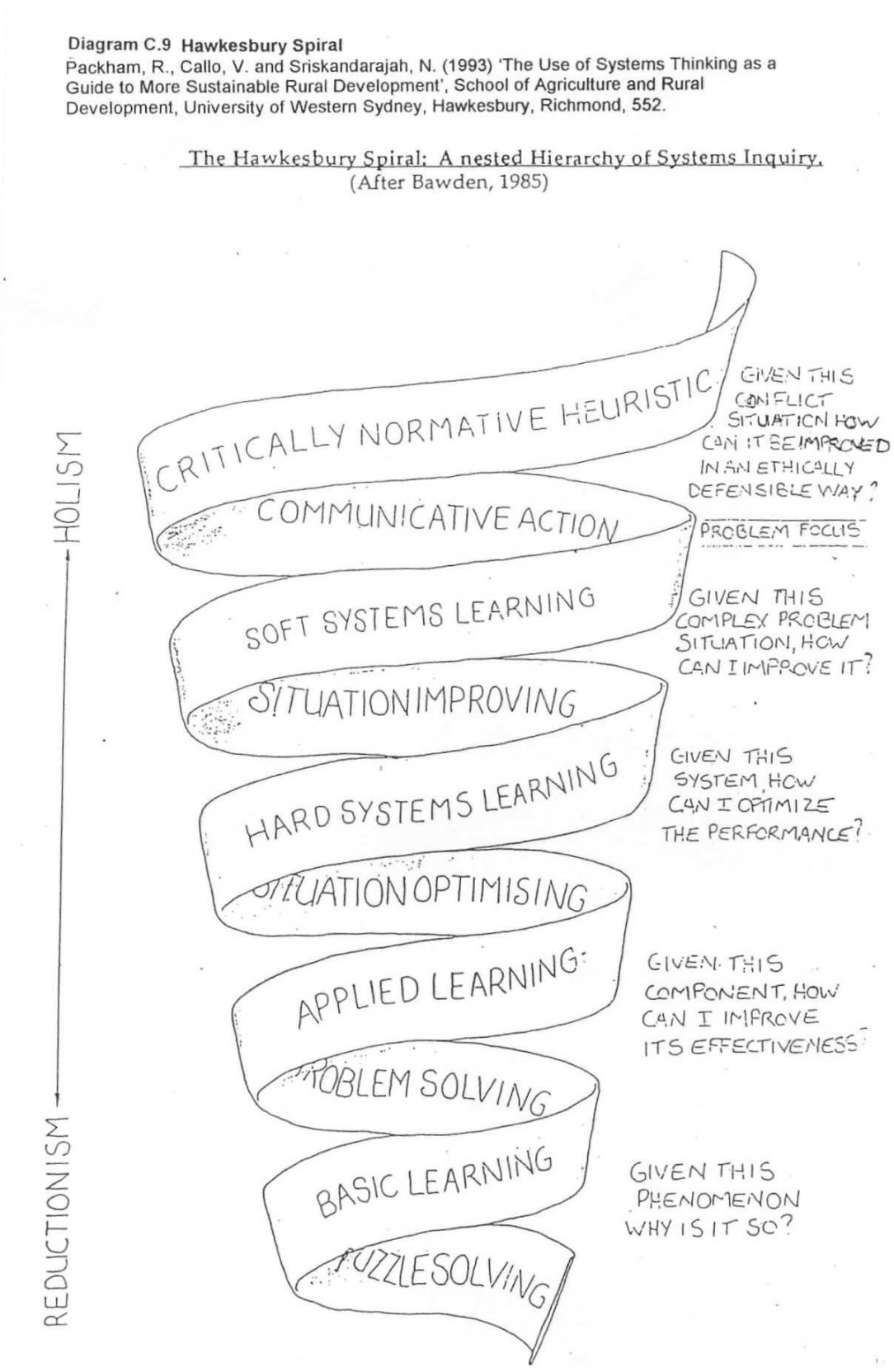
MECHANISTIC VIEW	ECOLOGICAL VIEW
LEVEL 1: EDUCATIONAL PARADIGM	
Core Values	
• Preparation for economic life	• Participation in all dimensions of the sustainability transition – social, economic, environmental
• Selection or exclusion	• Inclusion and valuing of all people
• Formal education	• Learning throughout life
• Knowing as instrumental value	• Being/becoming (intrinsic/instrumental values)
• Competition	• Cooperation, collaboration
• Specialisation	• Integrative understanding
• Socialisation, integrating to fit	• Autonomy-in-relation
• Developing institutional profiles	• Developing learning communities
• Effective learning	• Transformative learning
• Standardisation	• Diversity with coherence
• Accountability	• Responsibility
• Faith in 'the system'	• Faith in people
• Modernity	• Ecological sustainability
LEVEL 2: ORGANISATION AND MANAGEMENT OF THE LEARNING ENVIRONMENT	
Curriculum	
• Prescription	• Negotiation and consent
• Detailed and largely closed	• Indicative, open, responsive
• Discursive knowledge	• Non-discursive knowledge also valued
• Decontextualised and abstract knowledge	• More emphasis on local, personal, applied and first-hand knowledge
• Fixed knowledge and 'truth'	• Provisional knowledge recognising uncertainty and approximation
• Confusion of 'data', 'information' and 'knowledge'	• Ultimate concern with wisdom
• Disciplines and defence of borders	• Greater transdisciplinarity/ domains of interest
• Specialism	• Generalism and flexibility
Evaluation and assessment	
• External inspection	• Self-evaluation, plus critical support
• External indicators, narrowly prescribed	• Self-generated indicators, broadly drawn
• Quantitative measures	• Qualitative as well as quantitative measures
Management	
• Curriculum control and prescription	• Curriculum empowerment and determination
• Top-down control	• Democratic and participative
• Architecture, energy and resource use, and institutional grounds neither managed ecologically nor seen as part of the educational experience	• Ecological management, linked to educational curriculum and experience

