

An Open Systems Model of Consciousness and Learning

(Adapted from *Searching*, 1999. The Search Conference is used as an example of the findings all the way through.)

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Over the last 50 years or so we have seen a creeping realization that instead of a discrete world of individual things, we are living in a series of nested ecosystems within an environment both physical and social with which we are inextricably interrelated. As part of this growing realization is a much more accurate appreciation of the human as a complex social creature, far from the close to caricature of mechanical or rational *man*, that which was posed by older theories of learning or economics. This seriously biased and distorted portrait of the human has consequentially distorted out thinking with some serious effects as we have seen with the application of mechanistic theories to the education system which we have still not been able to get on top of due to the huge inertia in DP1 systems (See Ecological Learning herein). That is to say nothing of what a belief in mechanism has done to all our organizational structures themselves with which we are also overloaded, despite the fact we know how to change them.

Today's people live in complex ecologies both social as well as physical where they search for purpose in their lives as part of the broader search for meaning. That appears to be most central human concern and many strands of research converge on the fact that the process of extracting meaning from the totality of the ecosystems in which people find themselves is that process we call *learning*.

Here we look in a little more detail at what some of our more powerful new approaches have to contribute to our emerging picture of people searching for meaning as the primary adaptation. The Gibsonians armed with the rapidly burgeoning field of Ecological Psychology and open systems theorists armed with powerful concepts such as directive correlation are converging towards a more comprehensive theory which may throw a brighter light on consciousness, human learning and adaptation within changing informational environments. We now explore some of the possibilities of that convergence.

From a general ecological perspective as well as our particular concerns here, behaviour remains the important focus for exploring the concept of learning (Johnston 1985: 5). Learning may be defined as the modification or maintenance of the behavioural relationship between an animal and its environment as a result of individual experience (p6). It involves acts, sequences of behaviour that have consequences for the animal (p7), or person, consequences of meaning. Learning must be conceived as a process which is integrated with other developmental processes to ensure successful adaptation (p18). It must, therefore, be capable of being integrative of concepts of consolidation and differentiation of meaning and the changing span and scope of goals throughout the life cycle.

The hallmark of an ecological approach to learning is ascertaining **what** has to be learnt. This is the process of 'task description' (Johnston 1981) and for the task description here, we need to have observations of people in their species specific environment (the Type IV), their ecosystem or econiches (e.g. their organizations) and be able to analyze what behavioural changes are occurring which indicate that learning is taking place over time (adapted from Miller 1985: 80). Here we concentrate specifically on the econiches within which such learning may occur.

When discussing processes involving human cultural evolution, individual learning and system development, we immediately confront the complexities of human adaptation caused by consciousness. Our methods for adaptation and cultural transformation involve bringing to

consciousness the dimensions and nature of these changes. At the same time, much of our group life and learning operate at subconscious levels. An adequate model of ecological learning must encompass meaning and adaptation at all these levels. Here I propose a model within which we can position all these experiences and practices, better understand previous failures and improve our tools.

Consciousness is related to language, the self and the objective world, reality, in complex ways. But there are convergences in the literature which allow a firm formulation in terms of directive correlations.

Formative Work

Jaynes (1976) devised a list of what consciousness is **not**, including that it is not necessary for learning. Both animals and humans obviously learn without consciousness as the case of *Orillia* (Emery M, 1986) illustrates. He arrived at consciousness as "the work of lexical metaphor" (p58) but failed to distinguish between spoken and written language. He concluded, therefore, that up until quite recent times, human beings were not conscious. But Luria makes it clear that contact with literacy and the development of the 'literate mind' are associated with the development of the ability to **abstract**, as is necessary to solve syllogisms when direct experience is lacking. Jaynes following Locke confused consciousness with the development of generic conceptualization.

Asch (1952: 287-8) is more useful when he says "The self is more than one other object in the psychological field. It has the unique property of being both the subject and object of experience; it is for us both the source and end of experience...the realization of ourselves as actors and knowers permits simultaneously an increased detachment from the environment and a deepened cognizance of it." Then in 1972 Chein published *The Science of Behaviour and the Image of Man*, a rigorous and comprehensive system of psychological concepts. Behaviour he defines as "any spontaneous directed action" (p77). From this he derives the concept of awareness.

Awareness is "minimal behaviour, behaviour conceptually stripped of all components save that which is barely sufficient to maintain some spontaneous directed action with respect to an object" (Chein 1972: 83). Awareness is included in every instance of observed behaviour. Every awareness is inherently a directed act and therefore motivated. And as Shaw et al (1982) add, awareness is perception. Dreams, hallucinations, etc, are simply different kinds of acts (p162). So too then are all our perceptual behaviours including imagining or conceptualizing our futures. They too are inherently directed or motivated awarenesses and will be subject to the same psychological laws as any other perceptions, particularly so in this context of bringing them under conscious control.

Chein (1972: 95) then formally derived the relationship between awareness and consciousness:

"Let us call any awareness which is itself an object of a behaviour of the same object a **conscious awareness**; it is an awareness accompanied by an awareness of it. By the same token, any behaviour that is itself an object of another behaviour of the same actor is a **conscious behaviour**; and, if it is a motivating behaviour and if, as motive...it is similarly an object of another behaviour, it is a **conscious motive**."

A desirable future for example, therefore, becomes conscious when we are aware of ourselves perceiving our desirable future. It functions as conscious motivation when it is a goal of another conscious behaviour such as creating a community. To maximise the success therefore of the Search Conference, it is critical to ensure that each particular element and motivating behaviour is brought to conscious focus.

Vygotsky (1962: 91) agrees that consciousness is present when we are aware of the activity of the mind and our awareness. Chein and Vygotsky also conclude that consciousness demands a hierarchical framework which is itself a **system** (Vygotsky 1962: 92). This is inherent in both the above hierarchy of conscious motives and that of goals, purposes and ideals. Bringing ideals to consciousness in the service of consciously creating a community, motivates purposeful behaviour directed towards those higher level motives.

Consciousness is not extensive or continuous (Vygotsky 1962: 91). "Cortical consciousness is really chiefly cortical unconsciousness or a potential" (Caudwell 1949: 192). If a behaviour does not become an object of another behaviour of the same actor we may call it **subconscious** where 'sub' means 'less than' (Chein 1972: 96). That is "if I am aware of an object or motivated with respect to it or, more generally, behaving toward it, but am not aware that it is an object of my awareness, motivation or behaviour, then the latter are subconscious. I may be fully aware of some aspects of my behavioural activity, but, if I am not aware of the directedness of this activity, then the behaviour is subconscious". As learning takes place, so previous behaviours which were objects of awareness become components of a higher integration of behaviours or system of directive correlations. They therefore lose their potential as objects of behaviour unless the higher system is disrupted. Subconscious behaviour should be expected to be very common.

We see this phenomenon e.g. as a SC proceeds, behaviour becomes increasingly and coherently directed towards the highest level of the system of motives. Therefore, previous behaviours in relation to aspects of the topic become less salient. ***Peoples' behaviour changes!*** They themselves may not be conscious of this at the time but others will. It is not uncommon for people to express surprise that a particular individual or group has not for example, been antagonistic about a specific proposal. Similarly, it is common for surprise to be expressed at the high degree of commonality or agreement of views. This is simply a reflection of higher order motives being brought to consciousness and replacing lower order and more fragmented goals. It is a figure-ground reversal, the basis for perceptual reconstruction or Lewin's original 'unfreezing -refreezing' phenomenon.

This is, of course, the operationalization of the $A \rightarrow X^B$ model of diffusion in action and in so far as the influential communication is mapped as a response against the appropriate environment, it is adaptation in action.

The Model of Consciousness as Adaptive Behaviour.

