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*The development and use of maps
of socio-cybernetic systems
to improve educational and social policy*

ABSTRACT

The main aims of this paper are:

(1) to explore the benefits to be derived from trying to construct socio-cybernetic¹ maps to depict, help to understand, and find ways of influencing, societal (management) systems. Or, put another way, to assess the extent to which the attempt to represent the operation of societal systems in terms of socio-cybernetic maps helps, like a fault-finding chart associated with radio circuitry, to find ways in which linkages may be altered or added, and components changed, to remedy dysfunctions so that the system achieves its intended goals more effectively;

(2) to discuss some of the problems we have encountered in trying to develop such diagrams with a view to both making explicit previously unrecognised features of the specific system we were studying and alerting others who might wish to follow a similar path to difficulties they are likely to encounter; and

(3) more specifically, to use one of these maps to illuminate the processes that are heading the planet toward destruction and, in this way, discover some of the points at which it would be realistic to seek to intervene to halt or re-

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¹ The word "Cybernetics" is here taken to mean the study and representation of control, feedback, and guidance systems in machines, animals, and societies.

verse this process without those interventions being nipped in the bud, or their effects negated, by the rest of the system.

BACKGROUND

Starting in the late 50s, the first author and his colleagues set about trying to clarify the objectives of the educational system with a view to stimulating developments which would facilitate the more effective achievement of the system's manifest goals. We canvassed the opinions of parents, teachers, pupils, and employers. Then checked these opinions against available data on what made for different types of success in different areas of life and for the development of different kinds of society offering different patterns of life satisfaction to their members. We studied the curriculum processes required to nurture the desired qualities, and we worked on the development of means of assessing them².

But, most important from the point of view of this paper, we studied the barriers which prevented the educational system achieving objectives which were, and are, espoused by more than 90% of the population – objectives which have, for more than 150 years, been endorsed by philosophers of education and government departments, and which are demonstrably crucial to the effective operation of organisations and society.

Given that the most widely advocated objectives are *not* those which receive most attention in schools and universities it is necessary, if talking at cross-purposes is to be avoided, to indicate the kind of objective we are concerned about here by saying that they *mainly* involve developing qualities like the confidence and initiative required to introduce change, the ability to work with others, and the ability to solve problems.

² *Raven (1994).*

Perhaps more importantly, they involve identifying, developing, and giving pupils recognition for, their particular idiosyncratic talents; that is, they involve catering for, and nurturing, diversity. They require teachers to draw out the talents of students instead of putting things into their heads.

Exploration of the barriers to achieving such objectives revealed that there was, and is, little understanding of how such qualities are to be nurtured or how they can be assessed: how can multiple and complementary talents be nurtured and recognised?

But, vitally important though this lack of technical understanding is, much more important is the widespread failure to acknowledge the *sociological* functions performed by the so-called "educational" system and thereafter ask how these sociological forces could, like the wind, be harnessed to do useful work for humankind instead of driving it against the rocks.

Linked to this is the problem of catering for diversity within public provision and the tension between a desire to promote diversity on the one hand and a desire to have standards to judge performance and ensure that the system does not degenerate into *laissez-faire* mediocrity (or, worse, the positive cultivation of mediocrity) on the other.

In the end, and very surprisingly, the work led to the recognition that the central problems faced by society in its efforts to obtain desired benefits stemmed from inappropriate beliefs about management – and public management in particular. These were last centrally addressed by such people as Smith, Hayek, and Mill two centuries ago. (It is important to note that it was Marx's failure to discuss them which led to the deaths of millions of Russians and, eventually, to the discrediting of "communism" despite the fact that the only hope for the survival of the human species lies in rapidly finding out how to run societies in such a way as to give effect to the long-term public interest [as distinct from the interests of dominators] ...

that is, in finding out how to run genuine socialised economies).

Slowly, we came to realise that we were dealing with a *system* in which it was impossible to change any one part on its own because the effects of that change would be negated by the reactions of the rest of the system.

But, at the same time, we came increasingly to realise that centrally directed system-wide change was a non-starter because there was altogether too little understanding of both the system itself and its components. As Beer later put it, it seemed that the monitoring and management system had to be at least as complex as the system it was intended to manage. The system had to encompass diversity. It had to do different things in different ways with different children. It had to promote *pervasive* experimentation and learning in every last nook and cranny. It had to encourage teachers and researchers to contribute in a wide variety of different ways to that process. It had, above all, to promote learning about and experimentation with (ie actively generating new insights into) systems processes. It had to be open to influence from numerous feedback loops. In short, it had to be organic.

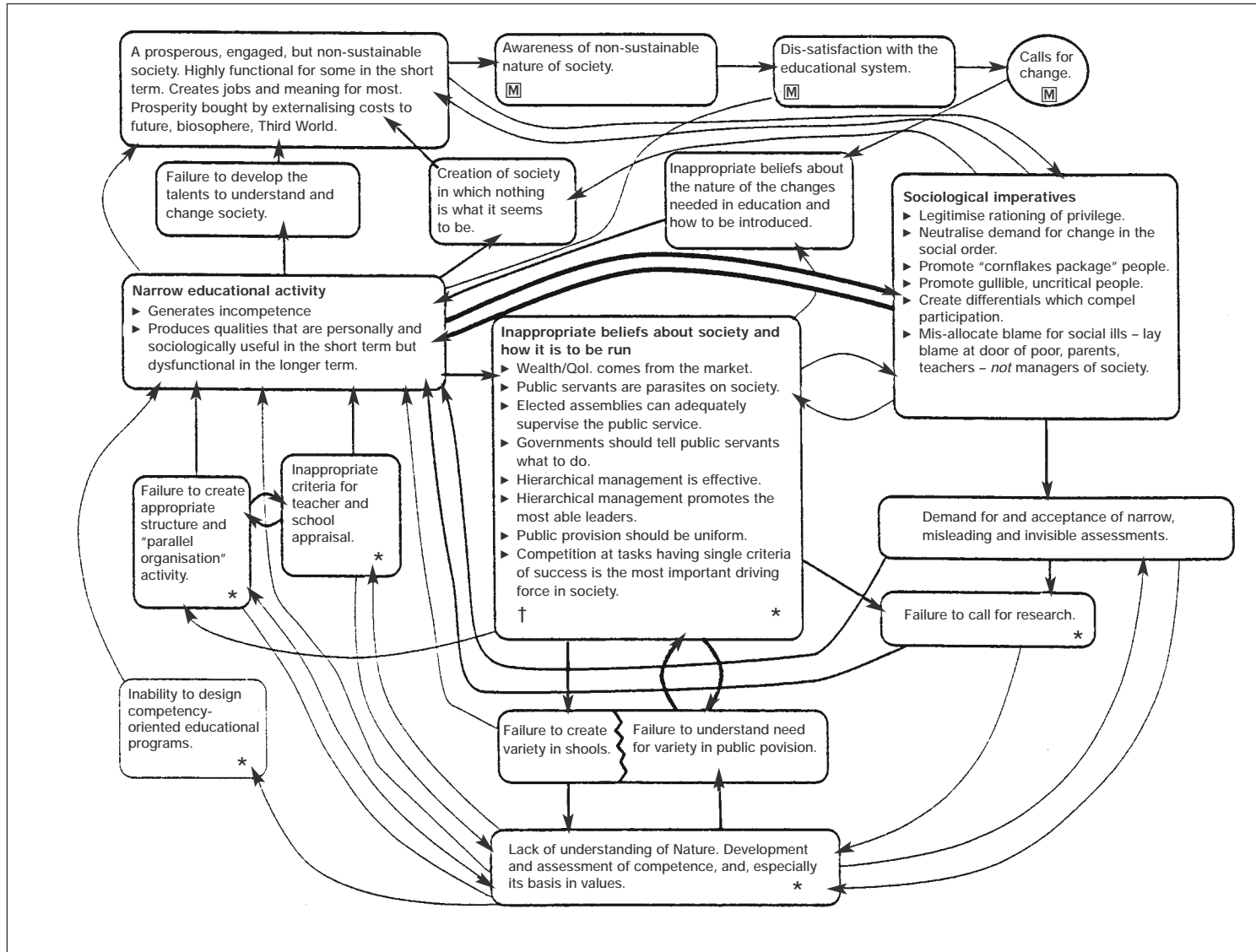
Smith and Hayek's marketplace came closest to providing a model of an appropriate learning and management system. This was a design for a *societal* innovation, learning, and management system which would work without anyone within it having to know anything very much. The *system* learned. It was not necessary for the individuals within it to do so. There was no need for wise men. Indeed, there can be no such thing. It was non-authoritarian, non hierarchical, and decentralised. It encouraged and catered for diversity as a crucial part of the learning mechanism. It was the antithesis of the authoritarian framework assumed by authors such as Senge when writing about how systems thinking is to be utilised in management.

