THE SOCIAL AND NEUROPHYSIOLOGICAL EFFECTS OF TELEVISION AND THEIR IMPLICATIONS FOR MARKETING PRACTICE:

An Investigation of Adaptation to the Cathode Ray Tube

(Volume One)

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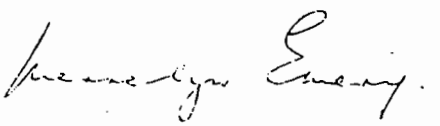
DECLARATION.

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of a university or other institute of higher learning, except where due acknowledgement is made in the text of the thesis.



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ABSTRACT.

The question of adaptation, particularly of our ability to adapt to new technologies was raised in previous research on television and, more generally, the cathode ray tube(CRT). The hypothesis that CRT technologies do not induce maladaptive behaviour was therefore subjected to a comprehensive literature review, with data re-analysed, wherever appropriate, within an ecologically realist theory of human functioning and by methods which better illumined the open systems nature of such functioning. Sommerhoff's model of adaptation through the formation of directive correlations was elaborated within this framework, generating sub-hypotheses and tests for maladaption. It directed research into both the medium and short-term time scales.

The results of the tests indicated by this model showed clearly that CRT technology cannot satisfy the requirements for adaptation on either time scale. At the medium term level of learning, the effects of the two major institutional applications of television, education and marketing, were contrasted. Television as educator in both the formal sense and as promotor of well-informed democracies has failed to meet expectations. There is more forgetting than remembering and the a-conceptual knowledge so afforded is testable only by recognition, not recall. Even this 'knowledge of' is subject to inaccuracies as it is an ecologically incomplete form. For some marketing purposes, however, television reigns supreme. The dynamics elucidated here to account for its failure in education also account for its success in marketing. These dynamics appear to be inherent in the medium and hence not readily gainsayed. There is also evidence that over a longer time scale heavy viewing has broad dissociative and disadvantaging effects.

At the short-term level, the picture cannot be called final as there is still a dearth of clarifying experimentation. Analyses, however, of television epilepsy and theta wave activity are confirmatory of the direct testing so far performed; the modal reaction to the CRT is cortical slowing. There is internal consistency between the two levels of analysis.

A check of literature on VDUs confirms that the maladaptive agent is indeed the CRT rather than any other dimension of television viewing.

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PART I THE THEORETICAL CONTEXT

1. Introduction and Overview

Cathode Ray Tube (CRT) technology in its many variants is now an ubiquitous feature of the 'developed' world and increasingly, of the 'developing' sphere. The questions are now, as it approaches its fiftieth birthday, 'what has it done for us?', 'what is it doing for us?' and 'what are the limits of its potential, if any?'. Specifically we enquire about its potential to induce adaptation or maladaption in human system's functioning; or, in short, is CRT an adaptive technology? Even to ask such a question implies a solid ancestry of doubts about the adaptivity of CRT or the existence of data which point to its maladaptivity. Similarly, the question implies several strands of conceptualization: that we may distinguish a technology from the functi or material which it purports to serve or communicate; and secondly, that we can clearly delineate 'adaptive' from 'maladaptive'. There is also a third; that we can adequately perceive what it means to be human.

Behind the focus on CRTs lies, however, a broader aim. This derives from the current context in which we find ourselves, a world of galloping uncertainties and innovations. Far from Orwell's 1984 where there was little need for research and creative endeavour, our 1984 abounds in such activities across spectra, the diversity of which encompasses vast expanses of human time scale and cultures. Whether the expression of this diversity be in terms of turbulent field (Emery & Trist, 1965) paradigm shifts (Kuhn, 1962) or cultural revolution (Mead, 1970, Emery, F. 1978) the phenomenon appears to center around two choices.

The first is no more or less than a continuation of the world view, or root metaphor of mechanism (Pepper, 1966) which has, until recently led us to regard technology, new technology and progress towards the development of innovative forms of technology as a 'good'. Chein (1972) called its operation 'scientism' and it rests upon a perception of humanity as an aggregate of redundant parts (Emery, F. 1967).

Unquestioning acceptance of this 'good' has brought us to the point where we have available and in some cases employ, technologies with proven powers of destruction and little intuitive appeal to the common person. All may be viewed as extensions of the human potential but there are obviously human potentials which we may wish not to extend. Simply, our capacity to generate technologies has outstripped our ability or willingness to evaluate their potential as extensions of the human race. Where such evaluation has been attempted it has foundered because of lack of agreed criteria and methodology for evaluation.

This divisiveness is at root as much a product of the previous coherent and dominant set of cultural assumptions and world view as are the new technologies themselves. That world spawned its own anti-thesis (Emery, F. 1978) and today we may choose an alternative cultural set which perceives humanity and its potential for multi-functional and adaptive development as humanity-in-environment or contextualism (Pepper, 1966). Impetus for the accelerating acceptance of this view comes from many quarters and is now sufficiently widespread and powerful for the divisiveness to be highly visible. The elements of the emerging alternative adopted here consist of the cosmology of the new physics, a view of systems as open rather than closed, and the paradigm of knowing as direct perception rather than the construction of inferences from

associated sensations. From this new (old, see Emery, M. 1982) emerging world view comes the questioning of the continuing rush into new technologies and concomitantly, the evaluation of those into which we have already rushed.

Because the old view has failed in its attempts to adequately evaluate its own products, there is a need today to explore the new as a conceptual framework and methodology for judging technologies; one which is comprehensive rather than narrow, oriented towards adaptation and survival rather than 'progress'. Thus the success of our efforts in evaluating CRT technology may serve as the point or example of the broader purpose, the evaluation of the conceptualization itself as an evaluative tool. The traditional criteria of parsimony and explanatory power are applied. Should such an evaluation prove useful, the open systems mode of thinking and analysis may be applied to any technology or, indeed, any phenomenon or innovation. This is the hope.

If we are not to fall into the old Cartesian trap of 'true or false', attempting fragmented "descriptions of reality as it is" (Bohm, 1980, p.17), we must attempt to provide the most enriched form of insight possible into the enquiry at hand. This process of enrichment serves hopefully not only the direct task of answering the question of CRTs' adaptivity, but also the induction of a perceptual recentering, or at least a questioning of the appropriateness of the question itself. Only through such a process is it possible to uncover the hidden assumptions behind any world view.

The thesis falls into three parts, the reason for which will become clear immediately below. Part I offers a context within which evidence about

CRTs may be more clearly perceived and evaluated. In this first chapter we outline the essential features of the technology including its radiance, and highlight television as that member of the CRT family around which most data has collected. The emphasis upon television as a medium rather than thing (content) is traced historically, and in contrast to its conceptualization within the old mechanist metaphor. Some fundamental notions of television's effects emerge from this and form the basis for the overall hypothesis that CRT technology is a maladaptive technology.

The conceptual framework within which the investigation is conducted is presented and elaborated in relation to other perspectives converging on an alternative paradigmatic approach. Central to this are the two axioms of (i) a systematically organized ecology, (ii) to which humans as purposeful learning systems with the power of consciousness are adapted. Taken together these two provide a third, namely (iii) that because we have evolved within a natural ecosystem, our ability to adapt is limited. While we have the ability to create 'unnatural' phenomena, our creations may exceed these limits. They may make demands of us which require resources and powers we simply do not have. These axioms essentially define the ground of the research and serve also as benchmarks for judging technological effects. A technology which disrupts or destroys our ability to learn as ecologically adapted humans and alters the potential for consciousness, is automatically a candidate for the judgement of maladaptation. At stake is our ability to consciously make adaptive choices. Should this potential be eroded without our knowing and intent, so much the more strongly the label of maladaptive will apply.

Building the foundations upon which we may specifically test these broad conceptual concerns involves elaborating the nature of our ability to directly perceive and know the ecosystem in which we are embedded. From this elaboration we derive two hypotheses which express our ecological interdependence and simultaneously pinpoint distinct technological features which disrupt the processes of maintaining and enhancing interdependence.

To ground these fully with an appreciation of a distinctively human ecological theory, we develop a model of consciousness and learning as the hallmarks of our species. Based on the concept of directive correlation (Sommerhoff, 1950, 1981) we formally define consciousness, learning, communicating, remembering, forgetting, imagining and expecting as adaptations. We argue from this and from open systems theory more generally, that two levels of analysis are required to comprehensively investigate the overall hypothesis, the short and medium time scales of adaptation. If the system is genuinely to function as system, results from these perceptuomotor and learning levels should provide a check on the internal validity of each. These levels of analysis then, are the basis of Parts III and II respectively.

For the short term level, we derive a main hypothesis for (mal) adaptation in terms of neurophysiological system states; specifically, that there is a range of states which fails to satisfy the focal equation for adaptation. At the medium term level, we disaggregate the concept of learning into learning strategies and types of knowing such that we may be quite precise about the effects of the technology and also at a later stage, be able to reintegrate the findings within the theory of causally textured environments. Having distinguished the two levels of

environment as extended social field and econiche, we can then establish the nature of the relations between CRT technology as econiche with unique affordances and historically verifiable social fields.

From the analysis of 'knowings' and 'not knowing', or forgetting, we move to the ways in which these processes may be operationally measured. Recognition and recall are differentially associated with different knowings and provide precise and objective tests of their presence. Thus, the necessary and sufficient substantiation of the hypothesis at the ontogenetic level will involve evidence that learning from television provides only knowing 'of' which cannot be elicited by tests of recall or remembering. Familiarity with, or knowing 'of' is ecologically incomplete and will be available only through recognition.

This is a simple and concrete verification, and in order to maximally utilize it we specify two focii for data collection and analysis; those of television's effects in the education and marketing systems. In today's world these are major institutions for which television has become a cardinal or substantial tool. But they differ significantly in that the education system aims to promote understanding which is measurable by recall, while modern mass marketing does not usually depend for its success on anything more than knowing 'of'. We put our hypotheses in a practical context by predicting, therefore, that in both systems the information communicated by television will be measurable only by recognition; thereby demonstrating that it has failed and will continue to fail as an educational medium, but is uniquely fitted for a consuming culture.

To sharpen the contrast between these predictions of maladaption with their consequent support from data in Part II, and established adaptive modes of communication, we look briefly at conversation in the service of the human group, or associating. We see that both spoken language and group life are ecological 'givens' whose disruption or denial results in developmental retardation. Television as a substitute for human transaction will therefore inhibit development and contribute to dissociation. But we also argue further that television makes a further contribution towards that state in its own right, thereby compounding its maladaptivity.

Conversing is also contrasted with literacy and the development of abstract reasoning divorced from immediate experience. Utterance and text are not to be confused as utterance has ecological primacy and the consequences of overvaluing the written word and the literate mind have also been deleterious to our cultural evolution. However, the advantages in terms of understanding which have been conferred by literacy mark the comparison of learning from televiewing and reading as a particularly luminous one. We expect, therefore, that such a comparison will dramatically confirm the utter failure of television as an educational medium.