Any formulation of consciousness in terms of directive correlations must therefore respect and account for its definition as awareness of awareness, within a hierarchical system, and also as a potential or non continuous behaviour.

Sommerhoff, without attempting a formal definition of consciousness, saw it in terms of the total hierarchical system of potential and actual directive correlations. Compared to death which is the "total breakdown of the integrated directive correlations that inform the living organism...its animation" (1981: 189), **unconsciousness** is a partial breakdown of this kind affecting merely the actual and potential directive correlations that exist between the current states of the person on the one hand and the current states of the environment on the other. It leaves the other internal directive correlations, the internal regulations, etc, intact (p193). There can also be consciousness without overt physical behaviour, e.g. private fantasies. Here we have the potential directive correlations, not the actual ones. Consciousness for the active behaving person, in the sense of being aware that one is aware, therefore concerns a hierarchy of actual directive correlations nested within a further hierarchy of potential directive correlations. Given that in actual directive correlations the value of Y_0 is an actual member of a set of starting conditions and in a potential directive correlation it is not, we may conceive of consciousness as a directive correlation within a hierarchy of actual and potential directive

correlations which satisfies the focal condition of person as product of environment (E_k) and human systems (H_k) at a given point in time.

Thus the first directive correlation within the hierarchy would present Chein's definition of awareness as minimal spontaneous directed action. E_k here is as usual a normally defined environmental feature or event. In order to satisfy the definition of consciousness as awareness of awareness, the awareness in the original directive correlation must assume environmental status. In other words the actual or potential set of starting conditions must include the behaving or aware self as an actual or potential member. It is not necessary however, for a formulation of our ability to behave consciously, that an actual value be specified. Given our lesson above that subconscious behaviour is common and consciousness only a known potential in any circumstance, it is sufficient to satisfy the definition that self may potentially assume Y_0 in an actual set of starting conditions. The function of the self, such that it may see itself as response to Y_0 then defines the original awareness, minimal behaviour as an **environmental event**.

We need only a single diagram, remembering that one may be conscious of purposes and ideals which lie outside a finite or possible time scale, and that we must be able to elaborate such a model in order to account for dreams, thinking, imagination and memory.

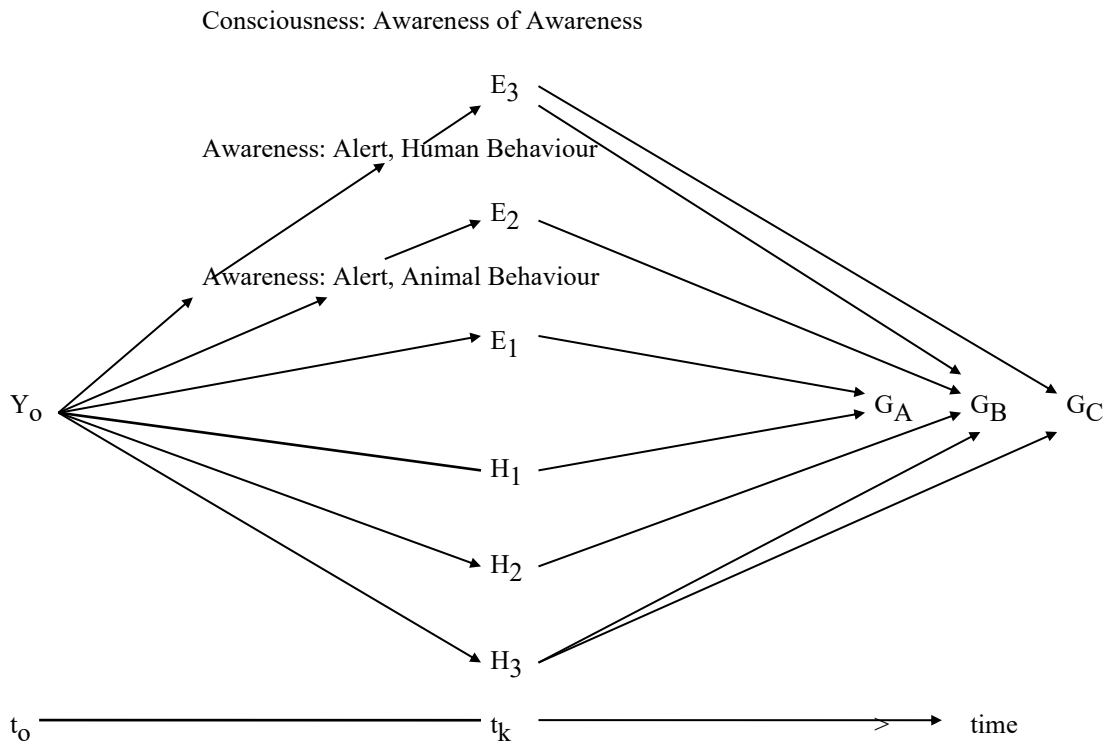


Figure 13. Consciousness as Adaptive Behaviour

Figure 13 shows a nested hierarchy of directive correlations for both animal and human adaptation. The direct correspondence of $E_{1,k}$ and $H_{1,k}$ specifies animal adaptation in respect of Y_0 , an actual member of the environmental set and G_A , a goal. Level 1 therefore specifies adaptive goal seeking behaviour. For human awareness, (level 2) the directive correlation is given by the condition where Y_0 is an actual member of the environmental set and the person behaves adaptively such that there is direct correspondence of $E_{2,k}$ and $H_{2,k}$ with respect to Y_0 and G_B where G_B is a purpose. The **ability to be conscious** is defined by the condition where the self assumes a potential value of Y_0 such that its response function as

observer is matched by its response function as observed or object. Similarly we may become aware of our awareness in respect to G_C , a set of ideals. The correspondence however, remains the same as in the case of purposes. As it would be maladaptive to be continuously conscious so it is maladaptive, if not impossible, to be continuously ideal seeking (Emery F 1977).

At level 2, human awareness, we will have for example, a person being productive within a Type IV field, behaving adaptively when s/he is pursuing a purpose in ways appropriate for that Type IV field, e.g. behaving cooperatively with another pursuing the same purpose. While simply behaving productively and cooperatively around the shared purpose, both can **become** conscious if they can reflect upon themselves as people behaving productively and cooperatively around that purpose. Similarly, we can become conscious of our ideal seeking if we have the conditions and opportunity to do so. (If the econiche or organization within which these people are cooperating is structured on DP1, appropriate for a Type III environment, their cooperation will be seen as strange, negative or maladaptive.)

However, it is clear that in terms of the question of consciousness present at any given moment this formulation is not sufficient. For the self to assume a potential value of Y_O in an actual set satisfies the requirement that we **may** be at any given moment conscious. But what about the moment when we are fully aware and conscious? "When I observe myself, there is involved an immediately present I" (Chein 1972: 198). In such a case the self does actually assume Y_O in an actual set so that 'we devote our behaviour exclusively to it'; it becomes figure on ground.

The moment of consciousness then is an adaptation when there is correspondence between all of $E_3, E_2, E_1, H_1, H_2, H_3$. (We must allow the possibility that at times we lapse into goal seeking). At every level of the motivational hierarchy, therefore, we are behaving consciously when we reverse the normal figure-ground of 'task being performed' to 'ourself performing task' or 'ourself behaving' that is when we function equivalently as subject and object.

Here we have the essence of diffusion - perceiving our own motivated behaviour as we continue it over infinite time frames. It means that our conscious perception of our progress is itself a motivational behaviour. Ideal seeking is inherently attractive. When ideal seeking motivates the behaviour of a community (brought into being through conscious, collective ideal seeking) every moment of consciousness motivates the growth of community towards the approximation of the ideals.