Unfortunately, the market mechanism doesn't work. As the first author has documented in his *New Wealth of Nations*, it neglects the most important information (eg on sustainability), does not deliver high quality of life (wealth), and does not reward the most important contributions to societal improvement. In practice, it has been overturned. Whereas the market mechanism was designed as a cybernetic system which would set and stimulate ways of achieving its own (inarticulate) objectives, the control of cash flows and prices is now used to orchestrate the achievement of goals established through the political process. What is now presented as "The market mechanism" is nothing of the sort. It is a means whereby a few people manipulate the information available to, and the perceptions and behaviours of, billions of people, the structural (trading) arrangements of the planet, and economic conditions, presenting the latter as "economic necessities" which force compliance with their commands.

In due course, our work prompted us to try to map the network of feedback loops that led the educational system as a whole to neglect its manifest goals. We tried to follow the model provided by Morgan in *Images of Organisation*. Put another way, we sought to generate a socio-cybernetic map of the field. The result is shown in Figure 20.4

This immediately raised the question of how the feedback loops could be made to "run the other way", or somehow be supplemented, so that the system would achieve its manifest goals. We struggled with the problem for 5 years but, having got nowhere despite consultations with Morgan, we published the diagram without answering this important question. We did, however, describe at some length the management arrangements, job descriptions, and staff appraisal systems that are required to create the ferment of innovation and learning that is required to find ways of identifying, nurturing, and recognising the multiple talents of pupils within schools as well

Figure 20.4 . Feedback loops driving down quality of education.



* Intervention in these cells would help change the nature of the qualities nurtured and rewarded in the system. Motives which could be harnessed to do this are marked **M**.

[†]These need to be replaced by acceptance of the need to make managed economies work – to find way of giving effect to information concerning the public long-term interest, the need to explicitly create variety and information on the personal and social consequences of the options, and to find ways of holding public servants accountable for, and getting them to at in, the long-term public interest. This means systematic, broadly based, evaluation and participative democracy.

as the forms of bureaucracy and democracy that are required to support such a system.

Having struggled without success to find ways of reversing or supplementing the feedback loops in Figure 20.4 to produce the desired effect, the first author was more than a little surprised when, a few years later, in response to a question raised at a lecture, he heard himself saying "Well, what I am saying is that what we need in *this box here* (pointing to the middle box) is ... (reciting what we had learned about appropriate public management arrangements) ... and in this box *here* (pointing to the "sociological imperatives" box) is ...".

BINGO. That was the answer to the question of what a more appropriate system would look like. We had changed what was in the boxes, not the feedback loops. We produced Diagram 20.5.

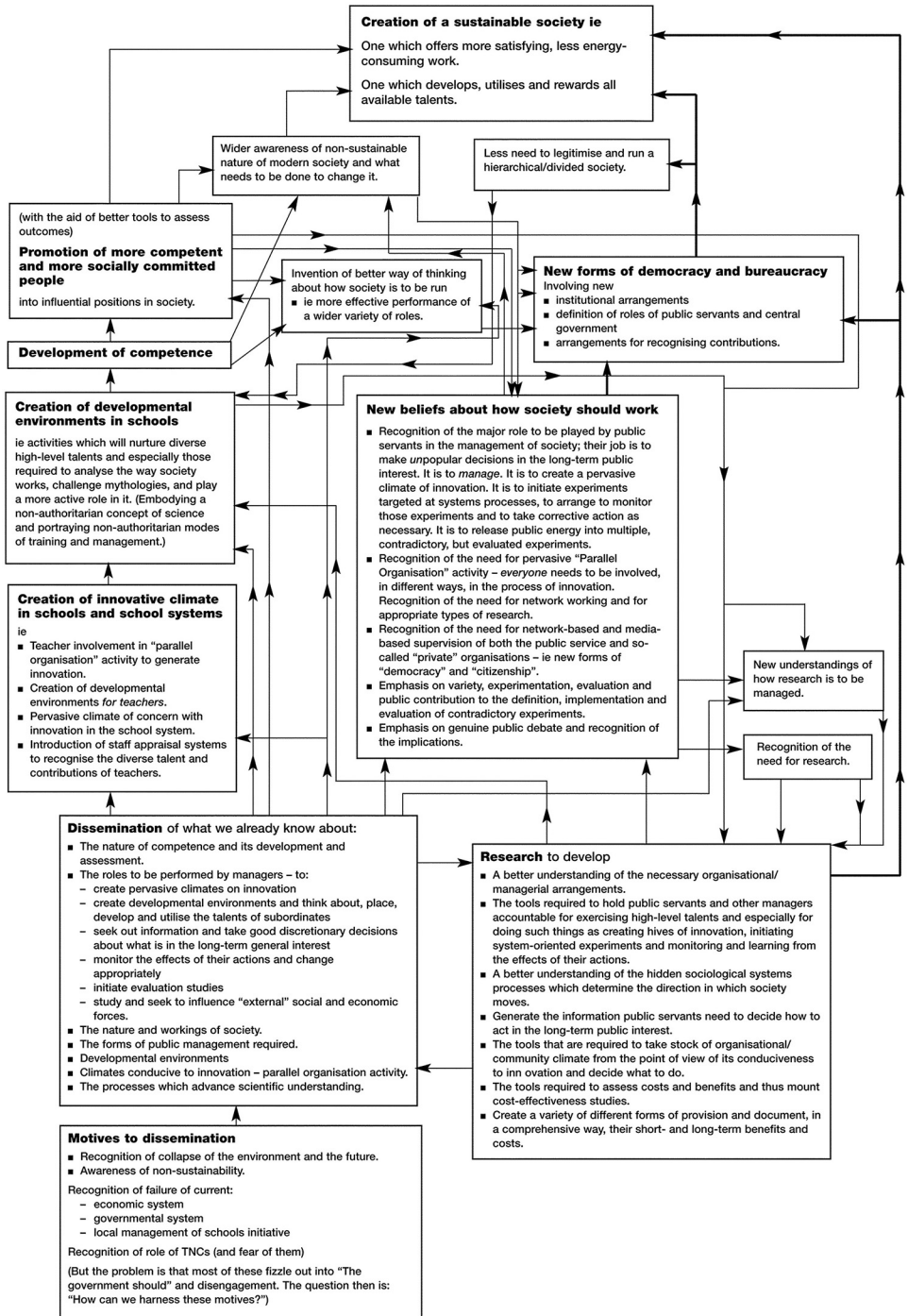
At that point, the work came together with research being conducted on sustainability.

Cross-cultural research conducted by Yankelovich and others (including ourselves) had shown that some 40% of the populations of Norway, Austria, and Great Britain wanted a range of radical social changes in order to create a more sustainable society. These demands were so strong that they had, in Great Britain, led to the formation of a new political party. But the formation of this party had, paradoxically, led to the political entrenchment of a party (the Conservative party) which had exactly the opposite agenda – this despite the fact that that Party actually had both the smallest absolute number of people voting for it *and* the smallest proportion of the vote that it had ever had³. One reason why this system did not favour the new

³ Some readers may be puzzled as to how this could come about. Britain is divided into geographical areas called electoral districts or "constituencies". Within a constituency, the candidate with the highest number of votes goes to Parliament. The creation of a new third party which attracted a substantial number of voters meant that, in constituency after constituency, the Conservative candidate attracted

Diagram 20.5

New societal management arrangements



Party was that no one knew how to implement the "new values". Nevertheless, it is entirely likely that the new party would have won the next election had not Mrs. Thatcher, in the of best political traditions, engineered the Falklands war to unite the country behind her.

To avoid misunderstanding we must again be clear what we are talking about. As we will see in more detail when we discuss Box 6 in the flow diagram which follows, implementation of the "New Values" involves getting rid of our motor cars, our defence system, and our banking and insurance systems. A revolution in our international trade is required. It therefore involves *radical* transformation of our economic and social systems, indeed the introduction of a new social and economic order. The change that is required is as great as that involved in moving from a hunter-gatherer to an agricultural society. Yet, just as no one living in a hunter-gatherer society could envisage what an agricultural society would look like, let alone more than a fraction of the developments needed to get there, so no one can generate any kind of blueprint of what a sustainable society would look like, never mind identify more than a minute fraction of the changes that are needed.

Yet, to repeat, these new values are strongly endorsed by some 40% of the population. And rightly so: our survival as a species, and the planet as we know it, depends on implementing these values. So, as in education, the question was: "What prevents society enacting widely endorsed values? "

This question led to an attempt to map the socio-cybernetic system that is driving us collectively toward our self-destruction

some 33% of the vote and the other two 29 or 30% each. So, in constituency after constituency, the Conservative candidate became that constituency's Member of Parliament – despite the fact that two thirds of the voters had voted against him or her. The result: a massive Conservative majority in Parliament based on the lowest-ever proportion of the vote.

despite widespread recognition of what needs to be done to avoid that outcome. The result was Diagram 20. 6

What is interesting is that production of this map led to no improvement in our understanding of how to move forward. Its sole benefit is that it highlights the question of how supporting myths are generated and selected in such a way as to perpetuate the system. We attempted to represent this rapidly alternating two-way flow through an indirect and opaque mechanism as an (incorrectly drawn) induction coil.