From that set of explorations we diverge to look more closely at what it means to say that the system functions 'as system' within a specified physical environment. Taking three factors within our environment we extract from the literature a coherent schema of linkages extending through psychological phenomena and into the neurochemical. The focus is the expected outcome of CRT's - reduced cortical activity - and the extensions towards more macro and micro- levels of functions provides

further explanation for hypothesized effects on learning and also permits the generation of tests other than those utilizing the electroencephalogram (EEG). Within this context we also examine some key dimensions of individual differences which firstly, appear to account for the range of sensitivities previously noted in this field and secondly, can provide a simple infrastructure for the evaluation of evidence of maladaption at the perceptuomotor level.

We then come full circle, returning to the question of adaptive potential within the context of causally textured environments. As the broadest perspective this brief analysis serves also as a check on the more detailed and operational hypotheses which constitute a necessary and sufficient test. Besides permitting us to specifically examine the technology with marketing and education as evolving systems, the reality of the environments themselves as historical processes provides a perspective on the evolutionary potential of CRTs. The analysis proceeds therefore from the recent past, much of which is still with us, to the rapidly evolving turbulence of today and thence to considerations of possible outcomes. Television and the newer CRT forms will be contributors to, or inhibtors of, these possibilities with adaptivity emerging from the adaptiveness of the projected environments themselves.

Part I ends with a summary of hypotheses to be judged against the available data.

Part II begins with a set of cases which illustrate the scope and depth of maladaptivity as conceived in terms of consciousness and learning. They are intended to illustrate the range of identified effects but they highlight, also, the all-encompassing intensity of effort that is the

hallmark of 'normal science' or orthodoxy defending itself against contrary results and the inroads of a competing paradigm (Kuhn, 1962).

The fourth case deals with the pinnacle of 'successful' ETV-- 'Sesame Street' -- and shows that the critical factor in this illusory success is the form of measurement. Differential use of recognition and recall indicates success and failure respectively in the program's ability to produce knowing 'about' and understanding. Finally to complete the survey of relevant dimensions, we look briefly at 'the boy who had nothing but television'. It makes explicit the fact that television does not teach, and opens the way for a comparison of TV and human transaction in so-called 'learning from television'.

As the case studies define the ground, so do the following chapters pick up the specific issues relating to the hypotheses and validate th conclusions from the cases. While taking each element or dimension separately, these chapters follow the traditional delineation of subject matter. Chapter headings reflect the predominant areas of interest - television in the service of educating and socializing children, its role in creating a well-informed democratic citizenry, its success in product marketing and an appraisal of the probability that television is able to be reformed so as to fulfil its long-held-out promise.

In the chapter on children's learning, we isolate the key reason why the educationalists and other experts have allowed the delusion that TV teaches to continue as the conventional or popular belief. At bottom it is a failure of the social sciences to preserve fundamental concepts and apply clear thinking. As distinctions between knowing 'of' and 'about',

recognition and recall, have been lost or blurred, so has our social science lost the ability to adequately perceive and explain.

Similarly, we find the same story in the complementary evidence on adult learning.

Chapter 8 addresses itself to the second major institutional focus, the marketing system. Here television has shone and insider comments clarify that the industry knows and exploits the peculiarities of the medium and its distinctive fittingness for the subconscious consuming culture. We therefore confront the essential and unique features that have been so exploited and find a consistency which confirms the primary hypothesis tying television to familiarity and recognition, not to understanding and recall or remembering. TV does not in any real sense meet the conditions necessary for a communication to be effective or persuasive. Yet television advertising has more than proved itself in this regard. The paradox is resolved by the distinctions made between knowing 'of' and 'about'.

Having outlined both the abject failure of the medium as education and its brilliance in marketing, we then reconsider the question of its rehabilitation. Is it true, as is widely believed, that television can be reformed, remade into a good solid, albeit technological citizen? The many efforts to put television into the service of altruism, cooperation, fitness, health, good nutrition and safe practices are reviewed in terms of the dimensions which do, or do not, fit the demands of the medium.

Surveying the fields of product marketing and prosocial television leads us to a pessimistic view, entirely congruent with the previous review of

TV as education and supportive of the hypotheses regarding recognition and recall. It is also confirmatory of expectations that this technolc has features appropriate to environments which have shown themselves to be maladaptive. We will see that it has little role to play in reducing relevant uncertainty if only for the reason that stability is a function of continuity which is guaranteed by remembering, conscious choice and control.

The last chapter in Part II then attempts a wholistic perspective starting from present day reality and the fact that there are heavy viewers. Rather than the microscope, the instrument is the wide-angle lens capturing the extent of the television lifestyle and its character as a disadvantage trap. As the strands draw together, we begin to see a coherent field of implications for individuals and our culture. Against the background of turbulence we examine the evidence for the emergence two distinct sub-cultures revolving around the poles of the printed word and television. The scenario for the latter is unequivocally that of dissociation. There is an insidious and creeping sense of loss as we complete this survey.

Having established that there is evidence of maladaption at the medium term level, Part III reviews the data available to test the hypotheses concerning CRTs' effects at the short term level of directive correlation. The first chapter looks specifically at the results of direct tests of television's neurophysiological effects. These consistently show reduced cortical activity as indicated by reduction of beta (fast) wave activity and increases in theta and delta activit There is also a substantial body of evidence confirming that our reactions to radiant and reflected light differ significantly. The

habituation hypothesis also receives some further support. While there is still no absolutely pure test of the original 1975 hypothesis (Emery & Emery, 1975, 76), the accumulation of data presented here further validates it as an hypothesis. We also review other more indirect evidence including early results from metabolic mapping techniques. This again is supportive of the overall 1975 position and its elaborations. Finally there is research which shows the essential importance of cortical activity and alertness in the normal waking day. A nice contrast is made with the evidence of the CRT's effects and consequences.

We then examine the one reaction to CRT technology which is strictly maladaptive in its own right and thus establishes the extreme end of the scale. Known simply as 'television epilepsy' this phenomenon is found to be to a large extent an affliction of normals. Associated research provides an explanatory model for the typical TV 'zombie' behavior and age of onset. Incidence is almost certainly underestimated.

In order to ensure that our test for maladaptivity is rigorously applied, we explore fully, slow, specifically theta wave activity as a 'mildly abnormal' response or intermediate reaction to the technology.

A definite range of reaction to television is established and explained. This cannot satisfy the focal condition of a directive correlation. In addition to this, we have the evidence from previous chapters that the technology inhibits consciousness and purposeful behavior. There are also indications that its effects exceed the back-reference period. On all three grounds the conclusion becomes inescapable, the effects of television at the short-term level are maladaptive.

As a check that the conclusions apply to CRT technology more generally, we survey the meagre but growing body of research on the effects of vid display units (VDUs, or VDTs).

The critical difference between watching television and using a VDU is distance from the tube and this becomes even more central to safety arguments as new research throws light on the hazards of extra-low-frequency radiation. These are discussed in relation to our co-implicate status with the environment and our extraordinary sensitivity to its every dimension.

The evidence relating to VDUs confirms that it is the core of technology which is the causative agent of maladaption, not merely television as a variant.

Our overall conclusions confirm the hypotheses as they reflect an overwhelming consistency in the evidence at both levels of analysis. There are almost no question marks left after this data survey and reanalysis, with the possible exception of the priority of image versus issue in televized politics. Even here, the weight of evidence leans towards the iconic, affectual pole rather than the carefully considered choice. CRT technology is maladaptive, a product of an age that was itself maladaptive.

This has been an introduction and overview. Let us now return to the beginning and spell out in detail the ground of the enquiry and the development of the reasoning which lies behind the answers to it.

Chapter 1 Origins and Basic Framework

1. CRT Technology, Nature and Function

CRT technology is a species of technology which includes among its members the domestic television set, the video display unit or terminal (VDU or VDT), the word processor, the personal computer and the video game. The central and uniting feature of the species is of course the cathode ray tube.

> "The cathode ray is a beam of electrons emitted from a gun at high potential at the back of the tube. The beam can be deflected by electromagnetic fields set up by rapidly alternating currents in coils which move the beam in two dimensions as it strikes the viewing screen. This screen is coated with fluorescent material whose phosphor dots emit light for a very short period of time after the beam has struck." (Colover & Warr, 1979, p 336-7; Warr, 1981, p 533)

For different members of the family, or species, the intensity of this beam, the brightness of the dots against the background and their time persistence, will vary according to the purpose of the specific member. While the intensity of the beam is governed by the electrical voltage, in a VDU for example, more voltage is needed to activate the storage type CRT which can hold a picture for longer as is required for graphic display, but less brightly than in a domestic TV set. Brightness and clarity, or definition, are also determined by the refresh rate, the rate at which the beam moves through the scan lines or rasters. Usually the rasters are horizontal with two basic rates, 625 lines in the European and Australian systems, and 525 lines in the North American systems. This scanning translates into 50 half frames per second for the first system, and 60 per second for the North American. It is a radiant light technology where the light emitting efficiency of the phosphor dots rarely exceeds 20% with some VDUs emitting as little as 6%, the rest being converted into heat which may be disposed of by a cooling system

(Warr, 1981, p 533). Increased speed of refresh rate also prevents flicker, the perception of which is also dependent on the individua sensitivity to the phenomenon. A television picture, as an object of perception, does not exist in any sense that could be understood of a physical object. It is the sequence of glowing dots that is received by the perceptual system and the impression of smooth continuous motion, the picture, is given because of the 'persistence of vision' in the human optical system (Stalker, 1983). Black and white television uses a screen coated with an even mixture of phosphor dots that glow either yellow or blue. For colour TV there are three different phosphors, red, blue and green, with a separate gun for each illumination. International systems vary in this respect also, with the German PAL system used in Australia generally giving more consistent and truer color than that found in the North American system.

The electronic nature of CRT technology is by definition one of radiance, obviously in the visible light spectrum, but also depending on its operating characteristics, in other frequency bands.

> "Low energy X-rays can be generated by the cathode ray tube (CRT) and electronic damper circuits. Depending on the phosphor used, ultraviolet (UV), visible, and infrared (IR) radiation can be emitted from the screen face. Certain electronic components and circuits can produce radio-frequency (RF) radiation. Performing a complete radiation survey requires several instruments in order to measure the different radiation types that can be emitted." (Murray, et al, 1981, p 414)

The range of, and safety limits on, this extended non-visible radiance is currently subject to dispute (DeMatteo, et al, 1981, p 8) and we deal with it in Chapter 14. The critical features of CRT technology ar however clear: it is a technology which is

(i) radiant, rather than reflective as in projected cinema

(ii) the object, thing or content to be viewed is contained within the medium, the technology itself, which

(iii) exploits a particular ability of the human perceptual system to perceive meaning.

This, briefly described, is the core of the actual physical technology. The three central features summarized above become critical as we grapple with a systemic analysis of the effects of the hardware. We now review previous research on CRT technology, particularly that relating to television, the oldest and most generic member of the species, in such a way that it may provide directions to the questions that a study of (mal) adaption should address. Television becomes the primary focus virtually by default -- only recently have the newer variants, such as VDUs, assumed research importance with, for example, the rush into the electronic office. However, the length of time that television has been with us, its ubiquity and the high hopes that were held for it as an educational medium, means that there is a wealth of literature on its effects at the psychological and sociological levels.