However, a further specification is necessary and we return to Johnston and Turvey's discussion of the role of the back reference period. An adaptive response to our awareness of awareness, our consciousness must not exceed the back reference period of the awareness itself, unless of course such consciousness is in its own right the beginning of another awareness (hierarchies within hierarchies). But if the period of consciousness was to seriously outlive the back reference period of the awareness it would amount to perseveration, the inability to respond flexibly to a changing environment. In these cases where the self takes on the actual value of Y_O and the back reference period exceeds $t_k - t_0$, we would expect to see something like stage fright or at the extremes, perhaps unresponsive catatonic schizophrenia. At the organizational level we would see for example, an enterprise fixated on and fiddling with its internal DP1 structure as it loses profitability in Type IV environment, at a time when others are searching the environment for both new markets and effective methods for changing from the first to the second design principle.

Both dimensions are therefore necessary in order to specify adaptation. The first involves becoming an environmental event such that we know ourselves as planners and actors who change the environment (L_{12} relation). The second involves the constraint that such planning

and its implementation is action towards purposes and goals in respect of the current environment. In this way we can learn about and know ourselves, by **extending** the total set of directive correlations. That is, by being aware of ourselves as an environmental event which affords some meaning to others in the Type IV field, we can respond adaptively not only to our own awareness but also to that of others for whom we are an affordance or resource. But if we in any given environment fail totally over the back reference period to perceive ourselves as a potential value or **affordance** of that environment, we may also be considered in terms of learning to be in a less than conscious and/or adaptive state. We also then fail to diffuse as we do not recognize ourselves as a resource to others.

The possibilities inherent in this model, for maladaptation as well as adaptive behaviour, defined over the two critical dimensions of correspondence and back reference period, emphasize two points. The first is that our ability to see ourselves acting in the environment means that we cannot escape seeing ourselves as a part of the totality. This not only generates learning, it also explains the belief that our humanness confers responsibility. Consciousness underlies the age old concept of trusteeship of, or responsibility for the physical environment. Those maladaptions which involve such withdrawal of responsibility are also a loss of our unique human characteristic. The second and interrelated point is that consciousness imposes the need for a degree of unity in actions, in relations with others, and in thoughts if a person is not to be overwhelmed (Asch 1952: 122). The notion of unity to preserve and communicate the content of consciousness is common but unity may not always prevail, resulting in informational overload (Emery & Emery 1976). Methods for change such as the Search may make it difficult for some people to preserve unity. This imposes serious responsibilities on the managers of these methods. The regulatory function of group life and conversation, as econiche and response function, are essential elements in the process of managing consciousness. These will be shown below to have a biological base. Unity or adaptation which is used in its sense of meaningful order, is established by the set of invariances, both ecologically and culturally determined, which define the common world. As manifestations of a system principle, group life and conversation function as the moderators of consciousness, preserving the set of directive correlations and orienting its orderly growth. This emphasizes the importance of structuring all our organizations or econiches for group life and conversation on DP2. Without such a transformation, we will continue to experience the growth of societal and cultural disorder and maladaptions such as dissociation.

Definitions of Learning and Diffusive Learning.

Such an explication takes us far beyond the simple model specified for animal adaptation. Now that consciousness is defined as the ability to directly perceive oneself as a potential or actual environmental event, it becomes clear that we, being conscious of many of our doings, learnings and knowings, have a choice of viewing them at any moment as affordance or effectivities. And because the set of directive correlations is infinitely expandable both through the range of possible variables and over past and future, we can better understand the process of learning and individuation. "The construction of the individual is seen as a gradual process of differentiation and organization in which the production of meaning is central...the problems of consciousness and of how one can represent to oneself one's own desires and beliefs can be seen (as)...the problem of **differentiation**" (Clifford & Frosh 1982: 269).

Clearly, individual human growth and development depend on the ability to differentiate and/or 'see' the possible actors and responses within the set of directive correlations. At the same time, consciousness expressed in terms of directive correlations allows us to see ourselves as part of an organized field together with the growth of complexity within the ordered, unified set of directive correlations.

The processes and principles of direct realism as medium term adaptation are those we use over the life span. Therefore, "learning works because it permits the development of effectivities that are supported by affordances in a real environment" (Johnston & Turvey 1980: 166). Our discussion of consciousness has shown that for humans, no clear boundary can be drawn between affordances and effectivities except in a specifically pragmatic sense where, for example, we may wish to limit the size of an investigation by defining an X only as an affordance, or effectivity. In the present context, however, and because of the breadth of our specification of Y_O as L_{22} , we accept that one of our human effectivities is to create affordances which contribute to the evolution and development of econiches and indeed environments in the sense that we have reserved for it, of extended social field.

Thus, we may be clear that learning as adaptation at the ontogenetic level is no more or less than the simultaneous development of affordances and effectivities towards environments that better support human purposefulness and ideal seeking. Consciousness demands that these 'goals' are also effectivities and thus ***learning is the growth of the total set of actual and potential directive correlations, or contents of consciousness, towards a meaningful order.***

This definition encompasses maladaptation but we can consciously choose to use our learnings to create new econiches which themselves will function adaptively, affording conscious learning to those within them. And we may consciously choose to function as an affordance or resource for conscious learning to others who are searching the field for ways to extend their own set of actual and potential directive correlations. Being both conscious of and motivated to use (by virtue of the motivational hierarchy as above) ourselves as both effectivity and affordance to others, we will be motivated to enter into positive, peer relationships with others around shared purposes including that of learning itself. This would appear to cover all the characteristics required of a **diffuser** or of **leadership in a process of diffusion**. We can, therefore, define **Diffusive Learning** as that learning which motivates the learner to recreate the learning environment for others either as actual or potential econiche.

These new econiches then function first as affordances for new conscious learning and as this learning proceeds, as effectivities available to the new learners to themselves create econiches for the learning of others. These econiches can be viewed, therefore, as affordance and effectivity, as organizational structure and medium of communication. Effective methods for diffusive learning will approximate these econiches and will continue to be adaptive as long as they establish the correspondence between environment or econiche and learner, the econiche as affordance for purposefulness and potential ideal seeking and awareness of the learner as actual member of the environmental set.

As a corollary to this, we can propose that the same set of characteristics which appear necessary and sufficient to define a diffuser may also be applied to the self as conscious object, in which case the self becomes conscious **life long learner**. We would expect in fact, that diffusers and lifelong learners as defined would be one and the same people. There will be a spiralling of learning and diffusing as the conscious lifelong learner extends their total set of directive correlations through creation of learning econiches which also then function as affordances for their own learning as well as that of others.

Note: There is no implication here that econiches or organizations learn. Learning as defined above is reserved for the individual person. A 'learning econiche' is used in the same sense as a 'learning organization' - it is an organization "structured in such a way that its members can learn and continue to learn within it" (Emery M 1993: 2). I have to keep repeating this because so many of our social scientists who really should know better keep on rabbiting on about learning organizations as if organizations do in fact have nervous systems, thereby contributing another distortion to the burden of mechanistic thinking we are already carrying.

The Wholistic Nature of Ecological Learning.

The response functions which map the starting condition onto what has been defined here as econiche, and which thereby support the phenomenological concept of learning, can be generically defined as **communication**. There are established adaptive communicative processes, that is, modes which conduce the adaptive learning spiral as defined here, but the very fact that these may be distinguished raises the question of a set of maladaptive interrelations between starting condition, purposefulness and response function within the context of learning. While it seems impossible for humans to avoid learning, it may indeed be possible for a set of directive correlations to give every appearance of a spiralling growth which mimics adaptation towards greater purposefulness, but which is in fact mimicking the form, away from the control of an ecological system principle. A physical analogue may be the malignant tumour which by its lack of differentiation leading to metastasis makes it evident that the guiding principle is not the orderly growth of the host system for symbiosis, but a destructive disregard for the whole in which it is embedded. Such a maladaptive spiral is rendered feasible by the nature of the human affect system.