And there things rested for another 10 years.

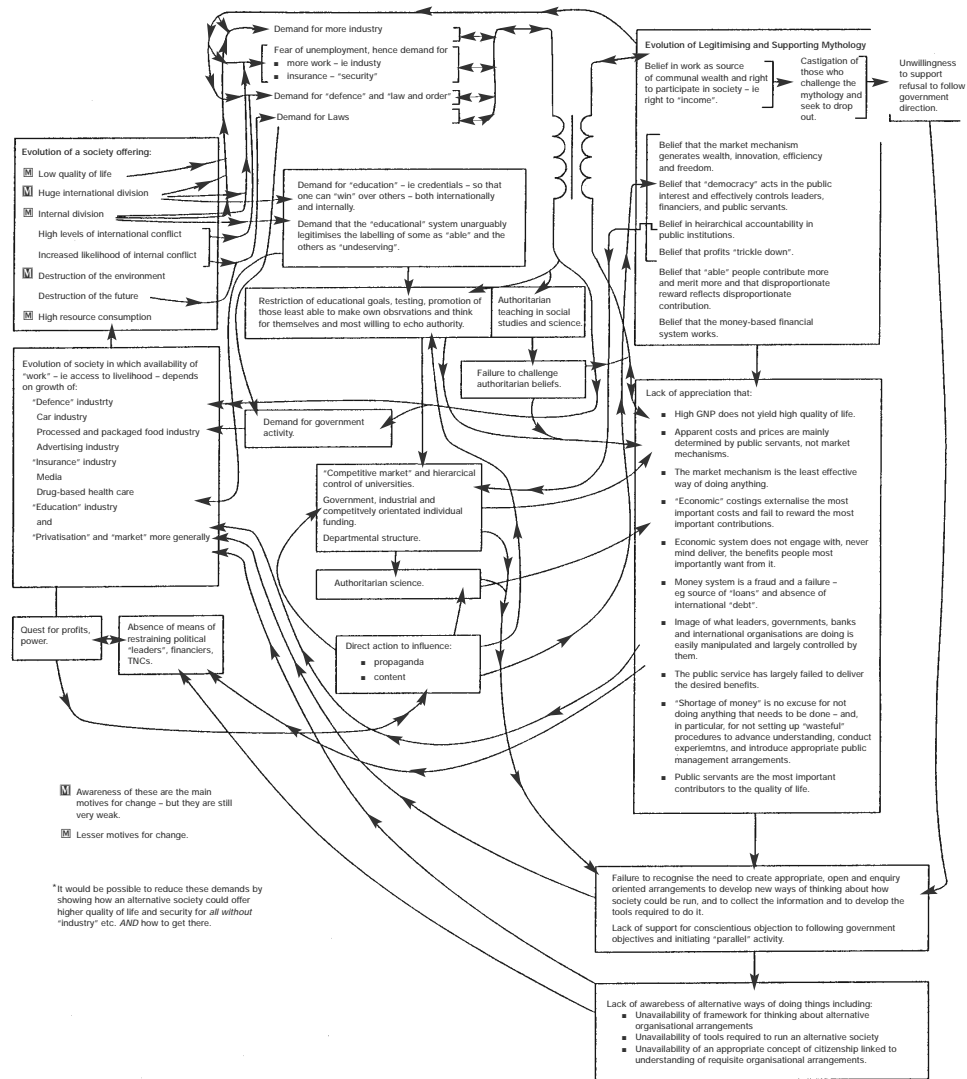
THE PRESENT WORK

At that point, discussion between the authors of what might be done to halt the destruction of the planet led us to return to Figure 20.4 – the *education* diagram. As we discussed it, the second author commented “But you have *not* done what Morgan said. The system you have there would spiral out of control. There are no feedback loops which would damp it down – ie there are no feedback loops of the kind that were, in Morgan’s cases, amplified to halt, and eventually reverse, the processes described! ” Note that the activity implied by the statement is similar to that implied by the question we had been asked, and struggled to answer, some 20 years earlier. But, being formulated slightly differently, it led us into another round of activity.

To begin with, we thought that our task simply involved trying to represent the negative feedbacks within Fig. 20.4. However, since we had published Fig. 20.4, there had been developments in our understanding of – or ways of thinking about – some of the sociological forces which contribute both to the educational system’s failure to pursue its most widely endorsed educational goals and to society’s inability to enact the “new values”. The latter were particularly important in that

Diagram 20.6

Feedback loops perpetuating non-sustainable society



these “new values” – the enaction of which is vital to the survival of our species and the planet – are, like the manifest goals of the educational system, widely endorsed. It seemed important to include our understanding of these more recently recognised processes in any new map of the main socio-cybernetic feedback loops which control the operation of the system. The incentive to do this was particularly strong in that we hoped that any new map would be more useful than the old one from the point of view of identifying the leverage points at which it would be most important and possible to intervene to improve the educational system’s ability to achieve its manifest goals (which also happen to be those that are most important from the point of view of creating a sustainable society).

Vandana Shiva (1998) had argued that major tendencies contributing to our collective destruction of our human habitat (Gaia) – and thus *homo sapiens* as a species – could be conceptually captured by noting modern society’s espousal of reductionist science and its tendency to create monocultures.

Reductionist science makes it legitimate – nay, almost imperative – for scientists (in pursuit of an idealised form of ‘the experimental method’) to focus on (or ‘manipulate’) one variable at a time. This has the effect of legitimising neglect of all outcomes of any process being investigated other than that on which the scientist has chosen (or, more often, been directed) to focus. In agriculture, this legitimises studies which, for example, focus only on the effects of pesticides and fertilisers on short term crop yields and neglect effects on such things as other species in the food chain, the fertility of the soils, humans who eat the new poisons in the pesticides or generated as the pesticides, fertilisers, and antibiotics interact with the biology of plants and animals, and even long term yields. In educational research it results in unethical studies focusing, for example, only on the effects of the educational programmes under investigation on such things as mechanical spelling ability and ne-

glecting their effects on such things as self-confidence, the ability to write creatively, and the ability to make acute observations – and especially the ability to make the acute observations about how society works that are required to stem the destruction of the planet and the elimination of our species. More generally, it discredits what might be called “ecological” science requiring the explication and study of numerous feedback loops and long term effects. Note that while “commercial pressures” might (though they do not) explain neglect of multiple outcomes in agriculture, this is not true in education.

In agriculture, a concern to minimise human labour, and, so far as possible, replace it by energy-intensive machines, fertilisers, and pesticides, coupled with manufacturers’ need to ensure that those machines, fertilisers, pesticides and seeds “make money”, has virtually eliminated farmers’ concern and capacity to husband the soils and tailor their practices to the needs of the situation they are dealing with. The result has been machine cultivation of monocultures. These have strengthened both farmers’ and researchers’ tendency to overlook covariances between appropriate species and habitat, to failure to study the way appropriate foodstuffs vary with habitat (eg it may be important to cultivate and eat different foods at the equator and the arctic) and, even more importantly, destruction of the diversity needed for both continued evolution and adaptation (including the adaptation of habitat to the needs of plants and animals) and the discovery of as yet unacknowledged contributions to the future.

The imposition of Western materialistic preoccupations and ways of thought on non-Western cultures is rapidly promoting a single universal human culture, destroying diversity in values, thoughtways, and patterns of behaviour. What Shiva calls the *Monoculturation of Mind* finds expression in at least the following forms:

- (i) the invisibility of the multiple talents required within the cultures of enterprise and innovation characteristic of societies and organisations which innovate, adapt, prosper and survive;
- (ii) the invisibility of, and thus failure to nurture, the wide range of talents that children possess and which are capable of being nurtured and recognised by schools;
- (iii) the promotion of the single-factor models of "ability" that are used to allocate position and status, and perhaps more importantly, to legitimise and enforce a hierarchy of differential power, prestige, and well-being which has the effect of compelling those who seriously question the overall system nevertheless to participate in it in order to avoid the consequences of not doing so. Those at the top must be "clever". Those at the bottom must be lazy, incompetent, and unemployable. The latter need to be motivated by the whip – now taking the form of withdrawal of even such security and income as they have; and
- (iv) in, perhaps another sense, the discreditation and rendering invisible of "non-scientific" ways of thought – and, indeed, of all ways of thought other than those which accord with the Western mindset. These processes in turn have the effect of legitimising respect for authority since those running the system must not only be the "most able" but also those who know and understand the "one correct way of defining and thinking about problems". Certainly they are not only able to give that impression; they are also able, by reason of their position, to discredit other viewpoints and impose their own.

How to introduce a representation of these processes, or forces, in revised versions of Figures 20.4 and 20.6? Clearly they highlight some components of the loop leading, in Fig. 20.4, from "Sociological Imperatives" to the educational system. But they also, as far as Fig. 20.4 is concerned, capture something of

the field of forces somehow created by the operation of our society and feeding back into, ie in some sense "driving", that society further along the trajectory it is following. Without claiming that they describe or capture the entire network of feedback loops, they do usefully highlight certain components that are very important from the point of view of understanding the operation of the educational system and the difficulty of changing it.