• Scale not considered	• Human scale structures and learning situations
• Synergies and emergence not considered	• Positive synergies sought
Community	
• Few or nominal links	• Fuzzy borders: local community increasingly part of the learning community
LEVEL 3: LEARNING AND PEDAGOGY	
View of teaching and learning	
• Transmission	• Transformation
• Product oriented	• Process, development and action oriented
• Emphasis on teaching	• Integrative view: teachers also learners, learners also teachers
• Functional competence	• Functional, critical and creative competencies valued
View of learner	
• As a cognitive being	• As a whole person with full range of needs and capacities
• Deficiency model	• Existing knowledge, beliefs and feelings valued
• Learners largely undifferentiated	• Differentiated needs recognised
• Valuing intellect	• Intellect, intuition, and capability valued
• Logical and linguistic intelligence	• Multiple intelligences
• Teachers as technicians	• Teachers as reflective practicioners and change agents
• Learners as individuals	• Groups, organisations and communities also learn
Teaching and learning styles	
• Cognitive experience	• Also affective, spiritual, manual and physical experience
• Passive instruction	• Active learning styles
• Non-critical inquiry	• Critical and creative inquiry
• Analytical and individual inquiry	• Appreciative and cooperative inquiry
• Restricted range of methods	• Wide range of methods and tools
View of learning	
• Simple learning (first order)	• Also critical and epistemic (second/third order)
• Non-reflexive, causal	• Reflexive, iterative
• Meaning is given	• Meaning is constructed and negotiated
• Needs to be effective	• Needs to be meaningful first
• No sense of emergence in the learning environment/system	• Strong sense of emergence in the learning environment/system

From Sterling, S (2001) *Sustainable Education – Re-visioning Learning and Change,* Green Books, Dartington, 58-59.

2.4 Transformative learning, systemic change and sustainability

Diagram C.9 Hawkesbury Spiral
Packham, R., Callo, V. and Sriskandarajah, N. (1993) 'The Use of Systems Thinking as a Guide to More Sustainable Rural Development', School of Agriculture and Rural Development, University of Western Sydney, Hawkesbury, Richmond, 552.



Box C.7: Case Study – Schumacher College, Dartington

In 2002, I conducted an evaluation of the learning environment and effects of Schumacher College, the privately run 'international centre for ecological studies', at Dartington (Sterling and Baines, 2002). There is good deal I could say about the College, but space is an issue and my main interest here is to outline some of the characteristics of the College which appear to contribute to its unusual reputation for providing deep learning experiences for a significant proportion of its participants. In my view, it is an excellent and very rare example of a learning institution that has intentionally sought and designed its own systemic development in order to offer a systemic development learning experience (to adapt Bawden's phrase). In many aspects, it is the opposite end of the spectrum from most mainstream institutions. Whilst the latter are often characterised by *systematic* management and organisation including top-down control, explicit rules, defined structures and areas of responsibility, and a degree of rigidity, Schumacher College demonstrates a high degree of *systemicity* that is, internal connection, relatedness and coherence which is in many ways the key to understanding its operation and distinctiveness. In some respects – and this was part of our critique – the College has taken this operational systemicity too far, evidenced by a lack of clarity and inconsistency at times.

However, and in contrast to the mainstream, the aims and objectives of the education programme and of the individual courses are less tightly defined, subject to change and evolution depending on how a course evolves, not spelt out at the detailed level of course aims and learning outcomes, and where expressed, relate to levels of personal change and long-term change in the wider world. Further, the College's ethos and operating principles are based on a partly implicit philosophy of holism, ecologism and systemisism, where 'everything relates to everything else'. There is a fine and dynamic balance between explicitness and implicitness, autonomy of the part and integration within the whole, structure and spontaneity, and healthy emergence and synergy is inherent to the mode of operation.