The contextualized formulation of learning here bears little resemblance to mechanistic assumptions that learning and its derivatives are cognitive activities. Defined contextually such fragmentation is impossible, "All our experiences are colored by feeling" (Thatcher & John 1977: 113) and the data below show that learning cannot be divorced from the total human system and that it is tied most closely to the affect or emotional system. Thus, while we use affect 'system' in Tomkin's sense, such usage does not imply a fragmented view. Affects are characterized by their urgency, generality and abstraction and are not tied to any particular function, affordance, or econiche, nor do affects distinguish reality from possibility. They are a free ranging set of effectivities which provide enormous amounts of information about the correlated nature of ourselves and the ecosystem (Tomkins 1962). Tomkins stresses the wholistic role affects play in the human system but their features of generality and abstraction carry the associated cost of ambiguity and permit error. By allowing self validation and self fulfilment, affects both motivate (Tomkins 1962: 6) and deepen our coordination within the ecosystem. But because the source of any affect may be incorrectly attributed, they provide the opportunity for maladaptive correlation.

An example is provided by the *Orillia* conference (Emery M, 1986) which illustrated the maladaptive effect of affect becoming disconnected from the task, the potential learning inherent within the task and from the majority of participants who formed the potential learning, planning community within the econiche that was the conference. One small group interpreted their task as **communicating** per se, an end rather than as a response to environment and a function towards task. Their behaviour mimicked purposefulness and adaptation but was centred entirely around affect for self validation and self fulfilment. Such maladaptions are powerful and such a disregard for the whole finally destroyed the potential adaptive relation between conference purpose, learning and outcome. It is vital, therefore, that there be understanding of the nature of the total set of directive correlations.

Here we must sound a note of caution about interpreting 'learning'. Nothing less than a conscious appreciation of the **total** set of directive correlations with **all** elements intact can satisfy the requirement of ecological learning for adaptation and inherent adaptivity. The failure of the *Orillia* conference was clearly a result of inadequate econiche design and management which emphasizes the need for a more wholistic approach to learning for adaptation and attempts to diffuse it.

Remembering and Forgetting: Consciousness and the Concept of Memory

A theory of learning is incomplete without an explanation of two of its foundations, remembering and forgetting. It's a bit difficult attempting to diffuse something you can't remember. In addition, our methods for active socioecological adaptation are often remembered as high spots, events of accentuated clarity of remembering. They are frequently described as 'unforgettable'. This indicates heightened emotional intensity but before we turn to that aspect, it is necessary to be clear about these foundations of diffusion or the lack of it.

Contextualists Don't Have Memories

The concept of memory that accompanies the first mechanistic epistemological theory of fragmented sensory systems and associations has itself been a mechanistic one of maintaining connections and making selections. Above all it involves storage and retrieval - information goes in, is stored and if memory or retrieval is working well, there is assumed to be "a certain **invariance of quality** of that which is stored at one time and then retrieved at a later time" (Von Foerster 1969: 4). But Von Foerster's example of being asked what he ate on an aeroplane flight, to which he replied in words, demonstrates that the system did **not** function as a storage and retrieval one. Even if it had, we would not expect that it would have demonstrated that 'certain invariance of quality' required for such a definition. In the field of visual perception, Potter and Levy (1969) showed that rapidly presented pictures are processed one by one for precisely the time viewed, and are **not** held with other items in a short term store. There are many examples.

Apart from numerous difficulties with the storage and retrieval model, forgetting as disruption of connections has also turned out to be an incorrect hypothesis. Luria's (1981) empirical work shows the predominant role of direct perceptual experience, confirming Gibson's (1966) conclusion that the brain does not have to integrate successive visualizations in immediate memory. He was led to reject the concept of separate fragments, bits, called memory and memory traces (Reed & Jones 1982: 396). As our perceptual systems are structured on DP2, redundancy of function, there is every reason to believe that neurons of the nervous system follow the same rules. Gibson (1966: 262-5) saw that a totally new concept of memory was required, one tied appropriately to perceptual system functioning.

Memory as a 'thing' is such an ingrained concept to the Western mind that it seems almost inconceivable that we could do without it. And yet as we shall see below, memory is not a thing or a warehouse. Neurophysiology indicates memory to be functions and processes (Schwartz 1983; Burbach et al 1983; Lynch & Baudry 1984; Weingartner et al 1983) and models have been developed where 'memory' has been incorporated as part of knowing and comprehending experience (Von Foerster 1969; Franks 1974).

There is a certain irony in all this as Bartlett clearly showed the way forward for research into *Remembering* in 1932. This classic appears to have been relegated to the archives of many, but not those of the modern Gibson school (e.g. Hoffman and Nead 1983; Jones 1976). Jones argued convincingly that our perceptual system is ecologically bound to pattern, rhythm and hence to time. "It is misleading for psychologists to continue treating time in Newtonian terms as if it were some absolute abstraction that we perceive apart from other dimensions, or as a 'thing' that is stored or consumed by activity. It is none of these. Time is one of the defining properties of our world and so of ourselves" (p353). Her emphasis on nested hierarchies of time patterns is a direct precursor to the model below, particularly in terms of expecting, learning and remembering. "Distinctions between expectancy, perception, and memory are subtle, for all are tied to the same psychological mechanism - namely, nested rhythms" (p347). These are directly equivalent to nested hierarchies of directive correlation with specific back reference periods. **Invariance** is clearly implicated as the key concept with

details or sub patterns being subjected to loss or rapid transformation. Methods which focus on invariances will, therefore, be better remembered.

Others in different fields have also searched for an adequate theory of memory. Sheldrake (1988) explored the possibility that memory is inherent in nature. He proposed that biological life forms inherit a 'collective memory' from all previous generations. Life forms grow and develop as they do because the habits of these generations have been transmitted. His analysis led him to the concepts of morphic field and morphic resonance. The morphic field is a very close approximation to the concept of a field of directive correlations. The approximation is sufficiently close that if we were to make some substitutions such as the following, his theory would come extremely close to that elaborated below. A beech seedling as it grows into a tree takes up the characteristic shape, structure and habits of a beech. Its inheritance is not only a matter of chemical genes but also a matter of transmission of habits (p1). Now consider that a beech seedling is growing in an ecniche within an ecosystem, neither of which vary greatly from those into which previous generations grew, that is, there are a large number of invariances in the environmental conditions under which all generations developed. The habits then become the directive correlations operating within the field and within the constraints imposed by the beech's genes. The greater the invariances in the fields of successive generations, the stronger will be the habits or as we shall call them below, the remembering. Sheldrake also extended his theory to humans such that memories depend on the reconstruction of patterns of connection within fields. What we consciously remember are subjective experiences or perceptions of what happened (events) which are organised by fields, and remembering them depends on **self resonance** (p201, my emphasis).

Goldmeier has also shown that memory cannot be separated in any real sense from knowing. Remembering and forgetting are intimately related to the nature of that to be known and its processing. In *The Memory Trace* (1982) Goldmeier puts 'memory' centrally into ecological adaptation and contextualism. Perception extracts information out of a gigantic range of possibilities and groups it for meaning and meaningful data reduction. "Memory deals with the **result** of grouping" (p6). Data reduction or changing information is the key to understanding the concept of memory.(p4).

Goldmeier begins from the concept of 'singularity' (Pragnanz). What is important for perception and therefore memory is that features have a small range of high resolution, singularity, and a broad range of low resolution, non singularity (p44). Singularity is established as self consistency and as norm, a meaning which is reflected in our language and functions to maximize the efficiency of coding, or minimize the complexities of cognitive objects. (p57) Sheldrake also emphasizes the role of similarity as the basis of his concept of morphic resonance (p108-9). The more similar the patterns of activity, the more specific and effective will be the resonance (p132).