More generally, as we hope eventually to indicate in a revised version of Fig. 20.6, they generate *system* features which in turn have the effect of compelling huge numbers of individuals to participate in a social system that they recognise as inhumane and dysfunctional⁴. They lead us all to each day commit scores of unethical acts – acts which are, in some sense, in our short term interests while clearly not in our own longer term interests, let alone those of others or the society in which we live.

The implication of all this seemed to be that, if we wish to understand the reasons why the educational system generally fails to perform most of its manifest educational functions and instead mainly performs latent, sociological, functions, we need to understand, and find ways of influencing, not only the sociological imperatives shown in Figure 20.4 and the way in which they determine, and are in turn influenced by, the educational system, but also the origins of the deep-seated forces which drive toward reductionist science, monocultures, hierarchy, and

⁴ Many teachers and parents express their concerns in precisely these terms in relation to the educational system. It is also clear that many of those who turn up at meetings organised by eg The Other Economic Summit, The Centre for Human Ecology, Friends of the Earth and others are struggling to find ways of behaving which will not have, collectively, such inhumane and dysfunctional effects. We do not know how many such people there are in total although the previously mentioned work of Yankelovitch and other suggests that there could well be 20 million in the UK alone.

dominance. How to represent these processes in a socio-cybernetic map?

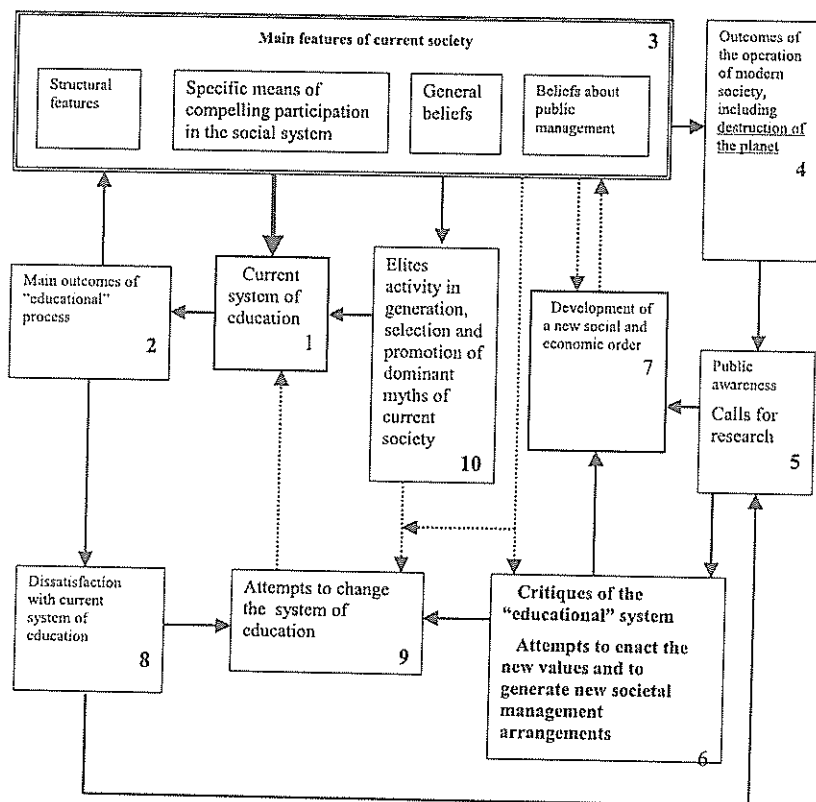
There was something else which needed to be represented. It is clear that further progress on the collective trajectory on which we have embarked is going to produce sufficient destruction of our habitat to destroy, without purposeful human intent, *Homo Sapiens* and his system. This is the ultimate socio-cybernetic feedback loop! Unfortunately, that loop is likely to kill our host (Gaia) at the same time. But how to represent it? It is a *future* feedback, not a current one.

So, to represent both the processes perpetuating the current Western social system of which the educational system forms a part and those which are most likely in the none too distant future to force reform of the social system in which we live it seemed necessary to include aspects of the wider system represented in Figure 20.6 but not included in Figure 20.4

The result of our attempt to do this is shown in Figure XXX.

To appreciate its significance, however, we need first to note that what Figure 20.4 highlights is that, in seeking to understand the operation of, and find ways of influencing, what happens:

- (a) one is dealing with a *system* in which an attempt to change any single component (such as the educational process in a school) is likely to be negated by the operation of the rest of the system (in this case by an examination system which first *defines* "ability" in terms other than those which lie at the heart of the experimental curriculum and then uses these assessments to allocate present and future social position and status, thus giving them enormous power to control what happens in the school.)
- (b) what determines what happens in the educational system is, not the wishes of parents, teachers, pupils, ministers of education, or anyone else, but the role which the system



If boxes A and B are connected by a solid arrow, an increase in A results in an increase in B. If the boxes are connected by a dotted arrow, an increase in A results in a decrease in B.

Figure XXX. Feedback loops perpetuating (—) and damping (---) the Educational System's contribution to the destruction of the planet

- plays in legitimising and perpetuating a particular pattern of social organisation.
- (c) while one key intervention might be to change what is assessed in the examinations which take place at the interface between the educational system and the sociological system for allocating position and status, any attempt to

change that system in such a way that it would recognise the importance of a wide variety of important talents is going to be undermined in a thousand ways because, for its continued operation, our society needs a single and unarguable criterion of merit.

- (d) other key features of the system that undermine well-intentioned attempts to change include (i) current organisational arrangements within schools, local authorities, government systems and society, and (ii) inappropriate beliefs about how public management should operate.
- (e) the activities on which it is (unexpectedly) most necessary to focus if widely desired improvements are to be introduced are, not such things as curriculum and assessment, but the management processes that are employed. These need to change in such a way as to focus on the activities required to understand and influence the *system* itself – ie on releasing a ferment of innovation and learning in every nook and cranny of the system – and especially learning about the hidden sociological systems processes documented in this very diagram --- and how to influence them. The requisite understandings of public management are very different indeed to those identified within the central box in the diagram.

Ideally, any revised diagram should underline the same conclusions. Unfortunately, Figure XXX does not do so with the same force. What is more, it is not so complete in itself as Figure 20.4: To understand it, it is necessary, whilst examining it, to review the contents of the accompanying boxes – which expand the brief headings in the boxes on the diagram.

Since it is a systems diagram, it would be possible to begin an exploration of what it tells and its implications with any one of the boxes.

However, since our initial focus in this work was on the educational system, it is convenient to begin with the heavy box

labelled *Current system of Education*. A few of its main features are set down in Box 1.

BOX 1

Main Features of the Educational System

- A "Miniature of Society": Unarguable authority who knows best; tasks set by authority; authority has the right to determine what one will do (regardless of one's personal talents and interests) and control the terms in which one's worth will be evaluated; single-factor models of ability (monocultures of mind); ability conceived individualistically rather than collectively; acceptance of compulsion, however absurd the tasks, fraudulent the claimed benefits and irrelevant they are to personal or societal needs; acceptance of required attendance for arbitrary hours; required tolerance of boring and useless tasks; tolerance of being treated with disrespect, disdain, contempt, and indifference to personal qualities and needs; tolerance of inability to influence; required recitation of "truths" which conflict with direct knowledge and common sense, thus inoculating people from the feelings of discomfort which otherwise come from mouthing lies; promotion of those who ingratiate themselves with authority – ie work out what to do to gain esteem and do whatever is necessary to gain preferment; encouragement of the perception that those who succeed are "clever" and those who fail are lazy, incompetent, and undeserving of respect;
- Exposure to role models (teachers) who portray the most down-trodden, ineffectual, behaviour of any of the groups we have studied. These role models demonstrate, not only an inability to gain control over their destinies, not only no evidence of resigned acceptance of their inability, but even no evidence of feeling that they might have a *right* to do so. They lack resourcefulness and allow themselves to be forced to work in resourceless conditions, set tasks they have no hope of achieving, and judged against criteria they have had no hand in setting and which they have little hope of reaching. They allow themselves to be pushed about by authority ... accepting that authority has the right to treat them in this way because they believe that duly elected popular authority has the right to do what it wants.
- Compulsory acceptance of fraudulent "choice" mechanisms: a choice of school – but only between schools which all do the same thing, choice between schools pursuing alternative *goals* having been deliberately eliminated.
- Inducement to grudgingly accept a system which does not do what one wants it to do or what it claims to do in order to gain entirely other (materialistic and sociological; instrumental) benefits.

What we believe to be the most important *sociologically* useful *outcomes* of the process – psychological tho they are in themselves – are set down in Box 2.

These clearly help to reproduce the dominant social order, whose main features are listed under four headings, in Box 3.