2. Historical View of Television as Medium Rather Than Thing

That there was a problem with the new medium was obvious to one as early as 1935.

> "Proud of our inventions -- photography, the phonograph, film, radio -- we praise the educational virtues of direct experience. We believe in travelling, and use pictures and movies in the schools. But as we render man's image of his world immensely more complete and accurate than it was in the past, we also restrict the realm of the spoken and the written word and thereby the realm of thinking. The more perfect our means of direct experience, the more easily we are caught by the dangerous illusion that perceiving is tantamount to knowing and understanding.
>
> Television is a new, hard test of our wisdom. If we succeed in mastering the new medium it will enrich us. But it can also put our mind to sleep. We must not forget that in the

> past the inability to transport immediate experience and to convey it to others made the use of language necessary and thus compelled the human mind to develop concepts. For in order to describe things one must draw the general from the specific; one must select, compare, think. When communication can be achieved by pointing with the finger, however, the mouth grows silent, the writing hand stops, and the mind shrinks." (Arnheim, 1935, 1958, p 161)

As we shall see however, this warning went generally unheeded; indeed, the conceptual framework Arnheim employed was so trampled upon as the social sciences flocked to join a faddish series of Newtonian paradigms of human behaviour that by the time of his publication, television was being hailed as the saviour of the western democracies. Lost in the stampede was a distinction of which Arnheim was obviously well aware -- that of 'thing and medium'.

On page one of 'Thing and Medium' Heider asks the question which lies the root of this thesis: "whether something that serves mainly as mediator has not, from a purely physical point of view, characteristics which are different from those of an object of perception." (Heider, 1926, 1959, p 1) In the case of television, the object of perception is the content, the news, the political spot or your favourite program. These form the ostensible purpose or focus of intention to view. Predominantly the literature about television as well as the conventional wisdom, relays the impression that it is an excellent medium for the transmission of remote realities, events or ideas; in information theory terms -- excellent for learning. The belief that it is the content or object of television which determines our response to it, our evaluation of its properties, and qualities, has proven a barrier to our exploration of it as a <u>medium</u> or <u>socio-technical system</u>. (Emery & Trist, 1960, In Emery, F 1981c) Heider's critical point was that the more an object is

regarded as a medium, the less we can find out about it from its actual state. (1959, p 49) By choosing the 'pictures' as the 'thing' we have become like the person who crashes through a glass door, thereby discovering its solidity and 'thingness'.

Bohm's discussion of consciousness and thought provides an analogue as he argues that "the actual structure, function and activity of thought is in the implicate order" (Bohm, 1980, p 204) Each explicit thought becomes merely a figure against the ground of the implicate order. Each moment of explicit content in a TV program can be interpreted as no more than a figure whose structure and meaning 'is in' the ground provided by the medium. To study then a medium in Heider's terms, we must effect a figure-ground reversal whereby the medium is imbued with thingnesses, capable of isolation and identification. In order to attempt this we must largely put aside the content of television, permitting the medium to assume the status of a 'thing event' or object of perception.

Heider's notion was never entirely lost as we see. It surfaced occasionally, perhaps never more dramatically than in relation to television when Marshall McLuhan crashed through the glass door, shocking the academic establishment firstly with his proclamation that 'the Medium is the Message' (McLuhan, 1964) and as his intuitions deepened, with 'The Medium is the Massage'. (McLuhan & Fiore, 1967). McLuhan amassed arguments, albeit idiosyncratically presented, to the effect that television as medium did have unique properties as a 'thing' in its own right, particularly as an extension of 'man'.

McLuhan's key metaphors for television -- that it is iconic rather than conceptual, audio-tactile rather than visual, creating a new sensory

ratio and a new environment -- were all found to be basically sound with the exception of 'cool, participatory and involving'. "The people addicted to TV viewing are not typically those who have been on the streets seeking more involvement in the decisions that affect their lives". (Emery & Emery, 1976, p 133) But people do feel involved with TV programs and their characters, and this seeming paradox is but one that we hope to resolve here. These metaphors will be re-entered here as hypotheses, although in somewhat modified form, and tested against the weight of empirical data available for the more general hypothesis of maladaption.

More generally, Emery & Emery found in 1980(b), while studying the telephone, that simple linear attempts to rank the various media in terms of 'immediacy' or number of sensory components were inadequate and misleading as a conceptual guide to the influence and distinctive competence of individual media. Each medium appears to have a unique profile or signature which arises not from a linear or accumulative series of sensory access, but from exploiting in various ways the particular strengths and weaknesses of the individual elements of the human sensorium. The telephone, lacking a visual dimension, was assumed to be a less powerful communication medium than face-to-face conversation. The hidden assumption was that the informational richness and power of a medium rose in direct relation to the number of sensory channels evoked. The paradigm was clearly faulty and empirical work failed to support its hypotheses. While confusion reigned there was little possibility of defining the unique characteristics of the telephone as an unrestrained medium for spoken language (Emery & Emery 1980(b)). Similarly, television on the basis of the same assumptions has been hailed as the educational medium par excellence. Our previous study

cast severe doubt over this conclusion (Emery & Emery, 1976). It did not however, attempt a detailed systems analysis of learning and television's role in relation to it.

McLuhan was, of course, almost totally ignored by the mainstream social sciences. While many of the studies reported herein have proven to be minimally useful because of adherence to the S-R paradigm, there are others whose disappointing results are a direct effect of neglecting Heider's and McLuhan's research. Following a line of research from Chapman (1975) Barefoot & Strickland (1982) have refined empirical tests of the difference between face-to-face and television mediated groups. An earlier finding that "televised groups had weaker dominance hierarchies and that the hierarchies which did emerge were less stable over repeated group meetings" (p 561) necessitated a new design to overcome what was seen as a limitation and reason for the above result; that for which the team could find no theoretically clarifying explanation.

The 1982 design which specified leadership roles within the groups led, however, to yet another "unexpected" result (p 564). Within the television mediated groups there was less variability in leader dominance and discussion time. Also, not one novel solution was produced by a television mediated group. Barefoot & Strickland devised a line of reasoning which explains the result but it is as they admit "post hoc" and subject to caution. Such caution is emphasized by their warning (final paragraph, my emphasis) that "social processes are changed by the addition of electronic communications media. Until the nature of these effects is more fully spelled out by future research, those who use

mediated settings for important interaction should be alert for possible media influences on interaction outcomes". (p 565)

There is a further implicit warning delivered in this article. It is simply this: despite an accumulation of 'unexpected' findings, researchers in the social sciences have generally done everything they could to avoid confronting the uniquely determining characteristics of the media with which they are dealing. Barefoot & Strickland, as a recent example, are no exception. Their 'post hoc' explanation does not attempt in any sense to speculate on the specific influence of TV on their results. On the other hand, almost no stone of group dynamic, personality, or task is left unturned. I suggest that further research in this tradition will similarly produce confusion until it is grasped that a genuinely socio-technical approach which acknowledges the 'technical' as well as the 'socio' is adopted. There is good reason f contemplating the fact that television as a medium is a powerful determinant of human behaviour and that it is sheer hubris to continue to believe that we can act as if it were not.

That was the conclusion to which Emery & Emery came in their study of television which is the direct ancestor of this current work. Trying to make sense of the chaotic evidence that comprised television research in 1974, we were finally compelled to ask "what actually takes place when a person sits down and looks at a functioning television screen?" (Emery & Emery, 1980a, p 27)

Our first answers were drawn from a review of the anatomy and function of the central nervous system (CNS) as total system. Working logically from these data we tracked a visual stimulus from its reception in the primary

visual cortex to our consciousness of its meaning. In other words, we argued a case which did not depend upon empirical data about the effects of television, but which was well grounded in experimental, replicated and respectable neurophysiology. Integrating this approach with similarly authenticated psychological and sociological approaches to perception and communication, we arrived at this statement:

> "Television, as a media, consists of a constant visual signal of fifty half-frames per second. Our hypotheses regarding this essential nature of the medium itself are:
>
> 1. The constant visual stimulus fixates the viewer and causes habituation of response. The prefrontal and association areas of the cortex are effectively dominated by the signal, the screen
>
> 2. The left cortical hemisphere -- the centre of visual and analytical calculating processes -- is effectively reduced in its functioning to tracking changes on the TV screen
>
> 3. Therefore, provided the viewer keeps looking, he is unlikely to reflect on what he is doing, what he is viewing. That is, he will be aware but not aware of his awareness. The TV producer, on the other hand, is very much concerned about what the viewer is doing, particularly with whether he is continuing to view. The producer might be said to be striving to be 'the conscious ego of the viewer', as Margaret Ribble described the mother as 'the ego of the infant'. Put another way, TV viewing is goal-seeking but purposeless. Its end is in its immediate consumption. 'The Children of Change' want miracles. And they want them now'. Switching from one TV programme to another is not a choice between means but a conditioning to one consummatory behaviour rather than another, to old films or modern domestic dramas.
>
> 4. The immediate consumption of TV is inherently rewarding. TV producers have to constantly strive to sustain viewing and conform more closely to the viewer's self conception. But the intrinsic rewarding effects of viewing, the ratings, are the only end points for them, not sales or votes.
>
> 5. The power and control exerted by the television signal have far-reaching and cyclic effects on the total system of the individual". (Emery & Emery, 1976, p 73)

Searching for explicit evidence relating to this set, we received Krugman's (1970) paper, never published in exactly that form, which used as a demonstration of habituation rather than adaptation, as the operant process which results in a pattern of activity dominated by slow waves. We also found Heron's data on perceptual deprivation and Gibbs & Gibbs' Atlas of EEG, which provided independent confirmation of the existence of such patterns of neural behavior.

In particular, our logic lead us to focus on the left hemisphere, frontal lobe, as the immediate manifestation of the effect coupled with an hypothesized acceleration of effect in old-brain structures which are particularly concerned with the non-visual affective life; the thalamus and reticular activating system which controls the sleep-wakefulness cycle, and to a large extent, macro-muscle relaxation and/or tension. Because of the open systems approach, we were lead further to specul about concomitant effects on dreaming, mental health, particularly depression and schizophrenia resulting from the dissociative effect of the increased relativity of slow to fast wave activity; and from there back to cultural change, specifically the evidence for that cultural state of dissociation (subsequently documented for Australia by Emery & Emery (1979a). We also argued from the results of split brain research and other clinical work that the right hemisphere would be more affected and produce greater slow wave activity with colour than with black and white TV. Laterality of function was also, therefore, an issue. While alpha wave activity was used as part of the argument leading to our hypothesis, no specific role was predicted for this frequency band. Because of confusion surrounding this position, I clarified in 1980 that we did not expect TV-viewing to result in increased alpha activity (Emery M, 1981). We were predicting a shift in the relative balance of slower

to fast (beta) activity towards the slow frequencies, indicative of reduced intellectual function.

The empirical leads were small but there was a coherence to the hypothesizing which captured the imagination of many, including the Senate Standing Committee on Education and the Arts, charged with investigating the impact of television on Children in Australia. We had touched upon the effects on the young in section 10.2 of A Choice of Futures relating neurological development to activity and the role of education and learning. This Committee recommended a direct test of the hypothesis and the results of this experiment are reviewed in Chapter 11.