As the processes of the SC unfolds, it surveys the range of perceptions of environment and system and proceeds to group them in terms of a small core of essential features. These are certainly high resolution and as the commonalities between groups are established, they express the consistency within the community. Probable and desirable worlds and systems display singularity and as these build upon each other, meaning is heightened. Similarly in *Participative Design Workshops*, groups emerge from their bureaucratic morasses with similar, simple, elegant designs reflecting the consistency of the significance of the concept of redundancy of functions. It is, therefore, not surprising that these events are 'memorable'.

It is biologically adaptive to perceive and remember the spatial and temporal invariances of objects and to be able to 'disregard minor perturbations'...as long as they preserve the grouping and the singular features" (Goldmeier 1982: 63). Singularity is therefore the property of an invariance. But "the most fundamental characteristic of a singular attribute is, however, sensitivity to change" (p58). Should then a fundamental feature of the ecosystem or

directive correlation change in the process of implementing the strategic plan derived from the SC, there will be an immediate sense of unease. Most commonly, there will be a change in the extended field (L₂₂) and because of high resolution of the meaningful groupings extracted, this will demand a reconvention of the community to readjust the plan and preserve the singularity.

Goldmeier also explains part of the robustness of the Search as a method, and some cases of failure. While singular features are precisely encoded, easily learned and accurately remembered, near singularity follows the 'almost at the singularity' rule: because the coding is in the pattern, a modified instance of the perfect case will be seen as simply that. It is not necessary for the observer to have ever seen the perfect pattern. The history of Searching is replete with cases of less than adequate design and management which still managed to work in the end. These are the cases above where 'close enough is good enough'. Enough of the perfect Desirable Future is grasped to enable the community to fill in the gaps and proceed as if it had been perfectly delineated.

In the third case of non singularity, the encoding is only approximate and is not accurately reproducible. The singularities yield an instability of both perceiving and remembering. This is when Searches really flounder. If the work done, for example, on analyzing and then synthesizing the L₂₂ has been insufficient for a clear pattern to emerge, the community will have no clear perception or memory of it on which to proceed. In these cases, it is necessary to recycle, return to that stage and work until a singularity is achieved. Thus while many Searches are carried by the energy and exuberance released by the exercise of responsible self management for collective futures, the difference between muddling through and failure lies in the singularities achieved at each stage and, particularly, the ultimate singularity achieved by the clear pattern of adaptation achieved by the whole. So called 'Searches' in which the process of integration and consolidation of group reports through the rationalization of conflict is neglected, are particularly vulnerable to failure. Participants are left with an array of data without meaningful grouping and adequate singularity.

Goldmeier establishes that both visual and verbal material undergoes severe data reduction. Because biologically natural perception and speech contain redundancies, recoding for even greater economy may take place. (This does not happen with the psychological tools of nonsense syllables etc p87). There is also selective encoding but with spoken language, we remember what was meant but not what was said. This emphasizes the need for SC managers to be very clear about what they mean, particularly when they define the task. Lack of understanding on their part translates into confusion among the community. Confusion precludes singularity. Our ground rule that all material must be presented both verbally and visually also finds support as an aid to meaning and remembering. Adding words to a picture increases its self consistency and increases its recall although there is in absolute terms more to be remembered (p94).

Goldmeier also outlines the concept of "a global constraint that establishes a meaningful whole" (p96), in other words, the system principle; that which organizes and gives meaning. It is this 'inner logic' directly perceived rather than externally imposed or learnt, which is remembered. "We encode what we perceive and remember what we encode" (p100). This was similarly found in a study of Westerns (Emery F 1959a) and confirms that **singularity determines recallability**. Thus the more clearly a SC establishes the system principle, the adaptive relation between system and environment that provides the overall meaningful whole, the more it will be 'unforgettable'.

For theories of memory, hierarchies can be local and often only temporary, subject to rearrangement as new material such as system or environmental change accrues (Goldmeier as above: 100). This aids in the process of developing encodings which are selective and parsimonious. "The world is coded in such a way that a maximum of information is

represented by a minimum of psychological objects, with a minimum of parts, with the parts represented by their functions within the whole and possessing a minimum of features, and the **fewest values** of these features" (p102). The most parsimonious and meaningful base of values is the set of ideals. So the more precisely and concisely our futures are encoded into ideals, so again the more memorable the event will become. We can sum this up: Singularity as a feature of invariants is contained within a dynamic hierarchy of directive correlations of environment and system or person, the adaptive interdependence of affordance (meaning) and effectivity.

But over time with experience and learning, 'memory changes'. To explain this, Goldmeier develops the theory of intrinsic stress of a memory 'trace' as opposed to the 'fading' of memory. It is based on the three cases above such that stress arises in the second and third case where there is less than complete inner logic or perfect singularity. The further from singularity, the greater the stress on the memory 'trace'. (p108) The theory of stress so developed is simply the process of application, or validation (p241) of the laws of singularity as above and these were clearly laws governing **perception**. In the first case when we perceive perfect singularity, the traces are exceedingly stable and precise, and in recalling them, the memory is correct. In the third case of non singularity, the trace is unstable and subject to forgetting. Intermediate traces progressively change toward singularity and, when they attain singularity, become stable but their information content is decreased. Memories of them are incorrect (p241).

Now, substitute the word perception for the word trace. The sense or meaning remains identical. We are talking about the fate of perceptions over time, and our resulting perceptions of them. As we are capable of being aware of our awareness, and, as above, an awareness is a perception, we are capable of perceiving our perceptions. No concept of trace is required, only the laws governing the process of perceiving. Nor do we need hierarchical trace systems which are governed by the same set of laws. Once we evoke the concepts of directive correlation and integrated hierarchies of directive correlation **we have effectively rendered the concept of a 'memory' unnecessary.**

Contextualists Simply Remember and Expect

The 'memory trace' storage, retrieval and forgetting are pseudo problems generated by trying to explain the adaptation of living systems within the categories of the mechanist metaphor. Working within contextualism, we may grasp their lack of substance.

There has always been a contextualist stream through the literature as we saw from the reference to Bartlett 1932. All of the higher mental processes are "intimately" related (Brewer 1974b). Everything that is known about psychic development indicates that its very essence lies in the dynamic interfunctional or multifunctional structure of consciousness (Vygotsky 1962: 2). Von Foerster points out that while conceptually we may distinguish perceiving, remembering and inferring, we fail totally when attempting to isolate these functionally or locally (1969: 10). The evidence shows "that perceiving and imagining engage the same neural apparatus, and that memory-sustaining operations (such as rehearsal) and acts of remembering (such as imagining) are carried out within the perceptual system most related to the memory material" (Turvey 1974: 169). We explore the correspondence between the psychological and neurophysiological levels in more detail below. But these conclusions indicate the ubiquitous nature of the second organizational design principle. Our perceptual system appears to be organised into multiskilled, multifunctional groups pursuing their goals or invariances.

Remembering is a kind of **knowing** that relates person and environment and entails the same issues as perception (Shaw et al 1982: 224, my emphasis). In addition to detecting invariances, perceptual systems organised in this way can be generative devices which

construct perceptual experiences of certain kinds (Turvey 1974: 168). These include dreaming and hallucinating.

In an event whose scope is explicitly past, present and future in the present, we would expect then that as invariances are extracted through the event, the perceptual system will generate **expectings** based on these long standing invariances. There are the Most Desirable Future Systems which capture the adaptive continuities of past through present to future.

Memory is a transformational process, not structural (Shaw & Pittenger 1978) and it is incompatible with the Newtonian moment of time (Turvey 1977). When an historic event is recalled, it exists in the present (Pepper 1942: 242). Memory shares this characteristic with expecting. "Past and future are always present as overtones of the present. We may be remembering the past but the memory is present and we're expecting the future, and the expectation is present. We are dealing with an essentially human process which cannot be handled at any level other than that of consciousness. "Modifications produced by past experience are easily observable in most organisms. In contrast, men refer consciously to the past and the future. These become psychological realities in the present, objects of present thought and action. The latter effect of past experience involves carrying the past and future into the present in a way that provides the conditions for a deeper continuity in mental life" (Asch 1952: 121).