BOX 2

Main outcomes of the "educational" process

Reinforcement of

- (a) Single-factor models of "ability".
- (b) Notion that worth inheres in competitive individualistic characteristics.
- (c) Idea that there is only one "correct" way of thinking about things.

Acceptance of

- (a) The right of others to allocate one's tasks, determine the criteria against which one's contribution or worth will be evaluated, and assess one against their criteria and thus determine life style and respect.
- (b) A hierarchy of power legitimised by "ability" or "contribution" and thus the legitimacy of an underclass of disenfranchised who are viewed as incompetent and unemployable.
- (c) The dominance mind set: might = right; the right of man to dominate man; "men" to dominate "savages", "homo sapiens" to dominate nature. There is not enough to go round: competitiveness and greed is required for personal and social "success".
- (d) (Through teaching, especially in science and religion) the view that "the world is not as it seems to be". This undermines 'common sense' and the right of the individual to reality-test statements of authority. This becomes especially important in the acceptance of the right of authority, economics, law etc.
- (e) "Trained Incapacity"; the *breeding* of incompetence (in this way undermining faith in direct action) arising from the pervasive belief that a long training and specialist knowledge are required before one can start to do anything and observation of teachers who never *do* anything.
- (f) Abuse, boredom, denigration, and de-humanising treatment.
- (g) The right of authority legitimised through the "democratic" process to inflict abuse and denigration.
- (h) The view that current forms of public management are "of the people, by the people, and for the people", and that they, together with the market system, give one both access to information and an appropriate voice or means to influence what goes on.

Particular attention should, perhaps, be drawn to the items listed under the headings "*Some specific means of compelling participation in the social system*" (these being observations derived from Shiva) and "*Beliefs about Public Management*" (the significance of which has already been mentioned when discussing Figure 20.4).

The former are particularly pernicious in that they accelerate, instead of merely supporting and perpetuating, the planet's plunge to destruction.

As has been mentioned, it was the unexpected importance of changing widely held beliefs about the public management process – as distinct from developing a better understanding of features critical to the educational process itself that was highlighted in Fig. 20.4. The current diagram perhaps under-emphasises the importance of developing new arrangements for public management and understanding – and finding ways of influencing – the processes highlighted by Shiva.

Nevertheless, the heavy arrow back from the Main features of Current Society back to Current Educational System indicates that it is the four contents of Box 3 – and not the wishes of parents, teachers, pupils, ministers of education, or educational philosophers – that mainly determine what happens in schools. And so the loop comes around to show that what happens in education has effects which help to perpetuate the system.

However, other things also happen. Somehow, the society also generates a set of myths which legitimise what happens and result in the creation of arrangements which perpetuate the system. There is a very short loop with two-way flows here that is not adequately represented in this diagram but is shown as an induction coil with alternating current flowing through it in Fig. 20.6. These myths are at times to be envisaged as components of the system and at times as determinants of the system. Relevant myths include the myth that all need to work to create the necessities for well-being with its converse that if one does not work one has no entitlement to a livelihood. (These particular myths lead to creation of an inhumane, but sociologically functional, hierarchy and contribute to the generation of useless work [eg through the marketplace] to occupy hands that would otherwise have been idle). They include the myth that the market mechanism creates genuine wealth and the variety needed

BOX 3

Main features of current society

Structural

- Steep hierarchies of influence, prestige, well-being, and conventional wealth with those at the bottom conspicuously disenfranchised and subjected to demeaning, degrading, and dehumanising treatment.
- Pervasive insecurity.
- Externalisation of major costs to the 3rd world, the environment, and the future.
- Proliferation of unnecessary work so as to make the belief that only by working does one acquire the right to live credible and, simultaneously, removal of time for thought and socially-oriented action: production of junk food, junk toys, junk security ("insurance"), junk "education", junk "science".
- Monocultures: of mind, in science, in agriculture, and in human culture to discredit alternatives and legitimise hierarchy.

Specific means of compelling participation in the main activities of modern society

- Widespread and strong (moral) belief that only by working does one acquire the right to a decent way of life.
- Widespread acceptance of the myth that hierarchies which promote dominators are hierarchies which promote the most able and those most concerned with common good.
- Publicising the (manufactured) deteriorating conditions of life of a large underclass who are castigated as scroungers, parasites, incompetents, and idlers whilst simultaneously creating the illusion that all is due to the impersonal operation of mechanical economic forces.
- Privatisation and individualisation; denial of the social.
- The enforcement of monocultures of mind to discredit discussion of wider issues and alternative perceptions and, indeed, render those issues invisible and thus undiscussable.
- Reductionist science and thinking more generally.
- Generation of an appropriate set of myths.

General beliefs/Myths (which have somehow been crafted)

- Authority tends to be good (ie to act in the public interest), right, and necessary.
- From both an economic and evolutionary point of view, 'there is no alternative' to the present system.
- The current state of things stems from the impersonal workings of economic forces.
- A hierarchy of worth/wealth/power/right to power is natural and inevitable.
- Social division is part of the natural order.
- "The most able naturally rise to the top".
- Individual competition to succeed at tasks set by authority with single-valued criteria of success is the best way to tap human motives for social progress.
- "Full employment" is a pre-requisite to economic and social development.

- More (formal) education is a pre-requisite to economic and social development.
- The market mechanism creates genuine wealth and the variety needed for well being; it stimulates innovation, delivers high quality of life, rewards the industrious, provides meaningful choice and opportunities to influence what happens, and it delivers such benefits as it does deliver in an equitable and efficient way. (All of these myths contribute to the creation of useless work, the performance of which consumes endless resources.).
- Happiness comes from material possessions.

Beliefs about public management

- Public provision should be uniform and lack lustre.
- The role of public servants is only to implement decisions taken by elected representatives and not, for example, to release people's energies in a ferment of innovation and learning.
- Democracy is government of the people, by the people, and for the people ... and it works!
- Democracy provides an effective way of orchestrating communal action for the common good and ensuring that leaders act in the public interest. (Such myths conceal the persisting power of elites and their ability to control what happens in such a way as to determine their continued support.)
- Democracy involves the right of the majority to impose their will on all.
- Public Management ("communism") does not work.

to ensure feelings of well being among people with diverse tastes, that it stimulates innovation, that it delivers high quality of life, that it rewards the industrious, that it provides meaningful choice and opportunities to influence what happens, and that it delivers such benefits as it does deliver in an equitable and efficient way. (All of these myths contribute to the creation of useless work, the performance of which consumes endless resources.) They include the myth that more education is needed for economic and social development. They include the myth that most public spirited are promoted. They include the myth that democracy provides an effective way of orchestrating communal action for the common good and ensuring that leaders act in the public interest. (Such myths conceal the persisting power of elites and their ability to control what happens in such a way as to determine their continued support.) They include the myth that social advance comes from cumulation of self-interested individualistic action – a myth which divides,

individualises, and deflects attention from the need to act in the public interest and thus promotes destructive competition and the neglect of the social.

The question of how such myths are generated, selected, and maintained is one of the most vital for social research, for it is such myths that overwhelmingly determine the way in which felt needs are translated into action.

But the system also generates elites whose position is partially legitimated by the myths of the educational system. And these elites seem to contribute to the creation of, and they certainly select, promote, and enforce, myths which have the effect of legitimising and perpetuating the current system. These elites themselves, and the myths with which they are associated, then act to dampen and discredit attempts to change the system of education.

By the same token, the overall network of processes we have described as "main features of current society", and the myths and elites with which they are associated, operate to neutralise attempts to enact "the new values" and in this way create a more humane and sustainable society.

If, for the time being, we pass over the two negative loops damping the emergence of a new social and economic order and the way in which failure to do so helps to perpetuate the system, the next process depicted in Figure XXX is the fact that the current social order generates social turbulence (such as intra- and inter-societal conflict) along the lines described in Box 4: Outcomes of the Operation of Modern Society. The accelerating destruction of the soils, the seas, and the atmosphere may be described collectively as components of the overall destruction of the planet or Gaia.

The deteriorating conditions of human life – collapse of the food base, destruction of the atmosphere, international conflict, etc. – will – regardless of any intelligent action human beings may take – force the introduction of a new social and economic

BOX 4

Outcomes of the operation of modern society

- Accelerating intra- and inter-national division.
- Exponentially accelerating consumption of both renewable and non-renewable resources.
- Concentration of power in fewer and fewer hands.
- "Globalisation".
- Destruction of diversity in human, animal, and plant culture.
- Destruction of soils, seas, and atmosphere.

DESTRUCTION OF THE PLANET

order (although it may be difficult to discern much order in the chaos). Note that we have no option but to change. Continuing further along the trajectory on which we have embarked is not an option.