By the time we gave evidence to this Committee, our continued research had directed us to the Gibson school and their conclusion that humans do not have the capacity to extract information from radiant light (Emery & Emery, 1980a). This supplemented rather than replaced habituation as the proposed mechanism; "there isn't just one villain, there are two" (Emery M. 1981, p 218). We began to follow the burgeoning literature on neuro-transmitters as well as the increasingly unequivocal evidence on the failure of educational TV and the introduction of video display units into office work.

Quite clearly we were charging television with maladaption at several levels: the neurophysiological, the level of the individual purposeful person, and the cultural. This, then, must become the central hypothesis: that television induces maladaptive behavior. The hypothesis must be formulated rigorously within a framework sufficiently comprehensive and systemic to allow critical tests of (mal)adaptation at each of the specified levels.

The answers we will give here are drawn from a convergence of theoretical perspectives, evolving from and within the current cultural transition. Briefly these perspectives consist of Open Systems Thinking with its search for an organizing principle (Emery, 1981c, Angyal, 1941, 1981); the New Physics concerned with an implicate order (Bohm, 1980) and Naive Realism with its emphasis on direct perception and knowing of invariances (Gibson, 1966, Reed & Jones, 1982). All are ecological, fitting within the root metaphor of contextualism (Pepper, 1966) and all agree that a science which is to genuinely serve humanity takes as axiomatic an image of people as active, responsible parts of their world (Chein, 1972). A more detailed examination of these correspondencies will also reveal both the implicit and explicit views of adaptation and adaptiveness.

3. Conceptual Framework: Open System Thinking

In order to examine 'medium as thing' we need to use the paradigm which has become known as Open Systems Thinking. With this we can perform figure-ground reversals and avoid fragmentary paradigm one (Emery, F, 1981) solutions.

> "To deal with the world's complex problems, we have to develop and apply widely a new methodology for thinking that leads us from the singular viewpoint to a system of thinking, from system to an organization of systems to synthesis, and from synthesis ultimately into metamorphosis -- in other words, a methodology of integrated thought and action in which there is a continuing feedback and flow forward to deal with constant changes at all levels". (Stulman, 1967, p 25)

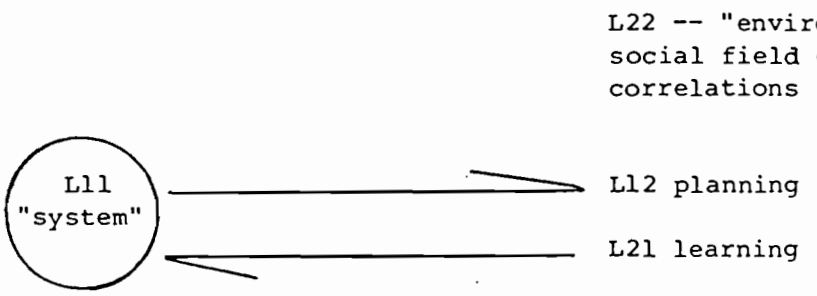
It is the paradigm expressed by the word 'Synergy' that means "behaviour of whole systems upredicted by the separately observed behaviours of any of the system's separate parts or any sub-assembly of the system's parts". (Buckminster Fuller, 1970, p 64) A substantial literature now exists to support such a paradigm and its use and usefulness as a

practical tool would appear to be similarly established. Some basic definitions and concepts may be in order here:

A system is defined as a "set of interrelated elements, each of which is related directly or indirectly to every other element, and no sub-set of which is unrelated to any other sub-set". (Ackoff & Emery, 1972, p 19) "The logical formulation of a given system states the construction principle or the system principle of the whole. Every system has one and only one construction principle". (Angyal, 1941, in Emery F, 1981c, Vol. I, p 38) Systems considered here are the individual person, the human group, or more generally organization and the culture.

A system exists in an environment which is "a set of elements and their relevant properties, which elements are not part of the system, but a change in any of which can cause or produce a change in the state of the system". (Ackoff & Emery, 1972, p 19) The following diagram expresses the concept of an open system and the fact that as an environment may affect the state of a system, so also may a system affect the state of its environment.

Figure 1.1. The Open Systems Model



The model expresses the view that the basic set of relations between a system and its environment are lawful (L) and able to be known, and that

both system and environment are governed by internal dynamics which are similarly lawful and able to be known. The function of a syste designated '1' acting upon the environment '2' is the planning function (L12). Environment acting upon the system is known to us through the function of learning (L21). L11 and L22 express the intrinsic natures of the system and environment respectively. It follows therefore, as convincingly argued by Jordan, that 'system' has a core meaning, "and that that core meaning expresses a conceptual or perceptual figure, a discriminable, distinguishable invariant that can be identified amidst a host of different conditions and circumstances". (Jordan, 1973, p 60-1) Environment can be similarly identified and known as we shall see below. Within the concept of enviornment as we find it today, the choices of the many systems in their shared environment are co-related. These interdependencies constitute a richly interactive field of causation whereby a change in the nature of one system may set off an unpredictabl set of effects in other systems which sets off, etc., etc.

There are several implications arising from this very basic formulation.

(a) We may distinguish open systems thinking from causal or relational thinking as follows:

> "In causal thinking and research, the task is to single out, from a multitude of data, pairs of acts between which there is a necessary connection. In system thinking, the task is not to find direct relations between items but to find the super-ordinate system in which they are connected to define their positional value within such a system... When correlations are established for all pairs of items the task of the systems thinker has just begun".
> (Emery F, 1981, Vol. I, p 10)

"Our scientific thinking consists prevalently in the logical manipulation of relationships... but "holistic connexions cannot be resolved into

relationships". (Angyal 1941, in Emery F, 1981c, Vol. I, p 27) Systems cannot be deduced by the type of causal thinking based on isolated relations. By choosing linear logic we deny not only mutuality of causation but also the inherent complexity of systems and systems-in-environment. The task then of an open systems thinker becomes that of identifying the system principle, that which generates, serializes, and thus organizes and gives meaning to the system of parts, and also to the set of lawful relations which exist in the totality of the system-environment complex. One of the conclusions of this study therefore must be the identification of television's system principle.

It also follows that open systems thinking expresses an ecological rather than a disciplinary paradigm. That is "one that studies some aspect of an animal in relation to the environment that it inhabits, or, in complementary fashion, that studies some aspect of an environment in relation to the animal that lives in it". (Johnston & Turvey, 1980, p 150) It is in fact trans-disciplinary or perhaps more accurately, a-disciplinary. It is by definition concerned with wholes rather than with parts.

> "It is domain-based in that it links a group of sciences to a major sector of social concerns. The problems addressed are therefore almost always generic rather than specific... From the policy standpoint... domain has the characteristics of future-orientation and comprehensiveness". (Trist, p 72 of Emery & Trist, 1972, 1975)

Unlike the conceptual inventory and basically taxonomic approach to research we cannot isolate particular questions from their immediate and future practical context. Our discussion of environments for learning will be conducted therefore in the order which affords most potential for application.

(b) Because it is concerned with wholes, open systems thinking is also by definition concerned with human values and ideals. These human dimensions are as essential as basic data in an open systems analysis as are physical or economic properties. This, together with its a-disciplinary nature, sets it apart from the ruling disciplinary, 'objective consciousness' myth (Roszak, 1968, 1971) This may well be necessary for utilitarian as well as philosophic purposes. As Trist argued in 1972 "new values will become salient only if experience in all parts of the life space consistently supports their emergence". (Trist, p 182 of Emery & Trist, 1972, 1975)

This is particularly pertinent in the matter of research methods, and reporting, where as we will show through the process of re-analysis, the first, or dominant, paradigm has proven inadequate for the task of assessing the (mal)adaptivity of television.

Bohm's (1980) explication of and extrapolation from the new physics to a cosmology has far-reaching implications for social science. Starting from the convergence of relativity and quantum theory towards reality as an unbroken wholeness of the universe, Bohm has developed a new notion of order commensurate with this convergence.

> "This is the <u>implicate</u> or <u>enfolded</u> order. In the enfolded order, space and time are no longer the dominant factors determining the relationships of dependence or independence of different elements. Rather, an entirely different sort of basic connection of elements is possible, from which our ordinary notions of space and time, along with those of separately existent material particles, are abstracted as forms derived from the deeper order. These ordinary notions in fact appear in what is called the <u>explicate</u> or <u>unfolded</u> order, which is a special and distinguished form contained within the general totality of all the implicate orders". (p XV)

Bohm's argument is being accorded serious attention by some cognitive psychologists who link it with Leibniz's philosophy of monads and the great chain of being, and Pibram's holographic neural system (Weimer, 1982, see also Pibram, same volume, p 375).

As it is wholeness that is the actuality, concepts of interaction and integration lose their utility. Different ways of thinking become differing perceptions of the one reality, "each with some domain in which it is clear and adequate." (Bohm, 1980, p 8) Rather than searching for particles or fragments, we must regard our focuses as manifest appearances of a whole which remains implicit, a universal flux, or flow; the holomovement. Our intellectual objects or systems are simply patterns of abstractions from the flow which have a relative autonomy and stability. Directive correlation expresses the way in which formative causes, designs or intentions and 'what is' are mutually shaped. And 'what is', is a common ground enfolded in our consciousness although we may have no detailed perception or knowledge of it. Angyal's central notion of the need to identify the system principle which orders the behavior of the parts has its translation at the level of the universe into Bohm's explication of the implicate order which is enfolded into all of the parts. The delineation itself of a system where the boundary is conceived as a dynamic process has its analogue in Bohm's notion of the relative stable sub-totality or projection of the implicate order. Both theories show a concern for an end to mechanistic appraisals and closed systems, and for greater participation and more adaptive human futures.

In this they may be sharply distinguished from General Systems Theory derived from engineering and cybernetics rather than biology and human studies. (Emery M, 1982, c, p 142-144) Only methods which are

comprehensive have the power to set a scene from which the implicate order or system principle may emerge. Such is the rationale for the scope of this work and our choice of the neo-McQuitty causal path graphical analysis for multi-variate data (Emery, F, 1976, 1981)

Open systems thinking can be seen, as can modern physics, to be moving towards a convergence with some Eastern philosophies (Capra, 1975) centering on holonomy; the law of the whole (Bohm, 1980, p 156) "All the phenomena that constitute the universe are mutually determined" (Caudwell, 1949, 1971, p 159)

An important instrument for this paradigm is the concept of directive correlation (Sommerhoff, 1969, in Emery 1981, Vol. I, p 144-203) to which we return. 'Directively correlated' means in essence that system and environment mutually determine progress towards a goal state. These formulations may be relatively new but the concept is not as it was the dominant model for the ancient, pre-Euclidian cultures. (Emery, M, 1982, c, part I)

Our focuses of (mal)adaption are the L21 and L12 relations, our learnings from the environment and our planning for, or acting on it. But as above, this would be an incomplete analysis. Apart from the explicit knowledgement of the environment made by open systems thinking, this paradigm also includes the L11 dimension expressing the individuality, or character, of systems. Behind these new paradigms lies an image of man "as an active responsible agent, not simply a helpless powerless reagent". (Chein, 1972, p 6)

significant elements then in this image are consciousness and purpose as distinctively human properties defined over the ecosystem. (Sommerhoff, 1950, 1981, Johnston & Turvey, 1980). This relation marks human learning as a phenomenological given. Thus we appear to have two concepts of learning, but they are not incompatible. Our intrinsic character as learners will be differently expressed in correlation with the varying ecosystems of which we are a part. For the L21 relation we will reserve the term 'learning strategy' (Emery F, 1977). As consciousness, purposefulness and learning are axiomatic, then adaptation may also be defined as the ability to search the environment in order to choose the most appropriate learning strategy for pursuing our purposes within that environment. Maladaptation may therefore be defined as a failure to search the environment, or the choice of a strategy which is inappropriate and thus ineffective in the fulfilling of such purposes.