Memory is a system property (Edelman 1992: 238). It is an aspect of the generation of consciousness (Trevarthen 1978: 118), governed by the same ecologically adaptive mechanisms as are other properties. Brains are selective recognition systems where recognition is a kind of adaptive matching (Edelman: 79-81). What is a perception at one point in time will at other points in time and at other levels of the set of directive correlations, become a 'memory', remembering, or the basis for a creative idea.

From Goldmeier's own work and in order to abide by the good law of parsimony, the static, well preserved 'memory' is nothing more than a perception or awareness of an awareness of a well-defined or highly singular invariance. Additionally, major perceptual reconstructions do occur and these affect these 'static' qualities he lists; biases, stereotypes, from convictions, etc (p240). Far from being 'static', these qualities are subject to continuous change within the dynamic open system and are profoundly influenced by a change in ecotope, both by its structure and by the panorama and nature of social relations it contains. This forms the basis for the A X B model of diffusion as above.

A Model of Remembering and Expecting

Remembering is a transformational process or property of consciousness and the generation of consciousness cannot be separated in any structural sense from any other of the higher mental processes. In other words 'memory' may now be considered as a response or mapping function which both helps keep intact and generates the total hierarchical system of potential and actual directive correlations. Because it is a 'self-referential' mapping in that it relates to purposes, remembering can be included under the concept of communicating. Knowing, transposed over differing back-reference periods is a particular case of communicating with ourselves in order to check on our ecological status and intactness. Forgetting is also in the same sense a communicating with ourselves, but serves to bring into consciousness the fact that a particular object, or event, was of an unstable or non-invariant nature at the time, although it now assumes meaning. Certainly, forgetting is not then by definition, a maladaptive process, as by this very function it serves to keep within limits the **orderly** growth of directive correlations.

As with perception, remembering must by definition be a property or process of an ecosystem. As a response function it operates at the moment of contemporaneous experience, the time at which the focal condition is satisfied (Adapted from Mace 1974: footnote 149).

The transformative process is always therefore in reference to the current adaptive awareness of consciousness. As there can be little argument that the field of consciousness is rich and elaborate we can also follow Mace's direction for parsimony. "The more elegantly structured and interrelated we can show environmental information to be, the more parsimonious could be the processing strategies evolved in such an environment" (Mace 1974: 148). We shall employ such parsimony in discussing the relationship between remembering, imagining and expecting.

Figure 14 describes a series of directive correlational sets over time where awareness and consciousness are specified as levels within the hierarchy, as detailed above. The act of **remembering** is given by the transformative processes or response functions over the back-reference period $t_3 - t_2$ whereby the adaptive act established at t_1 , by a transformative process over the period $t_1 - t_0$, is substituted for another possible adaptive act at t_3 .

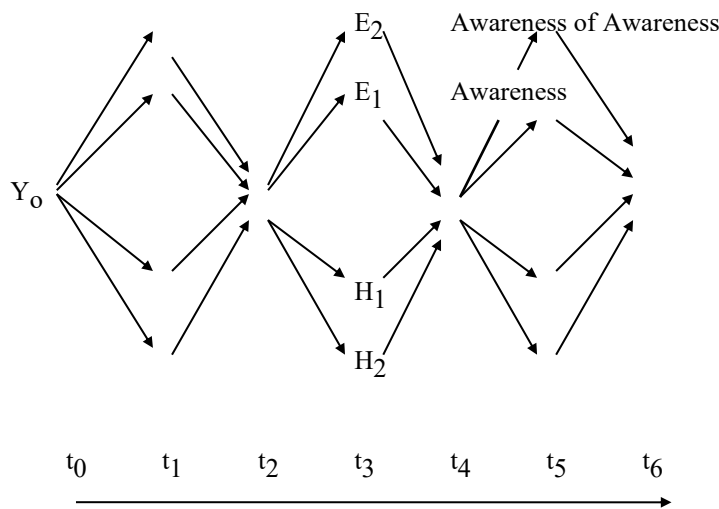


Figure 14. The Adaptive Acts of Remembering and Expecting

Let me now make a somewhat artificial distinction between perceiving and remembering in order to clarify this statement. Using Turvey and Shaw's (1979) postulate III, we can state that an act of remembering rather than perceiving can take place when the following conditions apply: If the value of Y_0 is an actual member of the set of starting conditions such that we are adaptively aware and/or conscious at t_1 , we define that act satisfying $F(E_2, E_1, H_1, H_2) = 0$ at t_1 as a 'perception' of the environment, directly and immediately given. If the value of Y_2 as an actual member stands in singular or almost singular relation to Y_0 and affords the same or almost the same adaptive act at t_3 as was performed at t_1 , then the act t_1 may be substituted for the direct perceptual act which otherwise would have taken place at t_3 . In such a case, the substitution is called 'remembering', or at the level of consciousness is called being aware of 'remembering'. The distinction is 'somewhat artificial' in that the perception of a perception defined over a previous back-reference period is still a perception. However, their common usage demands such a distinction and the model implies that at any given 'moment' we must be either 'perceiving' or 'remembering' (or imagining) and that we can also be aware that we are perceiving or remembering.

We specify that the nature of the transformative processes over the back reference periods $t_1 - t_0$, $t_3 - t_2$ and $t_6 - t_5$ are identical; governed by the same set of perceptual laws. The operators and mechanisms underlying them are similarly identical. Remembering is distinguished merely by the fact that it maps a previous directive correlation onto a

contemporaneous ecosystem. In other words, if the perception we perceive at t_x stands in singular or almost singular relation to an established directive correlation at some previous time, we call such a perception a 'memory'.

In terms of Goldmeier's theory of singularity, data reduction and intrinsic stress, this formulation works well. Unless the values of Y_0 and Y_2 in two econiches are absolutely identical, it is impossible for a remembering to remain entirely static over time as each instance of the response function will result in a slightly different adaptation. We all become aware that our memories of even important events change over time. While these in the long term may result, relatively speaking, in a particularly stable invariance, that perception may still be vastly different from its immature form many transformations ago.

This explains some of the radically different perceptions of the past presented in the history session of the Search Conference. People who may once have shared a small ecosystem move and change over time as above. The further back in the past and the greater the changes since a historic event, the greater the gap in the rememberings. As the Type IV environment continues, if not intensifies, the divergences will continue.

In the realm of human affairs which are conceptually many levels divorced from the perceptual invariant of a physical surface, cultural invariants may harden or gradually fragment. The latter will be replaced by the sudden but still immature perception of a new invariant representing the new 'coming together' of all the deviations from singularity of the previous transformations over a continuum of slightly differing econiches. In this way we can understand perceptual and conceptual reconstruction. It explains the **cultural revolution of the 60's**. After two decades of fragmentation of cultural invariants since the bomb went off, there was an **international perceptual reconstruction**.

Searching, Remembering and Reconstructing

Perceptual and conceptual reconstruction characterises the Search and accounts for much of its power as a method for socioecological adaptation. This is not surprising when we review its process, its psychological and its physical nature as an econiche.

In order to be precise here we must elaborate Figure 14 to include the SC in its setting.