BOX 5

Public Awareness

- Alienation arising from sensed discrepancy between forced way of life and human nature on the one hand and activities that are heterotelic to Gaia on the other.
- Awareness, through the media, of destruction of soils, seas, and atmosphere and thus imminence of collapse of food base.
- Awareness that economic indicators (GNP) and materialism do not deliver high quality of life: we have been duped by economists, politicians, advertisers, and the myths of "civilisation".
- Feelings of unease generated by conflict between our essentially thical natures and observation of plight of lower socio-economic groups and plight of third world and ethical nature.
- Sensitivity to the unethical – ie the long-term anti-social – nature of the activities one is required to engage in on a daily basis.
- Vague awareness that one has been tricked; that one does not live in a market economy at all, that the market process does not work, and that 3rd World has been systematically exploited by the "developed" countries.

However, public awareness of these deteriorating conditions (Box 5) will undoubtedly lead to actions which will contribute to the development of this new social and economic order. Unfortunately, public awareness of these deteriorating conditions is very much dependent on an input of "scientific" information via the media. As might be expected, our governing elites have already taken very firm steps to inhibit the collection of, and to constrain and distort the communication of, this information. The direct input from man's awareness of his alienation from his nature (the lapse from political correctness in this instance being more than justified by the link to Marx) should not, however, be overlooked (although there may actually be a greater input from women's direct awareness of their alienation from their nature). But note the conflict with reductionist science informed by a dominance philosophy: from just where do human sensitivities to the stifling of creativity and the long term interests of the species and Gaia spring? Reflection on this question suggests that human beings must somehow – despite the strident claims of reductionist science – have been *bred* to have a predisposition to be sensitive to the long-term social and Gaian consequences of their actions. How come humans are sensitive to actions that are heterotelic to Gaia and strongly predisposed to act on the basis of such feelings and perceptions? It would seem that there must be powerful biological forces at work compelling resistance to the dictates of the social forces we have identified. *The tendency to act ethically*, precisely because it is, from the point of view of the evolution of the species of such vital importance, *must be inborn*. Here, indeed, is a powerful damping process that is not shown on our map.

Public awareness of the problems leads to attempts to understand what is going on and sometimes to calls for research. Unfortunately:

- (i) "Common Sense" as a route to the solution of human problems has, on the one hand, been largely discredited

by the educational system through teaching (especially in science and religion) that "nothing is what it seems on the surface to be". We must have authorities to tell us how things *really* are" (so people believe rubbish about religion, economics, politics, society, human nature). On the other hand, "common sense" is, in fact, incapable, without advance in scientific understanding, of grasping, and intervening in, the complex, hidden, social systems which need to be influenced.

- (ii) The tendency to call for research has been seriously undermined by (a) the social processes which have been introduced to prevent researchers undertaking any research worth the name⁵ and to induce them instead to create mountains of junk publications (presented in a self-discrediting way, as "research", and in this way further undermining support for the whole operation), (b) the explosion of non-knowledge (presented in a self-discrediting way as "information"), (c) meaningless, reductionist, science, and (d) the denigration of the (minimal) amount of social research that does get done as "unscientific". Clearly, the topics that it is most important to research and understand as a basis for development are those highlighted in Figure XXX. Yet it is *not* "common sense" to believe that among the key developments needed if we are to get an educational system worth the name are new

⁵ These processes include centralised structures governed by "authorities" who have not "rocked the boat" and retain a strong interest in not doing so, with commissioning arrangements which (i) reject "threatening" proposals, (ii) evaluate proposals by focussing on references to previous work (which has the effect of ensuring that they are backward-looking to work which proved non controversial and non threatening), (iii) fund projects through arrangements which demand quick results, rapid publication, and the spending of inordinate time on proposal writing (and thus, in all these ways, stifling thought and adventurous work), and (iv) stress criteria of excellence which include publication in "high status" journals controlled by party hacks who seek echoes of the words of their masters and dread controversy.

forms of bureaucracy and democracy, still less that research has a crucial role to play in promoting the development of the requisite understandings, organisational arrangements, and tools of staff and organisational appraisal.

Despite the problems just mentioned, there is widespread recognition of the need to enact the "new values" shown in Box 6. (Unfortunately, there is much less understanding of the new societal management arrangements needed to enact them ... or even recognition of the *need* for new societal management arrangements. [Bookchin, 1980, 1992, is almost alone in this regard]). By and large, those who have come to recognise the importance of the "new values" – the enactment of which implies the establishment of a new social and economic order – simply call on *governments* to take the necessary steps. Yet, as we have seen, the social forces which direct and constrain government activity mean that it is highly unlikely that they will do so. (It follows that calls for government action amount to little more than crying into the wind.)

One swathe of attempts to understand what is going on results in critiques of the educational system – such as those presented by Goodman (*"Compulsory Miseducation"*), Antidote, and the Royal Society for Arts. Unfortunately, in the absence of basic research into competence, developmental processes, and appropriate forms of public management – and the development of appropriate organisational arrangements and social and psychological management tools – one tends – as indicated in Figure 20.4 – to get narrower and narrower, and more and more educationally inappropriate, specifications of the "educational" goals that are to be achieved and the introduction of heavy-handed management systems involving the castigation of "lazy and incompetent" teachers and pupils and reinforcement of single-factor and individualistic models of "ability" – with performance being evaluated using tools which have no con-

BOX 6

The New Values

Support for:

- Exchange based on Personal Relationships
(instead of commercial transactions)
- Ownwork (Communework)
(in place of Organisationally organised Work)
- Decentralised Production
- Community support networks in place of:
 - a. drugs-based health care
 - b. insurance
- Reduced Transportation of
Goods
People
- Concentration on Quality of Life (rather than GNP)
- Fair Trade with Third World
- Recycling
- Conservation of:
 - Non-renewable and Renewable Energy
 - Minerals;
 - Food
- Dismantlement of Defence Industry
- Stemming Destruction of Rain Forests
- Development and Utilisation of *all* Human Resources
- Equitable Distribution of Incomes
- Stemming Destruction of Soils, Seas, Atmosphere
- Sustainable Agriculture, Fishing, Forestry

struct or predictive validity (other than that of predicting future success in the "educational" system).

But here we are confronted by another paradox. Public awareness that there is something seriously wrong with the way our society works – that is to say, public recognition that there is need for *systems* intervention – has led to more and more calls for centralised government action on a wider and wider (European/World) front. The (correctly) sensed need for *systems* intervention is, in the absence of understandings of systems processes or how these are to be influenced, expressed

as a desire for *system-wide* change by what are presumed to be knowledgeable, public-spirited, individuals who are believed to be in a position to command the necessary changes. Collectively, these calls for public action to direct/control the unbridled operation of the system have, supported by (misplaced) faith in the effectiveness of "democracy", contributed to a situation in which control of the spending of some 75% of GNP now rests with governments⁶. Unfortunately, control over that spending has been captured by elites (23 single people, not corporations now own 41% of the world's wealth). But, more generally and more seriously, not only has privatisation (which, contrary to myth, *enhances* government control) channelled that funding primarily through corporations, layers of public servants cream off these funds so that they never get devoted to the desired activities. And inappropriate beliefs about how democracy and bureaucracy do and should operate have resulted in a situation in which public servants (among whom we may here include teachers) are commanded to act in ways which do not accord with either public priorities or effective educational practice. As we have already indicated, one gets, as shown in the triangular loop at the top left of Figure 20.4, into a situation in which educational goals are ever more tightly and universally specified and "lazy and incompetent" teachers branded as being in need of being goaded to work by creating hierarchies of "teacher quality" based on single-factor ability testing of their pupils unadjusted for their background. Instead of commanding teachers to pay attention to the needs of their pupils and providing them with the understandings and tools they need to do so, teachers are required to pay attention to the commands of what Mill and Smith described as "committees of ignoramuses" and subjected to derision and dismissal if they fail to execute those orders effectively. In this way, what starts out as a public-spirit-

⁶ See *The New Wealth of Nations* for details of this calculation.

ed move to damp the operation of a conspicuously dysfunctional system gets transformed into a process which further exacerbates its dysfunctionality.

Attempts to change the educational system arising through the steps shown in the feedback on the right-hand side of Figure XXX are joined by activities motivated by the direct observation (Box 8) of many adults, teachers, pupils, and employers that the "educational" system does not deliver the educational or social benefits (beyond the ability to read, write, and count) that are desired and expected. It was this realisation which led to the commissioning of our own work in the first place and it was also this realisation that has led to the huge, international, multi-billion dollar "Competency-Based Education" movement. It also fuels the growth of organisations like "Antidote" and it makes a major contribution to the demand for independent schools and home schooling.

BOX 8

Dissatisfaction with current system of education

- Awareness that one's talents have been neglected (mostly adult).
- Awareness that the system does not develop talents useful in life or work, but instead allocates position and status.
- Awareness that competition for scarce resources is heading planet towards destruction which collaboration could halt.

While – as a result of the other systems processes we have described – none of these activities has had the intended effect – and have, indeed, often been so corrupted as to become mere extensions of the very processes they were intended to alter – they have nevertheless managed to prevent the system charging wildly ahead.