There may appear to be an incompatibility between Bohm's consideration of the individual human being as "a relatively independent sub-totality" (1980, p 208) and their definition as purposeful systems; purposeful in that they can produce the same functional type of outcome in different structural ways in the same structural environment and can produce functionally different outcomes in the same and different structural environments". (Ackoff & Emery, 1972, 1981, p 31) For human behavior to be directively correlated with its environment, it must be orthogonal to it (Sommerhoff, 1950, 81) and sub-totalities appear not to be such independent parts. The difficulty is resolved by Sommerhoff himself in his discussion of free will and causal determination as a false antithesis. Freedom of choice may be no more than the implicit recognition that people's <u>overt</u> actions are orthogonal to environmental variables but that we are "a system in which arbitrary combinations of

action and environmental variables are possible initial states of any chosen time-slice". (as above, p 197-8) This, taken together with th notion of hierarchies of directive correlation, is not incompatible with Bohm's position of manifestations or projections of the implicate order. In fact, Bohm's most recent answer is substantively identical to that of Sommerhoff's - "True individuality means you have a true being which unfolds from the whole in its particular way for that particular moment... Anything which is not in the whole is not individuality but egocentrism". (Bohm & Weber, 1983, p 35, with my emphasis)

Human beings are then taken to be purposeful learning systems, capable of expressing their uniquenesses at the individual system level, within the limits laid down by the implicate order. But the concept of a purposeful learning system necessitates the explication of a model of decision-making or choice. There has been established a basic correspondence of the open systems model and the parameters of choice or decision making. Thus we find:

L11	Probability of choice
L12	Probable Effectiveness
L11, L12, L21	Probability of Outcome
L22	Relative Intention

(Ackoff & Emery, 1972, 1981, Emery, F, 1977, p 82-85)

The dimension, probability of choice, expresses the probability that a particular individual system will produce a particular course of action in a choice environment. (Ackoff & Emery, as above, p 35) It is tha dimension which is most commonly neglected in models of choice behavior, particularly those which are rooted in mechanism.

Probable effectiveness expresses the probability that a course of action will produce a specified outcome in a specified environment. Probable Outcome, or the probability that a particular outcome will eventuate in a specified environment, was given status as a primary parameter of the set as it is the only parameter which involves the L21 relation and thus encompasses learning in the sense of learning from the L22 or environment where environment is "a source of valences, positive or negative" (Emery F, 1977, p 84). This is very close to Gibson's concept of affordances, reviewed below.

Relative value is the measure attached to the degree of intention involved in a choice. As such, it is identified by Ackoff & Emery (as above, p 58) as equivalent to the L relation of Heider. The L relation covers such phenomena as "to like, to love, to esteem, to value, and their opposites". (Heider, 1946, 1981, p 105) Heider also identified a class of phenomena concerned with the cognitive aspects of the choice situation which he labelled the U relation, for "cognitive unit formations". This covers for example, "similarity, proximity, causality, membership, possession or belonging" (Heider, as above). The first three parameters above... "are mutually exclusive and we believe they exhaust all possible cognitive unit formations. By identifying a limited set of such relations it becomes possible to make further steps towards rigorous psychologics". (Ackoff & Emery, 1972, 1981, p 58)

Emery & Emery (1976) produced analysis and evidence for television's particularly strong relations with familiarity, a feeling of involvement with television and, indeed, the affective nature of the televiewing experience. Anticipating somewhat, their emphasis upon its ability to produce 'knowledge of' implicates the parameter of probability of choice

in the effects of viewing and the experience itself appears heavily weighted towards Relative Value. The muting of the parameters o Probable Effectiveness and Outcome indicated by their perspective indicates that while both U and L relations are present, the choices involved, firstly in viewing and secondly, in the effects of viewing, bear out Heider's contention that human behavior is not always of the 'rational' kind. Decisions are not always made by choosing a means to an end and a continuing 'rational' course of action. (Heider, 1946, 1981, p 110) Choices may follow psychologics rather than logic and right brain function associated with emotionality has received continuing attention. This literature is discussed in Chapter 4 when we consider the dimensions which contribute to individual sensitivity to CRT technology.

But the particular combination of parameters associated with television bears little relation to the wholistic picture presented in Table 1.1 below, particularly as it relates to learning. Probability of choice is the dimension tied to the self, the personal response, that denies the effectiveness of the other or cooperation, and is therefore productive of dissociation, the scenario ultimately resulting from such a denial of effectiveness or responsibility for outcome (Emery F, 1977). It represents not the elevation of the individual human sub-totality above the whole but the denial of the embeddedness of the self in the implicate order. Thus while psychologic may be common and human, it can also be taken to limits which mark it as a failure of adaptation. We expect therefore, that by examining the way in which choices related to televiewing and its effects are made, that there will be a constant and continuing pattern of the parameters of choice which will amount to a maladaption of human ability to weight choices, particularly in the

longer term. Television will be seen to be a dissociative and affective medium.

There is another level of human system function postulated by open systems theories which is particularly closely tied to the implicate order. This is our ability under certain conditions to be ideal-seeking; to choose between purposes. (Ackoff & Emery, 1972, Emery, F, 1977) These ideals, as with the nature of the transactive processes of learning and planning, and the causal textures of the field, have been derived from the inclusive and mutually exclusive set of system-environment relations. As a meta-theoretical guide (Johnston & Turvey, 1980, p 149) to an open systems analysis the following table expresses the current state of the art:

Table 1.1

Pattern of Relations between Basic Elements

Environmental Levels		Salient Parameters of Choice	Forms of Learning (L_{21})	Forms of Planning (L_{12})	Salient Ideals
I	Randomized	L_{11}	Conditioning	Tactics	Homonomy
II	Clustered	L_{11}, L_{21}	Meaningful	Tactics-strategies	Homonomy, nurturance
III	Disturbed-reactive	L_{11}, L_{12}, L_{21}	Problem solving	Tactics-operations strategies	Homonomy, nurturance, Humanity
IV	Turbulent	L_{11}, L_{12} L_{21}, L_{22}	Puzzle solving	Active adaptive planning	Homonomy, nurturance humanity, beauty

These correspondencies appear now to be well established although it will be noted here that I have deviated from the original notation for type II environments (Emery, F, 1977, p 81-91). The ecological approach to perception and meaningful learning discussed below necessitates a rethinking of this relation for which the notation L21 more appropriately expresses the concept of affordances. (Gibson 1977, 1979)

This constitutes a powerful base from which to examine and judge a technology. To simply study the intrinsic characteristics of a technology and extrapolate from these to its effects, or to isolate one or two parameters as focus, would leave such a study vulnerable. Open systems thinking has shown before, by its very novel conclusions about technologies, as in the telephone study noted above, that studies derived from less wholistic paradigms have failed to isolate satisfactory answers to questions raised by existing data. Commonly, it appears that the nature of the inquiry did not support an examination of the assumptions hidden within the paradigm itself.

Part of our task, therefore, will be to examine CRT technology and television in particular, with an eye to its standing on this map; its ability to induce a range of behaviors towards the active, adaptive pole. As we take purposefulness and ideal-seeking as axiomatic, given adaptations, we may specifically note that CRT technology will be maladaptive to the extent that it induces non-purposeful behavior and acts to inhibit the possibility of ideal-seeking.

Detailed dimensions of these L11 behaviors will be addressed below.

4. Direct, Ecological Perception/Knowing

In "Thing & Medium", Heider began the task of specifying the structure of the environment and concluded that it had a causal texture which underlies the distinction between objects and mediators, and is the basis of observed correlates between perceptions and thing events. Taking his argument further in 'The Function of the Perceptual System' (1930, 1959), he arrived firstly at "the performance of the perceptual apparatus is to a great extent determined by the structure of the environment" (As above, p 46) and in essence spelt out the death knell of sensationalism. It is not adequacy or richness of stimulation which determines perception, for perception is purposeful (p 51). "A function is called purposeful if it can be meaningfully referred to two different systems" (p 52), or in more current terminology used below, perception is a purposeful function of an informational ecosystem. This is clear in his review of the Gestaltists' progress in perception where he concludes that they failed to account for "the fact that contact with the environment makes the organism more coordinated with it". (Heider, 1939, 1959, p 83) He thus arrived at the concept of directive correlation. This is but the briefest summary of Heider's contribution which serves only to alert the reader to part of the foundations upon which the Gibson school rests. A more detailed exploration can be found in A Choice of Futures (Emery & Emery, 1975, 1976)

There have been many approaches to such a position prompted by varying dissatisfactions with the traditional theories (Laing, 1959; Schumacher, 1973, 1977; Pirsig, 1974; Goldsmith, 1981).

> "The concept of objectivity is inseparably linked with the recent explosion of so-called methodologies, which are, in

> various disciplines, but different forms of rendering the same myth of objectivity. The proliferation of methodologies is a menace; although they were meant to be an aid and help, in the long run they have become crutches, a substitute for thinking". (Skolimowski, 1978, p 233-4; with my emphasis)

De Bono's theory of thinking as perception elaborates Skolimowski's criticism. He shows partialism, or insufficiency of perception to be the primary effor in thinking; one which is derived from the academic habit of assuming a closed system. "Thinking" then becomes equated with data generation, semantic tidyness or freedom from logical error, the end result of which is 'peripheralism'. (De Bono, 1976, Part I) The phenomenon is endemic in the social sciences because the preferred methods cannot even approximate such a sweep of the perceptual field as would be necessary to think about the important practical affairs of humankind.

Michael Polanyi himself a distinguished scientist similarly evolved an epistemology of 'tacit' knowledge which rendered bare the claims of objective science and the paradigm of learning on which such claims were premissed. For Polanyi "knowledge is an activity which would be better described as a process of knowing" (1969, p 132) and that "the structure of scientific intuition is the same as that of perception... Intuition is a skill, rooted in our natural sensibility to hidden patterns and developed to effectiveness by a process of learning". (Polanyi, as above, p 118) Research then becomes simply a more intensely dynamic form. But tacit knowledge as personal knowing is an indwelling and a participation; a logic of perceptual integration. Learning essentially then for Polanyi as for De Bono, above, and Deikman, (1976) is the personal experience and training of perception. Thus we may have tacit knowledge, the content of which we are unaware but which may be

discovered by an act of perceptual integration. Following this line of reasoning (by tacit knowing) Polanyi arrives at the opposition of tacit knowledge and explicit knowledge, that of objective science. But "while tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. Hence all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable". (Polanyi, 1969, p 144)

Bohm's view is similar. People seek wholeness; experience and knowledge are one process which is better described as 'knowing'. He argues for a change in our language structure, to the rheomode (from the Greek verb 'to flow', Bohm, 1980, p 31). We would therefore not make a sharp distinction between "the act of perception and experimentation, the action of that which we perceive and of which we experiment, and the activity of communicating verbally about what we have observed and done" (as above p 45), thus avoiding the trap of fragmentation and the 'inside-outside' dilemma.