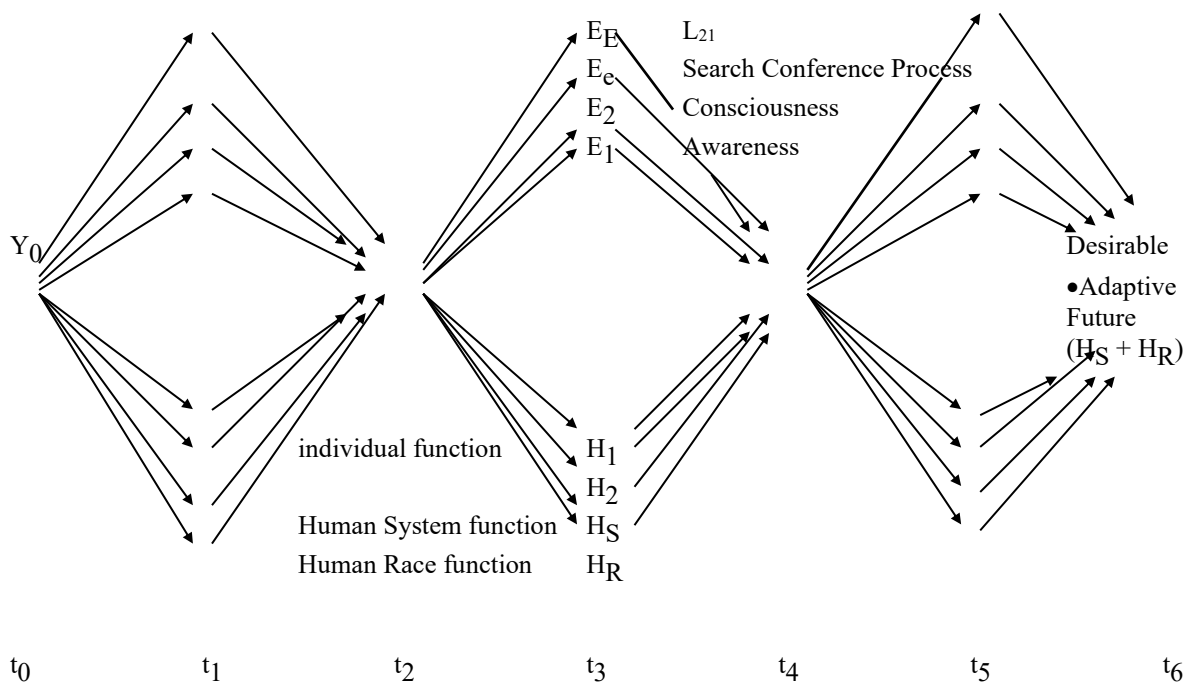


Figure 15. Remembering and Expecting as Adaptations within a Search Conference

In addition to our ability as individuals to be aware and conscious of ourselves as environmental events, we have the Search Conference as our econiche (E_e) within the extended field (E_E). Correspondently, we have a human system (H_S) within the econiche within the field. We also have the human race, H_R whose function in the basic system - environment model would be known as L_{12} .

In order for there to be a process of active adaptation in this model there must be exactly corresponding response functions across the whole set such that $F(E_E, E_e, E_2, E_1, H_1, H_2, H_S, H_R) = 0$ at t_3 and t_5 etc. Amongst other things and most importantly for adaptive learning (and diffusive learning), individuals must be able to consciously perceive not only their own behaviour but also the response functions of the human system in relation to the response functions of the Search within the broader level of extended social field.

Let us say that the Search is taking place at t_3 in Figure 15. In phase 1, participants compile their rememberings of the historic events and changes of the L_{22} over the recent period to the present (say $t_3 - t_2$). From this survey of rememberings they extract and extrapolate in various ways (from $t_3 - t_6$ or t_n for ideals) the most singular features of the current nature of the L_{22} . At this time they are conscious of the L_{22} and their responses to, rememberings of it. Their collective picture of the extended social field and its singularities become the wallpaper of their econiche. They then (phase 2) turn to their system's history (say $t_3 - t_0$) and extract its singularities, again becoming conscious of these and themselves as the system perceiving or extracting them. Again the results become a physical feature of their econiche. Then concentrating on their system at t_3 they repeat all aspects of the process. In phase 3, the integration of environment and system to establish the directive correlation or adaptive relation, they must turn to all elements of data and meaningful extractions produced so far. The future of their system at t_n involves the planning of an active adaptive strategy of which all are conscious.

In this process participants become immersed in the dynamic interplay of rememberings, communal extraction, imaginings, expectings, etc. and of singular perceptions of each of these separately and as they come together, into one whole system principle for the open system in relation to their individual system. As the community works through the phases, their perceptions over each time frame are undergoing change as is their physical econiche, the venue of the Search. At the least, the wall paper increases and moves around as does the furniture. Its psychological characteristics are concomitantly changing as they become bound by ideal seeking and developing trust. In its every aspect the Search is a highly dynamic econiche, exactly that hypothesised to be conducive to perceptual/conceptual reconstructions.

The greater the difference in the values of Y_{0-n} over t_{1-n} , the greater the transformation of the rememberings, the current perceptions and the expectings. Those whose system principles or invariants have begun to fragment through relevant uncertainty will have the highest probability of undergoing such reconstruction into a totally new (and hopefully adaptive) appreciation of the open system in which we are embedded.

When econiches are more static than dynamic, they should yield less transformation but there are dynamic econiches other than the SC which will cause transformation. These will be consciously perceived to be distressful if they do not allow creative work and the elicitation of ideal seeking, that is, if they do not have the appropriate design and management for adaptive communication. People may resort to or create econiches which attempt to isolate them from the dynamism behind the transformations. Clearly these dynamic environments like their counterparts in the ambient field are basically unpatterned, unstructured and create problems for human adaptation, precipitating a reduction of consciousness and control in

order to preserve some level of coherence and sense of wholeness. Such unstructured events are still with us. So are many approximations to the Search, designed and managed by enthusiastic amateurs which yield the same maladaptive results. Unpatterned and unstructured describes *laissez faire*, the absence of a design principle, and it is increasingly important that we distinguish it carefully.

'Deja vue' in this context (Emery & Emery 1976: 102) can be viewed then perhaps as the instance where the current properties of the ecosystem are such that a perception at t_{x-n} is spontaneously mapped onto the directive correlation at t_x . That is, the current affordance structure is a perfect instance of invariance. This can happen to people who have been trying in other ways to make change for years. In these cases which almost always appear to invoke consciousness, the mapping function itself perhaps becomes most visible and accessible to conscious conceptual analysis. The people to whom it happens often become energetic diffusers of their learnings of the Search.

To return to the majority of cases where singularity is less than maximal we would expect the rules for scanning the 'perceptual' field to hold for perceiving perceptions and therefore follow the principle of maximising the cortical firing rate (Haith 1980). This data provides the operating principle necessary to explain the 'unpredictable' shifts between perceiving and remembering. When the field does not afford a high firing rate, such as in a traditional talking head conference or school classroom, recourse would be made to the perceiving of perceptions in order to raise the rate. Almost everybody would have had the experience of drifting off into daydreaming and reminiscing during a boring lecture or conversation (awareness level) or deliberately thinking or remembering about the self doing something else (conscious level). The more undifferentiated the field, the greater the recourse to daydreaming or 'distraction', time out from consciousness and purposefulness (Emery and Emery 1976: Part II).

In terms of a theory of diffusive learning, the higher the singularity of the perceptions of an econiche or process, the more accurate the rememberings will be. Similarly, the greater the numbers of features of econiche and process that are brought to consciousness, the greater will be the ability to consciously diffuse learning of that econiche and process by communication and replication.