But from where did these restraints come? They came from children who felt themselves abused and sought to drop out of

the system. (We may here note the huge efforts made by the politico-bureaucratic system to *force* such children back in to a "streamlined" system of compulsory social allocation, ironically and paradoxically by then *forcing* them *out* if they display sufficiently disruptive behaviour when forced back in!). They came from adults who angrily realised that their own so-called "education" had not recognised and developed their talents and who therefore demanded that politicians go through the motions of taking steps to ensure that the educational system teach things useful in life. They came from teachers who recognised the deeply damaging effects that the educational system was having on their pupils or who realised that they were acting as handmaidens to God in allocating "the rich man to his castle and the poor man to his door" (as the hymn "All things Bright and Beautiful" used to say before being adjusted for political correctness) rather than drawing out the talents of their charges (as the very root of the word "education" implies). They came from coalitions of educators and employers – such as the Royal Society for Arts' *Education for Capability* pressure group. That is, they came from people who dimly realised that their genetic endowments had been repressed and who sought to find a place in the sun so that their own, or at least their children's, talents could develop and flower. Note that this genetic endowment included the predisposition to act ethically – that is to say in the long term interests of the species – when this conflicted with their own short term interests. They came from those who dimly realised that cultures of enterprise and innovation come from tapping *diversity*.

From where do the life forces driving diversity and ethical behaviour come? They are as mysterious as those driving monocultures, reductionist science, and dominance. Yet, if we are interested in changing the system, it behoves us to initiate activities which will help us to understand their origin. Yet,

once again, the importance of researching this question does not exactly jump out of our diagram and hit one between the eyes.

All of these activities have the effect of weakening the tendency of the system to spiral out of control. Unfortunately, starved of appropriate research and development, they lead, as indicated in Box 9, to massive programmes of government sponsored activity which generate useless and ineffective work and thus, paradoxically, have the effect of contributing to the system it was desired to change. And even such processes as do come into being are undermined by stifling feedback from the wider social processes listed in Box 3 and activities brought into being by elites whose position is threatened.

BOX 9

Attempts to Change the Educational System

- Establishment of Bodies like:
 - Antidote
 - Education for Capability
- Government sponsored activities like:
 - The Technical and Vocational Education Initiative
 - The world-wide multi-billion dollar Competency-Based Education movement
- Utilisation of Independent schools
- Use of home schooling

WHAT HAS BEEN ACHIEVED?

It is time now to take stock. What has been achieved as a result of all this extra work?

Perhaps the most fundamental development has been that the operation of the educational system has been set in the context of the operation of the wider society. This has the effect of explaining some apparent oddities in Figure 20.4. What does

it mean to say that sociological forces lead to a series of "failures" – failures to initiate research; failures to cater for diversity etc? In the context of Fig. XXX, these forces are perhaps to be understood as responses (negative feedbacks) from wider social processes to incipient calls for R&D arising within the narrower system. They damp, deflect, distort and corrupt those incipient demands. By developing a more detailed map whilst retaining the main features of Figure XXX it might be possible to map this process and thus discover how to bring about a situation in which appropriate research is indeed conducted. As we shall see later, taking this next step with a view to finding out how to fuel the relevant research is, perhaps, the most important thing we could do to contribute to halting the destruction of the planet.

Second, the new map simultaneously makes it clearer that:

- (i) if one wishes to change the educational system, one will have to influence the structural features of modern society, to understand and find ways of influencing the specific means of compelling participation that have been identified, and to influence public beliefs, especially about societal management, and
- (ii) the forces which could lead to demand for the necessary research are weak and are strongly damped by the operation of the system itself.

So how to enhance the demand for appropriate research? For the development of an appropriate societal learning and management system? As it stands, the map gives little indication of what to do to achieve this.

Third the Figure suggests that, if we wish to strengthen the processes damping the system's tendency to favour sociological goals over educational goals, and perhaps in this way reverse or change the operation of the system, we could amplify what happens along the way. Thus we might change features of current society, including general beliefs and beliefs about pub-

lic management, in such a way as to make the defects of current society *more* apparent (ie we might initiate changes which would put things *further* wrong), we might actively promote developments which would contribute to the destruction of the planet, we might seek to enhance public awareness of what is going on (including the way in which the system operates to stifle worthwhile research), we might try to strengthen tendencies to enact the new values, we might encourage more critiques of the system, and we might amplify dissatisfaction with the system. Unfortunately, the diagram as it stands (i) gives us no indication as to which of these are the most important things to do, (ii) does not indicate that, if the forces of evil are to be unleashed as a means of achieving their opposite, we must, if those forces are not to destroy us, somehow have in our pockets the tools that are required to ensure that a Phoenix rises from the ashes, (iii) does not indicate how to push the necessary R&D through the system, and (iv) indicates no way whereby dissatisfaction with the current system of education or attempts to enact the new values feed into calls for research. Thus Figure XXX leads us no more directly than did Figure 20.4 to see the need to design a new societal learning and management system which would meet the specifications laid down by Smith and Hayek than did Figure 20.4⁷, it gives us no more

⁷ An attempt to provide such a specification will be found in *The New Wealth of Nations*. Key features include insisting that contributions to a process of trying to understand and influence systems processes should be incorporated into all job descriptions and staff appraisal procedures and means of exposing people's behaviour to the public gaze so that they are more inclined to act in the long term public interest. In this way all are to be induced to behave like social R&D personnel. Note that the need to design forms of democracy and bureaucracy which would lead to action in the long term public interest (which amounts to a definition of socialism) was entirely overlooked by Marx and that, as previously noted, this oversight has contributed directly to process whereby the present system has been able to discredit the very idea that it would be possible to develop a system that would work. From our current standpoint, the development of such mechanisms would appear to be the

insights into priorities in research and development than did Fig. 20. 5, and it gives us no more clues as to priorities in research or how to unleash the research indicated in Fig. 20. 5 and the associated discussion in *The New Wealth of Nations*.

Fourth, although a more complete diagram might highlight them more effectively, it indicates that some of the most important processes damping the dysfunctional operation of the educational system stem from activities informed by innate components of human nature which lead human beings to seek to behave in ways which will enact their potentialities and act in the long term interests of their species. Enhancing sensitivity to such feelings and the willingness to translate them into action, and perhaps similar activities prompted by feelings even more mysteriously associated with Gaia, may be another way of stimulating change.

key development required to control the dominators who are at the heart of so many of our problems. Yet a key feature in such a design was noted by Aristotle and reiterated by Mill in the statement that "The function of elected assemblies is, not to govern, a task for which they are eminently unsuited, but to make visible to everyone who did everything". In a society in which control of the spending of some 75% of GNP in some sense rests with government, one can only reiterate that statement a-fortiori. It follows that democracy is to be understood, not as choosing among those who put themselves forward to be our leaders for the next 5 years or so, but as a means of making visible to everyone what each public servant is doing. From this it follows that the key developments are appropriate means of assessing whether public servants release everyone's energies to create a ferment of experiment and learning. ... and learning about, and influencing, the hidden systems processes which so much determine what happens in particular. So the evolution of new understandings of democracy and democracy is central to finding a way forward. Witness Fig. 20.6. Also necessary, of course, are new ways of thinking about competence and the development and recognition of its many varieties. To get these new ways of managing research are necessary.

REACTIONS

It may be felt that these new insights barely justify the additional time and effort that has been devoted to this project. More specifically, it has, as yet, led to no revision in the priorities for research or action shown in Fig. 20. 5, insights into how the commissioning of that research could be initiated, still less to new insights into forces which could be tapped to fuel the wide range of actions that would be desirable or how those actions could be stimulated.

It is possible that, by focussing on, and elaborating, certain sectors of the map one might get a clearer idea of how to move forward. Note, however, that it is not possible to isolate blocks for detailed consideration without first generating a more detailed map of the whole because the relevant feedbacks may arise from processes originating in distal sectors of the map. What one would need to do would be to develop a large scale, more detailed, map and then divide it into sections.

METHODOLOGICAL INSIGHTS

Figure 20.4 highlighted issues vital to educational improvement which those concerned (although not necessarily Marxist philosophers) had tended to overlook. It pointed directly to steps which could be taken to harness barely recognised sociological forces so that they would do useful work for humankind (in the way in which the new understanding of physical forces arising from Newton's work made it possible to design sailing boats which could more effectively harness the wind instead of allowing it to drive them against the rocks). Yet the request to use it for the design of an appropriate socio-cybernetic *control* system to help us to ensure that the educational system more effectively achieves its main manifest goals (a key objective in the study and design of cybernetic systems in engineering)

produced an impasse for 5 years. When the key insight (unexpectedly) came as a result of a public argument it led directly and rapidly to the design of a more appropriate system which had unexpected components (Fig 20.5). But, even then, to press the analogy, it resulted in specifications for the re-design of sailing boats, lighthouses, and systems for managing people rather than for the re-design of navigational *systems*.

The best that can currently be said about the effect of having set out to make Fig. 20.4 more complete by including representation of negative feedbacks is that the attempt, unintentionally, led us to include representation of more "external" constraints.

So, what have we learned?