These brief summaries do no justice to the richness of these positions, but highlight the concern that concepts of learning and knowing must be rooted in the individual perceptual activity which is itself embedded in the flow of the field. None have, however, achieved the clarity of Heider's formulation or unfolded as profusely as the work of J.J. Gibson and the Gibson School. Drawing originally on the Gestalt School and the individual contributions of Heider, this group has developed a coherent conceptual framework and programme. Polanyi, Bohm and Gibson are currently receiving serious attention from cognitive psychologists (Weimer & Palermo, 1982) From early on Gibson's radical departure from the orthodoxies attracted attention and much criticism. As the debate

has heightened, many of these criticisms have been either exposed as cases of paradigmatic blinkers, or have been adequately answered. (Reed & Jones, 1982)

The development of Gibson's thought, including previously unpublished papers, has recently been traced (Reed & Jones, 1982) to its current status as an ecological and systems theoretical appreciation of cognition. 'Cognition' however, is itself a term from the traditional approach and inadequate to convey the present scope of the work. Others of the school have clarified many of Gibson's original concepts and the following account is issue rather than developmentally oriented. As adaption involves the fit between the L11 and L22 dynamics, so our perceptual theories are crucial for making judgements about its development and determination. On the basis of confirmed nexuses of theory and data we can begin to sketch some fundamental human adaptations, with reciprocal maladaptions, and derive sub-hypotheses about the role that CRT technology may play as mediator of the L11-L22 connections.

Gibson argued on the basis of a lifetime of empirical practical studies that the associationist doctrine of knowing and learning could not be supported in fact. Simply put, "perception is . . . not reducible to sensations". (Gibson, 1966, p 237) "The neural inputs of a perceptual system are <u>already</u> organized and therefore do not have to have an organization imposed upon them" (as above, p 267). The environment has an informational structure which is knowable and known to a perceiver without benefit of mediators of any variety. Direct perception or the knowing of invariants for the visual system takes place at the level of surfaces, objects and events; in other words at the level of adaptive

meaning rather than at the level of physics. Meaning is given by the invariants extracted during exploration and locomotion. (Gibson, 1977, in Reed & Jones, 1982, p 289) Such a view of the environment explained amongst other things why an unchanging homogeneous array as in the Ganzfeld experiments resulted in disorientation and 'unusual' experiences. Gibson's definition of information may be what others would call organization (Pibram, 1982, p 387) and we cannot maintain visual control in unpatterned, unorganized, light (Haith, 1980).

Currently, debate in cognitive psychology appears to involve whether or not there needs be any form of representation in a theoretical stance. So far, little has been concluded as levels of representation have not been clarified. Clearly a word is a representation at one level, but its meaning can also be directly known. Pibram (1982, p 364) argues that there is room for representation and it is by way of regulating neurophysiological mechanisms. For the Gibson school, such mechanisms are simply mechanisms, whose existence neither supports nor refutes the directness of knowing. (Michaels & Corello, 1981). The real issue is the appropriate 'grain of analysis' and we return to this.

However, the notion of invariance, meaning and their relations to tacit knowledge and the implicate order is gathering support. The Gibsonian school argues for a fundamental realism for survival, in opposition to representationalism. Seeing is knowing rather than believing. "The crucial distinction between the two forms of realism is not so much that one believes knowledge of the world through perceptual means is possible, whereas the other does not, but that they disagree as to what the constituents of knowledge are -- facts or beliefs." (Shaw, Turvey & Mace, 1982, p 177).

Believing invites the assumption of intentional objects with immanent existence or inexistence. Knowing does not. While "knowing and perceiving are indeed intentional, the objects they specify are quite real in an ordinary sense, and therefore, commensurate with the physical objects required to define extensionally an animal's or human's environment". (Shaw, Turvey & Mace, 1982, p 180).

In a long and careful argument, Turvey & Shaw (1979) formally derive the 'Postulate of Indirect Perception' as a logical consequence of the doctrines of intractable nonspecificity and perceptual independence from stimulation. They outline their argument for a contrary postulate, which is underlain by a large body of data as follows:

> "First what justifies the claim that perception is a valid and reliable source of information for an animal or human about its environment is that perception is necessarily incontrovertible by any other form of knowing the environment (e.g. inference). Second, perception is incontrovertible, because it is necessarily a direct apprehension of that which is true by force of existence rather than by force of argument. And third, perception may not be contradicted because only propositions may be true or false and perception is not a proposition-making activity. Propositions are assertions regarding states of affairs that either always obtain or never obtain. Perception, by contrast, is not an assertion about states of affairs but is a state of affairs and therefore necessarily obtains." (p 214)

Therefore the 'Postulate of Direct Perception': "If some state of affairs, S, is (directly) perceived to be some state of affairs, T, then it is necessarily what it is perceived to be, namely T." (p 215) As they point out, the postulate for indirect or mediated perception renders the knowledge about the dangers of the environment so weak and tenuous "that it is difficult to imagine the successful survival of even one generation of animals, much less the continued evolution of their species over countless generations without a break in the chain" (p 214). The

Postulate of Direct Perception gives us then, not a 'naive' realism but a critical one.

In line with the above postulate and of central importance to this thesis is an early learning of Gibson which has been confirmed by later studies. There is "an important categorical distinction between ambient (reflected) and radiant light -- precisely, that one (ambient) but not the other (radiant) has been structured by its contact with the material environment and thereby makes reference to it." (Fowler & Turvey, 1982, p 6) Radiant light, which lacks macroscopic structure, provides no information to a visual system (p 8) (my emphasis). It is ambient light which contains information meaningful to animals. Textured surfaces, contours and movements, objects and events rather than images are the foundations of our visual perception which is the most 'exact' kind of perception. By 'seeing' Gibson meant understanding and the essence o perception became "selective attention to something important". "To see a thing . . . means to be in touch with it." Since the information contained in ambient light is unlimited, then each perceiver must select that part of the potential information he or she needs. Perceptual learning is the life-long process of increasing our attention to the meaningful features of our world. (Gibson, 1960; Reed & Jones, 1982, p 258-268).

But as radiant light does not provide meaningful information and CRT technologies are radiant, it becomes difficult to argue that they are providing ecologically or adaptively useful information, and promoting understanding or learning in the sense above. While people are highly attentive to television, it becomes doubtful whether this 'attention' is qualitatively of the same order as that which progressively enriches our

knownings about invariances. We hypothesize therefore that while television is an 'information-rich' medium it does not increase understanding through perceptual learning. On the basis of the hypotheses drawn by Emery & Emery, as above, and anticipating the next chapter, we can also hypothesize that the nature of the physical information contained within the radiant light signal will have direct effects, not at the level of learning or meaning, but at the level of neuro-mechanism or central nervous system reaction rather than purposeful response (Ackoff & Emery, 1972, 1981, p 25).

The theory is by no means confined to vision (Gibson, 1963). Invariants of the energy flux in every form have pattern or structure which convey "information about" the environment (Gibson, 1967; Reed & Jones, 1982, p. 376). Extracting invariants over time is the essence of the perceptual process and can be assumed to occur at higher levels, including those called intellectual (as above, p 378). This view of perception includes the concepts of memory and expectation (Gibson, 1975; Reed & Jones, 1982, p 395) and we may compare Sommerhoff's derivation of 'transformation expectations', 1969, 1981, p 171).

The actual nature of the extraction is given by scanning or searching. Perceptual systems are exploratory. In the absence of adequate information "the perceptual system hunts. It tries to find meaning, to make sense from what little information it can get." (Gibson, 1966, p 303) Gibson here alerts us to the fact that vigilance is also an adaptive behaviour. Attentiveness alone is insufficient. This is elaborated below.

Events, perceived at whatever point in the energy continuum, assumed a special importance later in the development of the theory. "An event can be defined as a minimal change of some specified type (including its continuants) wrought over an object or object complex within some determinate region of the space-time continuum." (Shaw & Pittenger, 1978, p 189) where by 'minimal change' is meant "the least transformation of a property of an object . . . needed to specify unambiguously the exact nature of that change." Shaw & McIntyre derived the principle of perceptual transitions which is needed to explain event perception. This states: "Global physical invariants have greater attensity than local ones (are more attended to). The attensity of local invariants is inversely proportional to their degree (where the degree of an invariant property is one more than its number of dimensions).

Thus, the perceptual organization of an event proceeds from global invariant properties to locally invariant properties according to their degree. In the case of invariant structures of the same degree, the structure most consistent with lower degree invariants will have the greatest attensity". (1974, p 353) This principle explained the 'modulatory program' by which the perceptual system becomes attuned to invariant information through experience. It is particularly useful when examining the difference between reality and two-dimensional images, static or moving. Even more particularly, it explains the extraordinary attention-holding power of television. The combination of a rapidly changing object of perception and lack of ecologically meaningful information would have maximum attensity as a local invariant, possibly to the exclusion of vigilance. This degree of attensity would itself be maladaptive.

Building on this work, Shaw & Pittenger (1978) isolated two fundamental types of event change; structural (what changed) and transformational (what type of change was it). By making this distinction they placed the theory firmly in the 'process' camp as there is an obvious hierarchical order implied between the two. While it is important to know what changed, which implies that one already knows what the what is, it is of greater significance for adaptation and survival to know the ways in which things change. Only this knowledge can form the basis of prediction and conscious control.

In an over-eventful environment where there is too much information, perception must become selective. "The modes of selective attention, in fact, define the principal perceptual systems" (Gibson, 1966, p 309). There are dangers in such environments of committing major errors. While the errors made in inadequate environments are mechanistically different from those made in overloaded environments, the end results are in psychological terms, identical. (See also Emery & Emery, 1976, p 86-7.) There are limits within which the amount of information is adaptive. Obviously it is nonsense to accuse the Gibson school of proposing a 'passive organism' theory of perception or cognition. It is predicated on active purposeful or goal-seeking behaviour within an ecosystem of which it is part and parcel.

Gibson's conclusions are now receiving support from research into newborns. Some of it has been popularized as in Pearce, 1977. Identification of surfaces, movement and events as central affordances are important from birth. "Newborns start by looking at the edges of things, exploring." (Friedrich, 1983, p 54) They prefer the complex to the simple and will choose a patterned surface to a plain one.

preferences are found with the other senses as well as vision. Invariances are already in the process of extraction at this stage. Experiments by Meltzoff & Moore have demonstrated also "the infant's very early capacity for . . . 'intermodal perception' -- to combine the brain's perception of two different activities in this case vision and muscular action, which is virtually the first form of thinking" (Friedrich as above, p 55). Before language begins they are developing the ability to recognize and organize affordances; the environment's wealth of meaningful resources. As a species they are obviously equipped to start learning about a world, one with an intrinsically meaningful informational structure.