Explaining Forgetting

We must be prepared to account for failures of diffusive learning, those that spring from cases of forgetting, not knowing, or 'loss of memory'. Two factors are needed here although they are interdependent; as remembering is a property of an ecosystem, so must be forgetting. The first is the degree of singularity, patterning, or lack of it in the ecosystem, and the second is the number of transformations a perception has undergone. As Gibson and Goldmeier have shown, we are part of and adapted to an orderly, structured world, not a random array. An ecosystem with a high degree of randomness is not fully perceived as in the minimal case of familiarity, knowing 'of' and is therefore not accessible to accurate mapping over time. The elements of invariance that are present will be accessible to mapping onto a future ecosystem at t_x but will be more radically transformed over time such that the perception at t_x will be a distortion or inaccurate memory of the original perception.

Normal ageing provides an analogy. Highly differentiated, singular perceptions such as we would expect from children after language and consciousness are fully developed, should prove highly resistant to transformative processes as they are ecologically bound to extract basic invariances. As learning proceeds by differentiation and organization, so these perceptions will become integrated into higher orders of invariances. But because in the first instance they were so biologically fundamental, they will be more available to recall than

more recent ones. As we grow older and consciousness itself is elaborated, so we move to perceiving the finer features of the ecosystem including its random elements. We may also spend more time and energy consciously attempting to 'encode' or map such elements onto the overall structure of directive correlations. This may increase the rate of transposition of perceiving, remembering, thinking, but its result will be a delay in the rate at which random elements are no longer found useful. In other words, to the extent that children are doers and the elderly are thinkers and rememberers, so we can explain the degradation of 'memory' over time. As we age, while the original invariances hold, the field approximates an unstructured array because our tendency towards novelty leads us to search for differentiation. In immediate perceptual terms therefore, we have difficulty selecting the awareness most adaptive to our purposes. It will however, maximise the cortical firing rate.

Forgetting or not knowing is therefore a function of the number of transformations in relation to the invariance structure of the ecosystem. The rate of forgetting will be maximal when the field contains little information about affordances and remembering is required, and when the field becomes so highly differentiated through rapid transformations of perceiving and remembering that higher order invariances fail to be perceived. Remembering serves to keep intact and generate the total hierarchy of directive correlations but an excess of perceiving and differentiation in the long run will increase the probability of entropy.

Forgetting and Not Knowing Means Failure

These are examples of failed attempts at methods for active socioecological adaptation and diffusive learning. Some are clearly due to excess perception and transformation without adequate opportunity to extract invariances. Once such was a so called 'Future Search' (Weisbord & Janoff 1995) held for the purpose of regional development centred on a small town in New Mexico, USA. It failed in that six months later all but one committee was bogged down or not functioning and there was confusion and some bad feeling in the town while the problems were getting worse.

The design of this conference followed **no logic**. There was no orderly progression of components of the open system. Learning about the L₂₂ was merged into an exercise with history of personal selves and the system. There was, therefore, no opportunity to clearly and cleanly extract the invariances of the external field or appreciate its unique significance. The lack of a distinct history session meant that the major changes in this multicultural region were ignored and so these tensions continued without conscious discussion and reconciliation. There was an immature type of action planning ('shopping lists') inserted in the middle but these ideas were left hanging and time ran out to return to it at the end. There was a shifting conference population of about 70. At no stage was there any effort to **integrate** small group reports. There were endless perceptions but no intergroup checking or consideration from which invariances could have been extracted. Not only was it completely impossible for participants to grasp any clear adaptive relation between environment and system, it was also impossible to obtain a clear perception of the core meaning of either environment or system. Any singular perception of goals was, therefore, precluded.

At base it was a failure of design and management, as is usually the case, but it is important to see how these failures translate into perceptual dynamics. The participants (there is no evidence that they became a learning, planning community) were left with an undifferentiated array of data, an ecosystem approaching randomness where invariances could at best, be only dimly perceived. There was nothing to be accurately mapped over time and as would be predicted from the theory above, rememberings of it diverged from the time of the conference to the first post conference meeting.

As events unfolded from that post conference meeting, it became obvious that the conference had failed also to produce knowings of structure and process and the second

design principle underlying them. While strategic goals were finally identified, their action planning and implementation were delegated to a set of **committees** which are DP1 structures. One of these, the 'river group' transformed itself into a self managing group, did creative work and made progress. The others functioned as designed with chairs, etc. and floundered with the normally attendant negative affects. Consciousness had not been evoked in the sense of 'here we are working together as a community taking responsibility for our future' any more than it had been evoked in the sense of 'here we are extracting the essential features of our region and consequently, 'here we are creating a clear conception of our desirable region'.

This is an example of Goldmeier's third case of non singularity. Had there not been a 'rescue', we could have confidently predicted that over time, rememberings of this conference would have become even more degraded and finally forgotten.

Many failures do not get rescued nor is there a clear analysis of the failure. Failure is usually not seen until some point in implementation where it is commonly interpreted as a failure of caring or energy, motivation, which is certainly involved. But it is involved together with failures of design and management such that clear precise perceptions of the system's desirable, adaptive future do not eventuate. Similarly, failures may result from an absence, or incomplete conscious perception of a different way of working. Failures of implementation can be transformational degradations, forgettings. This should not be surprising. Our concern is for meaning and if an event does not produce a clear cut, highly visible meaning, it is not adaptive to remember it. Economy is required of all creatures and none more than of humans with the burden of consciousness.

The Concepts of Imagining and Expecting

We return now to Figure 15 and examine a companion concept to remembering, that of expecting. Expecting is derivable from imagining and follows the same set of principles or laws governing transformational processes as does perceiving and remembering (Thatcher and John 1977: 260-263). Imagining takes place when Y_0 is a member of a **potential** set.

Imagining can have reference to past, present, or future. We can imagine that such and such could have happened, but didn't, as easily as we can currently imagine ourselves at the beach. We can imagine a desirable world and a desirable future for our system and we are conscious of our imagining when our self takes an actual value of Y_0 , environment or econiche (E_E or E_e) in a potential set. Expecting clearly has a future reference -- we expect something **will** happen or that something **would have** happened. Because of its future reference it also involves a potential set.

Let us assume as above that the Search is taking place at t_3 and we are expecting that as a responsible, learning/planning community, we will bring a most desirable system into being at t_6 . Expecting can be specified as the transformation processes operating over the back-reference period $t_3 - t_2$ to map the awareness at t_5 by the potential Y_4 onto the focal condition at t_3 to meet the goal of desirable adaptive system at t_6 .

An imagining becomes an expectation when it is future referenced **and** when by the laws of singularity it becomes an invariant or probability. We do not 'expect' all our future referenced imaginings to happen. Those that have no singularity in relation to the real world we class as fantasies as in fantastic, seemingly impossible or unreal. Those which are close to singularity are called possible and awarded a chance of happening. Those showing singularity or those which are strongly invariant are expected to happen. No additional concept is required to distinguish remembering from expecting. Both are simple, lawful transpositions.

Thus, while in the first phase of the Search, the community may only be imagining a desirable future, it will as it carefully works through the process of planning this future, and

becoming more trustful, coherent and self confident as a community, move from imagining to deeming possible, to confidently expecting, their desirable future. This desirable future based on the ideals is seen to have a high probability of motivating implementation, not only because of the singularity of expectations but also because the ideals are inherently shared by all. In the process of the Search, the basis for the expectation is that they have already perceived or learned how to do it. As they perceive how all the pieces **have** come together (t_3 - t_2) so they expect that they will continue to make that happen. They have perceived a set of invariants, or singular meaning.

In addition, each of these has become conscious of themselves and the community working through the process of the Search Conference within the structured econiche that is the Search Conference. All of the conditions required for ecologically adaptive and motivated or diffusive learning are present.

This whole discussion of learning, knowing, remembering and forgetting in open systems and ecological terms has shown once again, that contrary to the old mechanistic concepts of a bygone age, the OST approach not only presents wholistic theory, it is eminently practical. Every aspect of the success of the Search Conference is explained and can be predicted by the theory. So too can its failures and near misses. Armed with this theory, the practitioner has another backup to the other levels of design and management.

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