1. That the attempt to create socio-cybernetic maps does indeed underline the need to think in *systems* terms – ie in terms of feedbacks which are likely to undermine attempts to change any one part of the system on its own.
2. That the attempt to construct such maps does indeed allow us to summarise and highlight the unanticipated.
3. That the same field of forces can be mapped in different ways which have different advantages and disadvantages.
4. That there is no royal route to knowing what to include: new features will always be included as understanding advances.
5. That the practical implications for the design of genuine socio-cybernetic control systems are not necessarily clear in the first instance, but when one stumbles across them they can lead to dramatic new insights.
6. That implications for the design specification of components – the equivalent of valves in radio circuitry – seem to emerge more easily than recommendations for the re-design of feedback loops – of circuitry in the case of radios. Put another way, our attempt to make a more complete map of the links between the boxes has mainly resulted in articulating the contents of the boxes more fully. This was not what

happened when Morgan set about making his diagrams more complete. (We have not yet attempted to use these fuller specifications of the boxes to revise the contents of the boxes in Figure 20.5).⁹

That much is clear. But there are some other issues which it may be desirable to ponder further.

One is the apparent paradox that, while "research" occupies a very insignificant position in Figure XXX, it has occupied a considerable part of our discussion, merits more, and seems to be crucial to finding a way forward.

To take the discussion forward, we may first note that the second author not only dressed down the first for not including negative feedback loops in Fig. 20.4, he also laid into him for including "feedbacks" which began with the word "failure" – failure to call for research, failure to cater for diversity. How, he asked, could a feedback loop depend on something which did *not* happen?

Now, as a good physicist, instead of making fun of these entries, he might have done better to have asked what invisible forces were not represented. Newton noted that "to every force there is an equal and opposite reaction". In due course, this observation was used to design keels for sailing boats that made it possible to use the invisible equal and opposite reaction of the sea to the wind on the sails to sail into the wind. So, the appearance of the word "failure" may mean that there are indeed invisible forces at work, and the explication of these forces might make it possible to harness them.

In the course of the earlier discussion we argued that a *huge* amount of fundamental research and development on barely examined topics which are rarely viewed as "amenable to research" is essential if we are to develop an educational system which achieves its manifest goals more effectively and is less frequently deflected into performing latent, purely sociological, functions.

However, we also noted that there seemed to be fundamental reasons for the neglect of this research. It was not simply that its importance had not been noted. We observed that much of the research which does get done has the effect of discrediting both itself and the whole research enterprise. It seemed that both unidentified aspects of the system itself and the elites who play such an important role in its control had deliberately set out to deflect attention from the topics, stifle relevant research, discredit such research as did get done, and create mechanisms which would lead social "scientists" to discredit themselves.

Why should the system go to such enormous lengths to stifle something that is barely represented in Figure XXX? *There must be something wrong with Figure XXX* (just as there is something wrong with Fig. 20.4). But exactly what is wrong?

The answer is not clear. But some insights may be gained from the following: We have not attempted to use Fig. XXX to develop a new version of Fig. 20.5. But reflecting on what it might contain in the light of insights we have gained since Fig. 20.5 was first drawn up has led us to reflect that the design of a learning society – a society which would experiment and learn in the way in which Smith and Hayek's market driven society was intended to innovate and learn, that is, without anyone having to know anything very much – requires diffusion of responsibility for innovation, monitoring, learning, and action to *everyone*. Now, if calls for research and innovation are in fact bubbling up all over the place, how would one represent them in Figure XXX?

Perhaps they should be listed as inappropriately narrow job descriptions and staff appraisal procedures which contribute to the perpetuation of the system in some of the "component" boxes. But that would again involve identifying a positive from a negative. But even if it were true, there would still be *nothing* in Figure XXX itself to indicate that research is on the critical path to finding a way forward.

But what's this about a critical path? A critical path diagram is not much use if it fails to show all, or almost all, of the activities which have to be undertaken to achieve the goal and the links between those activities. Of course, a critical path diagram differs from a map of a cybernetic system. But a map of the cybernetic system for a missile or an atomic reactor (such as Chernobyl) is also not much use if it fails to identify the need to obtain key information, how that information is to be obtained, and how that information is to be fed back into the system. A cybernetic map of the guidance and feedback system for the human body would not be much use – and would give much misleading information – if it omitted the endocrine system.

Then again, a cybernetic map of the control system for an organism would also be of little use if it failed to show the body's sensors. Where are the sensor's in Figure XXX? Unaided public observation is indeed present. But unaided public observation would not be much use in helping to keep a missile on track. If we are trying to construct a societal management system that is less at the mercy of nature than a coracle in the sea, do we not need a craft whose construction is based on more scientific principles and whose cybernetic system utilises more scientifically constructed sensors to detect the functioning of key operations *within* our society? How are these to be represented in our socio-cybernetic model of the functioning of the educational system? Hey, guys, if we tried to indicate the absence of these in Figure XXX, would we not have more boxes saying "failure to develop" ... as we had in Fig. 20.4?

To return to our sailing boat analogy. It might be easy to represent the cybernetic system of a sailing boat. But what of the *system*? Then one would wish to add charts of the harbours, sea bed, rocks, lighthouses. One would need navigational aids. One would wish to add lighthouses, radar beacons, etc. etc. So, to move forward, one not only needs Newton's laws. One needs a host of developments, some integral to the design of

the boats, some specific to navigation (such as chronometers), some external such as harbours and networks of coastguards. Is it feasible to map such a cybernetic system? And what if one wishes to improve it ... is it indeed inappropriate to note the absence of key features such as chronometers which will enable one to plot one's position and course?

Then again, Chenobyl had plenty of instruments and people who had responsibility for acting on the information they provided individually, but how was what happened if the *collective* effect was not anticipated to be incorporated into the design of an appropriate cybernetic system?

But, in any organic system, such as the body's temperature control system, both sensors and responsibility for acting on them are all over the place. Contrary to what their advertisement would have us believe, the development of a BMW is *not* controlled in a manner in any way analogous to the way in which the genetic code influences the development of an organism. The latter is crucially dependent on the environment, is sensitive to feedbacks from all over the place, and is capable of substitution and re-generation (within crucially important limits) if interfered with.

So, in our quest to map the hidden network of forces and interactions which determine our social "reality" (in which we choose to focus on and emphasise certain things and ignore others) what are the internal and external sensors that should be represented? How should they be represented? To what should each be sensitive? Which aspects of the environment are relevant and which irrelevant?

At this point our quest to construct a socio-cybernetic map seems to have provoked the statement that "We seem to be in need of a better *theory*". Of course! Attempts to produce a better representation naturally provoke questions about what it is that is to be represented. Attempts to translate theory and its representation into action ("experiment"/action research)

lead, in an appropriate context, to better understanding. And better theory enables one to develop better tools and systems. We are dealing with a system which has no specific "most important" box.

Much of this discussion underlines the importance of completeness or comprehensiveness. This seems to parallel observations made earlier. We have argued that one of the key shifts required in educational research is from a preoccupation with getting an accurate fix on *one* outcome of an educational process to a concern to get a rough fix on *all* important outcomes. We also noted the need for a similar shift in much scientific research – such as in agriculture. We need to move from single-variable, reductionist, science to studying the multiple feedbacks in what might be called an ecological model of science.

A natural response to this statement is "But one cannot put *everything* in!" This, of course, is true. But how to know what is most important? How to represent sensors, gaps in the feedback process, interactions with environment, and context? (We should note in passing that it was not, in fact, amplification of the negative feedback loops represented in Morgan's diagram of the Watergate cover up that stopped it: it was *the process of exposing the behaviour to the public gaze*. As Mill put it, it was the process of making visible to everyone who did everything.) How are we to represent a control mechanism like *that* in the kind of cybernetic diagram so far envisaged here?

Something else it is important to note is that, contrary to the usual model for presenting scientific results, it is actually more important, from the point of view of advancing understanding, to report one's feelings of unease – feelings derived from the border of consciousness – about what has done than to present the "results" of one's work as convincingly as possible.

At this point it is important to reiterate that the attempt to generate a socio-cybernetic map showing the forces which are driving our society to destruction – toward non- sustainability

– produced relatively few new insights. Its main value was (unexpectedly) to problematise the process whereby appropriate myths get generated, selected, and enforced. But now we see that the development of this map was, after all, not a waste of time because it was the attempt to include these wider processes (the importance of which we would probably not previously have recognised) within a revised Fig. 20.4 that has led to the most important developments in that diagram.

CONCLUSION

The development of socio-cybernetic maps can be an illuminating experience. It may lead to both more effective action and the improvement of theoretical insights, but it is more likely to be a frustrating experience. It is not a routine technical operation in the sense in which the preparation of geographical maps could be so described. The question of what to include, in how much detail, and how for different purposes remains to be explored. More fundamentally, the whole question of what such diagrams are for, whether their construction is feasible, what is an appropriate model around which to build representations of *socio-cybernetic* systems, and what are the most important components to include seem to be both important and open.

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