Adopting the systems approach, Haith, through a series of ingenious experiments has shown that the newborn child is hard-wired to maintain a high level of retinal stimulation: "Newborns are congenitally equipped engage in visual activity that maximizes the likelihood that they will find visual information. This 'seek' operation is endogenously controlled, that is not dependent on external stimulation for its activation or maintenance." (Haith, 1980, p 89) This biological preparation is adaptive in that neural activity is essential and the baby is rarely awake. When awake they move their eyes virtually every half second. He notes similarly that "the same activity that produces a high-firing rate, fixating and scanning near areas of high contour density, is also an activity that keeps babies near the most informative parts of their visual field." (Haith, 1980, p 124). The visual system is highly organized, certainly not random and is inappropriately described by responses and reflexes. (p 126-127) Of particular significance here are the following findings:

(i) light puts babies to sleep or darkness wakes them up

(ii) a qualitative difference in visual activity exists between scanning in light and dark conditions. In the complete absence of visual stimulation, the newborn displays well-controlled, smooth, search behaviour. In patterned light the center-of-gravity of the newborn's scan behaviour shifts to coincide with the location of an edge. In unpatterned light the newborn loses control.

(iii) rather than simply staying near an edge, newborns attempt to cross back and forth over them. In this way they maximize the cortical firing rate. This is probably also an adaptive mechanism for establishing interhemispheric connections (footnote, p 121)

(iv) stimulus organization, meaning, memory and task requirements begin to play a role in scanning as early as two months of age.

Haith's evidence supports the concept of a system with two scanning routines, an Ambient Search Routine (ASR) and an Inspection Scan Routine (ISR). The ASR finds targets for inspection, governs the continuous activity of the eye-movement system and comes into predominant control when the cortical firing rate is low. ISR comes into play when a target is detected and it produces contour encounters and crosses. Because these routines are in competition, one may suppress the other. With this explanation, Haith shows why much looking which is usually called 'meaningless' is not such at all. People (not just babies, p 119) must simply attempt to maintain a high rate of firing. By this method of sampling the energy provided by the currently available visual array we remain alert to and intelligent of significant events and changes in the visual field.

These scanners are clearly the basis for the psychological concepts of vigilance and attention. Adaptive behaviour consists of an optimal mix

of the two, dependent on environmental conditions. As we are evolved for a natural physical world we would expect that as an environment deviates from this, so the optimal mix of vigilance and attention will be disturbed. Building on our previous hypothesis of the attensity of television and knowing of its decidely unnatural emitted light, we suggest more definitely that television induces maladaptive behaviour through its suppression of environmental vigilance and also that the process of watching television will result in a lowered cortical firing rate.

This research has accomplished several things. It certainly confirms that we are physically adapted to the natural structured environment and equipped to directly perceive and know it, at least visually. And there can be no convincing justification for assuming that such organized systems could not exist for other perceptual modes. Secondly, it stresses the adaptive role of activity, both at the level of gross movement and at that of cortical firing. Again, given the centrality of activity to such adaptation, we must assume that the generalization will hold for all levels and areas of activity. Active is adaptive. Thirdly, we see that the role of ambient light in relation to activity changes with age. This raises some fascinating research questions about light and the progress of maturation. It also raises some disturbing questions about the wisdom of permitting children and infants to spend long periods of time in an environment suffused with a narrow spectrum of light emitted by two or three phosphors. Mander (1978) has dealt in detail with some of the issues raised by the quality of the television spectrum.

Some part at least of the answers to these questions is provided by Kellaway, 1973. Early deafferentation in humans "results in neuronal

changes in the visual system that are of a type which is prone to generate EEG spikes" (p 403). These are a manifestation of a complex process which may interfere with the ability to process information. Deprivation rather than deafferentation produces similar but less profound effects (p 408). Because the retina is an extension of the brain (p 394) a majority of the EEG spike foci observed in children may result from visual deprivation rather than palpable lesion (p 412). It has been demonstrated that "the neuronal organization of a sensory system during the critical period of development is evolved, in terms of adaptation, to match the probability of occurrence of features in its sensory experience." (p 413-4) The ceiling on the critical period in which humans are vulnerable to aberrations of visual input is not precisely determined but could be as high as four or five years (p 412-3).

These findings are highly suggestive, particularly in the face of a wide-range of individual sensitivities to light and the model of epileptic onset known as 'kindling' or accumulating sensitivity (chapter 12). Suggestive they must remain until some epidemiological data about CRTs is specifically addressed. But Kellaway's research confirms not only that we are adapted to the real environment, but also that as deviations occur away from that base, so also will the process of normal system organization.

Research by Starkey et al (1983) has added a further dimension of understanding. Using infants six to eight months old, they showed they could extract information about number across two very different kinds of display, or perceptual mode. They in fact had to disregard the modality, visual or auditory, in order to detect the invariance. The enumerative

procedure is more 'general' than a modality specific pattern recognition (p 181) or, in other words, meaning is extracted by a single, organized perceptual system.

It is the core ecological concepts of the Gibson school to which we now turn in order to develop a model integrative of direct perception and knowing, and directive correlation. From this model we derive the key propositions we will need to test the hypothesis of technological maladaption.

Chapter 2 Consciousness and Learning as the Primary Human Adaptations

1. Adaptation as the Property of an Ecosystem

While event perception emphasized the primacy of process, other central Gibsonian concepts accentuated the ecological stance. "Perceptual knowledge is first and foremost an adaptive relation between perceived and perceiver". (Mace, 1974, p 141)

Direct perception of globally invariant physical information is due to the evolutionary attunement of the biological systems supporting cognitive processes, then by contrast, direct perception of local invariants is due to attunement of the modulatory states of those biological systems by the experience of the organism with its world. "According to the principle of cognitive symmetry this attunement arises from the symmetrical rearrangement of states of the biological system with respect to the invariant structure of the events perceived." (Shaw & McIntyre, 1974, p 347-8) The attunement is accomplished by the 'education of attention', or in other words, by learning. (Gibson, 1966)

We are behaving adaptively then when there is perfect symmetry between the information states or events of the environment and our psychological states, events or behaviour. Central are the concepts of affordance and effectivity. Affordances are properties of the environment relative to an animal, the acts or behaviours permitted by objects, places and events. They define what the environment means to a perceiver, what he or she can do with it. "It is the affordance that is perceived." (Gibson, 1967, Reed & Jones, 1982, Michaels & Carello, 1981, p 42) Affordances do not change as a perceiver's needs change; they are therefore real and persistent properties, objectively defined over the components of an eco-system regardless of time to time use. An

affordance is therefore not a force in the field but the basis of a potential directive correlation.

The concept of effectivity is derived from the term used by John von Neumann to mean purposive activities (Shaw & McIntyre, 1974, p 307). An effectivity is the potential purposive behaviour of a perceiver in the field, and again relative to the field. For perception to be valuable it must be manifested in appropriate and effective actions on the environment. Similarly, for actions to be appropriate and effective they must be constrained by accurate perception of the environment. (Michaels & Corello, 1981, p 47) Affordance and effectivities are species-specific (Gibson, 1972, Reed & Jones, p 410) in terms of metabolism, power and ratios within the sensorium, etc. What a desert affords to a snake which is temperature sensitive is very different to what it affords to a human being attuned to surfaces. (Michaels & Corello, 1981) For an animal the effectivity is a goal-directed act, for the person, an intentional act (Fowler & Turvey, 1982), similarly environmentally constrained, but clearly also defined in relation to a hierarchical set of goals, purposes and ideals. Taken together, affordances and effectivities for a human being express the process of living in a meaningful world where "Meaning is a property of the ecosystem and individually the animal and the environment constitute <u>partial</u> systems with reference to meaning." (Turvey & Shaw, 1979, p 209) This is exactly comparable to Bohm's concept of sub-totalities within the implicate order.

Similarly, as the Gibson school have defined affordances and effectivities in respect of both the environment and purposiveness th work fits exactly within the model of directive correlation. These interrelations are carried further below. But there is one other concept

which serves to unit Gibson's work with social psychology and the broad framework discussed above.

> "People are not only parts of the environment but also perceivers of the environment. Hence a given observer perceives other perceivers. And he also perceives what others perceive. In this way each observer is aware of a shared environment, one that is common to all observers, not just his environment . . . The awareness of a common world . . . is not entirely due to our verbal agreements with one another . . . (but) also to the independence of our perception from a fixed point of observation, the ability to pick up invariants over time."
> (Gibson, 1974: Reed & Jones, 1982, p 411-2)

Gibson has elucidated the third of Asch's (1952) conditions for effective communication -- the emergence of a mutually shared field. A mutually shared field of objective environmental features can now be defined as a field whose features afford a common set of behaviours to those perceiving it. This insight bolsters our confidence that we may assign to the environment certain objective values determined by mutually agreed perceptions.

As is made clear, the most central human concern is for meaning and the process of extracting meaning over the totality of the eco-system; that process we call learning. Clearly the Gibsonian and the open systems theorists are converging towards a more comprehensive model or metatheory which may throw a brighter light on consciousness, human learning and adaptation within changing and uncertain informational environments.

2. Directive Correlation and Adaptation

Sommerhoff (1950, 1981) presented his model of directive correlation as follows:

"1. At a given time tk, it is a necessary condition for the subsequent occurrence of a certain event or situation that two or more onthogonal variables x_1, x_2 . . . x_n should satisfy

$$F\ (x_1, k;\ x_2, k;\ \ldots\ x_n, k) = 0$$

2. There exists an antecedent point of time to, a variable y and a [illegible] of functions x, k; x2, k . . . Kn, k such that

   Xi, k = Xi,k (yo) i = 1,2 . . . n

3. There exists a set So of values Yo which has more than one member and is such that for all Yo in So

   Xi, k (Yo) is bi-unique

   i = 1,2, . . . n, and

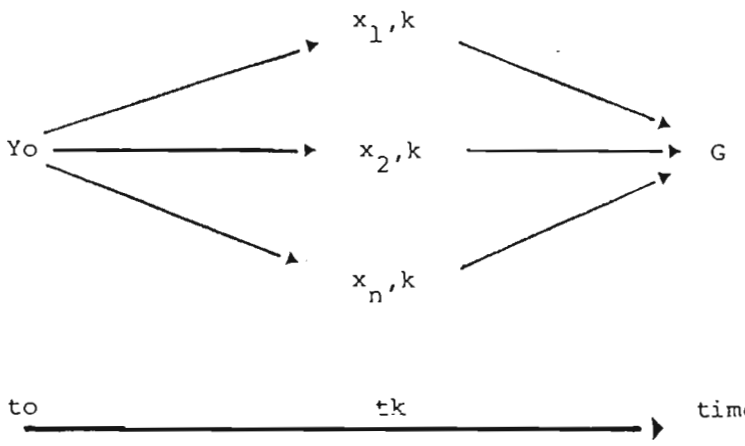
   F ((Xl, k(yo), X2, k(Yo) . . . Xn,k(Yo))) = o

then xl, k, x2, k . . . Xn,k will be said to be <u>directively correlated</u> in respect of the <u>goal</u> G and the <u>coenetic variable</u> Yo. The function F will be referred to as the <u>focal condition</u>."