In this situation, transformative learning is more likely, often reported (including in feedback to our questionnaires), but not of course, guaranteed. Part of our evaluation sought to understand how and why this took place. Without going into too much detail, it is clear that the College often provides an intense, engaged learning experience, where the teacher/learner distinction breaks down and a particular learning community emerges. There is a systemically coherent total learning environment that both

challenges *and* values/provides security for people and their beliefs, and further, works at different levels of consciousness and of knowing. Participants are challenged to look at their thinking, beliefs and actions and are offered new frameworks for thought. For many this is an extension and an affirmation, rather than a shift of fundamental thinking, depending on how 'ecological' their starting point is. For others, a more profound and sometimes unsettling shift is reported.

In brief, Schumacher College has evolved a 'learning system' which can, and often does, facilitate epistemic (or transformative) learning. This learning environment is characterised by its fluidity, integration, multidimensionality, intensity, ethical integrity, caring and synergy.

Rather like Hawkesbury, there was a strong element of design founded upon an expressed ethos in the development of the College, but from the early days, a systemic quality of learning has been intrinsic to the evolution of the 'learning system' that the College became over time. However, there was very little systemic learning theory involved in its development – rather this evolved from a set of guiding principles which reflected its ethos. Its director, Anne Phillips (1999) set out the College's values and principles which may be summarised as:

- reflective learning for individuals and the institution
- cooperation
- shared purpose
- the enjoyment of learning
- service and creating opportunity for service
- treading lightly and living simply
- the intrinsic value of work of all kinds
- celebrating diversity
- living with ambiguity
- a good experience for everyone
- self-regulation within a framework rather than coercion
- recognising limitations, and
- a spirit of rigorous inquiry.

This comprises a management ethos which is key to understanding the College. The principles interact in practice and achieve a synergy which gives rise to the ambience or spirit of the College which, in a positive sense, 'infects' everything - including in most cases, the participants. In essence, it is an ethos of caring, of goodwill, and particularly of trust. In short, transformative learning arises in conditions whereby the College's environment and operation is 'curriculum as lived experience', rather than a backdrop

to formal instruction. A summary of 'defining characteristics' of the College's learning environment are included below.

The defining features of Schumacher College

Human scale - a maximum of 25 participants on any course, so that the College retains an atmosphere of conviviality; also human scale architecture and site.
Inclusion – 'everybody does everything'. This means first, that all staff and resident helpers are involved in day-to-day running of the College. Second, that all members of the College – staff, helpers and participants – partake in daily duties maintaining the College, including cleaning, tidying and cooking in an expression of common service.
Ephemeral but intense learning community – the conditions encourage the emergence of a strong sense of learning community amongst participants, which is the more so as everybody knows it will soon disperse.
Unity in diversity – often, experienced people make up the participants, who are ecologically oriented but have diverse interests and backgrounds within that orientation.
Good food – high quality but simple vegetarian food, mostly locally sourced and mostly prepared on-site. This is a central part of the College's ethos.
Ecological principles - as far as possible operating according to ecological principles with regard to resource use and making this part of the everyday curriculum
Exploration - open-ended enquiry rather than working towards prescriptive 'learning outcomes'
Focus - only one short course running at any one time, resulting in a particular ambience and learning community in residence
Variety - in the working day, with most intellectual input in the mornings, and more opportunity for negotiated activities in the afternoons and evenings.
Aesthetics – a pleasing and atmospheric environment and location.
Emergence – no one attempts to know or control what might emerge from the dynamics of any particular group or course
These interact synergistically to produce the ambience and learning situation.
From Sterling S and Baines J, 2002.

3 CHANGE AND MANAGEMENT

3.1 Theory of systemic management and change

ESSENTIAL MANAGEMENT DIFFERENCES BETWEEN MECHANISTIC AND ECOLOGICAL MODELS OF EDUCATION

MECHANISTIC MANAGEMENT	ECOLOGICAL MANAGEMENT
STYLE OF MANAGEMENT	
• Goal oriented	• Direction oriented
• Product oriented	• Process oriented
• Controlling change	• Facilitating change
• Focus on single variables and parts	• Focus on sets of relations and the whole
• Aware of causal relationships	• Aware of emergence
• Power-based hierarchy	• Leadership and self-management at all levels
• Command and control	• Democratic and participative
• Vertical structures	• Flatter and integrated structures
• Intervention from 'outside' system	• Working with and from inside system
• Interested in prediction	• Interested in possibility
• Problem solving	• Problem reframing and situation improvement
• Adaptive learning	• Adaptive, critical and creative learning
• External evaluation	• Self-evaluation with support
• Quantitative indicators	• Qualitative and quantitative indicators
• Planning	• Design
• Closed	• Open
Effects on system (tend to be)	
• Standardisation	• Diversity and innovation
• Homogenisation	• Heterogeniety but coherence
• Dependency	• Autonomy-in-relation at all levels
• Externally directed	• Self-organisation
• Dysfunctional emergent properties	• Healthy emergent properties
• Poor ability to respond to change	• Flexibility and responsiveness
• Unsustainability	• Greater sustainability

From Sterling, S (2001) *Sustainable Education – Re-visioning Learning and Change,* Green Books, Dartington, 47.