(1969, 1981, 173-4)

Figure 2.1

<u>Basic Model of Directive Correlation</u>



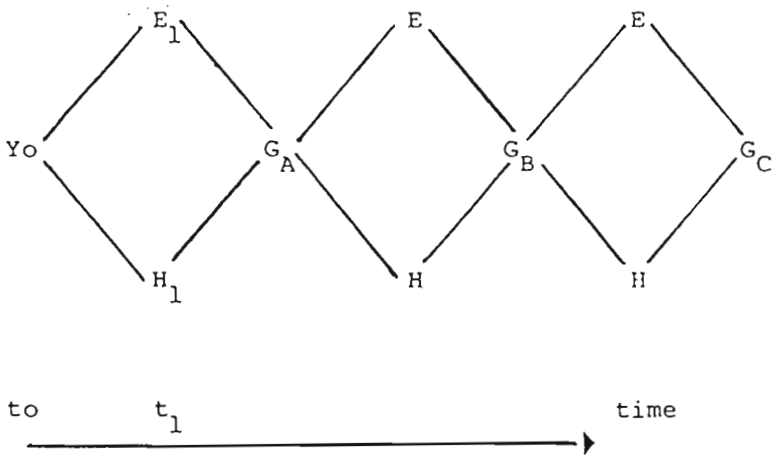
These would appear to be the "two kinds of objects whose ontological status must be elaborated -- reference objects and intentional objects in an ecological analysis. (Shaw, et al, 1982 p 168) The coenetic variab[illegible] is clearly the reference and the goal is the intentional object. The interval tk - to is called the <u>back reference period</u>.

In its simplified form we can specify that Xl,k is a certain specific condition of the environment, E k; and Xn,k is a certain specific variable of a system H k. We adopt the letter H here because we will be referring specifically to human adaptation. We note also that Johnston & Turvey (1980, p 160) challenge Sommerhoff's proposition that the set So must have at least two members in any instance of adaptation.

But we need a sense in which an organism can be shown to be a living biological unit whose ultimate goals include self-preservation. The necessary concept is that of "an integrated sequence of activities (which) stands for a relation between these activities which enables us to attribute an individual goal to each, and at the same time an ultimate goal to the whole sequence." (Sommerhoff, 1981, p 187) This concept is provided by the integration theorem: "If G_A is the goal event of a directive correlation A and if the occurence of G_A is a necessary condition for the occurrence of the goal, event G_B of a directive correlation B, then G_B is also a goal-event of A." (Sommerhoff, 1981, p 188) Sequences of directive correlations will then look as follows:

Figure 2.2

Sequence of Directive Correlations



Over time, such a sequence to be adaptive, will result in a more coordinated movement of E and H. At another level, particularly in the human realm, the adaptiveness of such coordination will depend ultimately on the adaptiveness of the value of Yo and the nature of G_c or G_n. Sommerhoff has also provided us with the tool of potential directive correlation, the objective system property of being prepared or alerted for the appearance of a particular environmental condition. That is, the state of preparedness is definable in terms of the response function that would characterize the behaviour of the system if that specific environmental feature or condition were to materialize.

3. Elaborating The Concept of Adaptaion

Following Sommerhoff, Johnston & Turvey (1980) have taken the directive correlation model of adaptation into three major time frames, of which two will concern us here, and show how the concept may be more broadly applied in ecology.

Adaptation is conceived in three senses. It may be elucidated:

(a) as an interdependence. This is the sense in which Johnston & Turvey use the term 'relation'. An animal does not possess adaptation, rather it may stand in an adaptive relationship to some environment. The environment must be defined in order to discuss the animal's adaptation. Adaptation for some G is a property of ecosystems. (p 157-8) Specifically, we take their point that "it is just as legitimate . . . to inquire into the source of an environment's appropriateness as it is to inquire into the nature of an animal's adaptation . . . an environment is not appropriate per se, but only in relation to the animal that is adapted to it." (p 158)

(b) As a characteristic. An adaptation, or adaptive feature is some characteristic of H that enables it to survive (and reproduce) in E. An adaptation for some goal G is one that enables H to attain G in E. "Determining whether a particular characteristic of an organism (person, human system) is in fact an adaptation, and if so in what way, is an extremely difficult problem". (Johnston & Turvey, 1980, p 159)

(c) As a process. An adaptive process is one that gives rise to an adaptive interdependence between H and E in regard to some G. Adaptations as characteristics are a product of (a process of) adaptation. For adaptation as process, we see that a system will or will not have a specific sensitivity to the value of the coenetic variable. Using this sensitivity it may or may not produce (use) a corresponding response, of Hk at tk. We may therefore define two functions, one (P) defined on the environment, the other (B) defined on the animal, such that:

$$P(Yo) = Ek$$

$$B\ (Yo) = Hk$$

It is the correspondence of Ek and Hk that defines the adaptiveness o the effectivity of Hk in relation to G. Adaptation is thus formally defined by the equation specifying the focal condition, where Ek - Hk = 0 defines perfect adaptation.

Johnston & Turvey have used the back-reference period to aid in the conceptualization of maladaption. "In order for Hk to be an adaptive response to Ek at tk, the function P must be determinate and single valued, that is P must always map a given value of Yo onto the same value of Ek. If this were not the case, B would often map Yo onto a maladatpive value of Hk, since the value of Ek would be inappropriate. Another way of saying this is that given an adaptive mechanism with a back-reference period tk-to, Y and E must be invariantly related over at least the span tk-to. Alternatively and equivalently, given a environment such that Y and E are invariantly related over a span of no more than tk-to, adaptation to E can be effected only by an adaptive mechanism with a back-reference period of tk-to or less." (p 163, using my notation). Variations in the environment require adaptive responses with different back-reference periods. "It is the timescale of the change and the back-reference period of the response that determine whether the response can be adaptive with regard to the change." (p 164)

As Johnston & Turvey point out, the model does not incorporate the initial state of the adapting organism which may be important in processes involving evolution and individual development. This further variable will be incorporated in this analysis because we attempt to deal with the more complex field of human rather than animal ecology and in particular, the complexities arising from consciousness.

4. Consciousness and the Complexities of Human Adaptation

Caudwell in 1949 and Jaynes in 1976 have reviewed the various historical, philosophical and psychological approaches to the 'problem of consciousness', which need not be reproduced here. As we will see, consciousness is involved in some complex relations with language, the self and the objective world, reality. There are, however, convergences in the literature which allow a firm formulation and evaluation in terms of directive correlations.

Consciousness in the new physics is to be comprehended in terms of the implicate order, along with reality as a whole; a dynamic interplay of elements in differing degrees of enfoldment 'all present together' within the holomovement. It can be seen as a series of 'moments' vaguely defined by linear time or space (Bohm, 1980, p 29) but better described as a series of meaningful events. These by definition cannot be permanent but each element or moment has a certain explicate order which enfolds all the others. As the human being is a sub-totality of the whole, so is consciousness a sub-totality of the human system and the whole establishing the common ground. "Mind enfolds matter in general and therefore the body in particular." (Bohm, 1980, p 209) "As a human being takes part in the process of this totality, he is fundamentally changed in the very activity in which his aim is to change that reality which is the content of his consciousness." (p 210) This appreciation takes on special significance when we need to examine that form of knowing called wisdom.

Jaynes (1976) devotes his first substantive chapter to what consciousness is <u>not</u>, namely:

1. Extensive. We are conscious of what we are doing at all levels only a part of the time. For some activities it can be undesirable as well as unnecessary.
2. A Copy of Experience. You can know something without being conscious of it (tacit knowledge) and this is the basis of difference between recognition and recall to which we shall be returning.
3. Necessary for Concepts. "Concepts are simply classes of behaviourally equivalent things" some of which are partially innate. We may be conscious of a particular example but not of the concept. But "one of the great functions of language is to let the word stand for a concept". (p 31)
4. Necessary for Learning. Here Jaynes provides more examples elaborating point one above, but does not use the most simple argument that animals obviously learn but are not considered conscious at all.
5. Necessary for Thinking. Such acts as judging are given by direct perception. "One does one's thinking before one knows what one is to think about". (p 39)
6. Necessary for Reason. An elaboration of point 5 involving the bursting forth of insights.
7. Located in the Head (or anywhere else)

What he does not refute, and what he himself comes close to is the following observation:

> "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." (Asch, 1952, p 287-8)

After a long and torturous exposition on language which fails to distinguish between spoken and written language,[1] Jaynes arrives at conscio usness as "the work of lexical metaphor". (p 58) "Consciousness is an operation rather than a thing, a repository, or a function. It operates by way of analogy, by way of constructing an analog space with an analog 'I' that can observe that space and move metaphorically in it." (p 65) This is indeed close to Asch's very simple and straightforwardproposal, but had Jaynes proceeded on the basis of this positive statement rather than on his seven points showing that

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[1] See Appendix to this chapter.

consciousness is not necessary, he would not have been able to substantiate his main thesis; that up until quite recent times human beings were not conscious.[2] Luria's discussion above, makes 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' Lockean derivation of the nature of consciousness has led him to confuse 'consciousness' for which there was and is a good and useful definition, with the development of generic conceptualization.

We turn now to that good and useful definition. In 1972 Chein published The Science of Behaviour and the Image of Man, a rigorous and comprehensive panorama and system of psychological concepts. Behaviour he defines as "any spontaneous directed action" (p 77). From this he drives the concept of awareness.

Awareness is "minimal behaviour, behaviour conceptually stripped of all its components save that which is barely sufficient to maintain some spontaneous directed action with respect to an object". (Chein, 1972, p 83) Awareness is included in every instance of observed behaviour. Every awareness is inherently a directed act and therefore motivated.

And as Chew et al (1982) add, awareness is perception. Dreams, hallucinations, etc., are simply different kinds of acts. (p 162)

Using the same irrefutable and common sense observation that Asch made, he continues:

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[2] See Appendix to this chapter.

> "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." (Chein, 1972, p 95)

Consciousness is present when we are aware of the activity of the mind (Vygotsky 1962, p. 91) and our awareness. As for Bohm and Chein, so also for Vygotsky in his analysis of the consciousness of conceptual thought; consciousness demands a hierarchical framework.

> "To us it seems obvious that a concept can become subject to consciousness and deliberate control only when it is a part of a system. If consciousness means generalization, generalization in turn means the formation of a superordinate concept that includes the given concept as a particular case. A superordinate concept implies the existence of a series of subordinate concepts, and it also presupposes a hierarchy of concepts of different levels of generality." (Vygotsky, 1962, p 92)

Similarly there is agreement with Jaynes' first point that consciousness is not extensive or continuous. (Vygotsky, 1962, p 91) "Cortical consciousness is really chiefly cortical unconsciousness or a potential" (Caudwell, 1949, 1971, p 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, p 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". (Chein, 1972, p 96)

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.

Any formulation of consciousness in terms of directive correlations must therefore respect and account for:

(a) its definition of awareness of awareness
(b) within a hierarchical system
(c) and 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, p 189) unconsciounsess is a "partial breakdown of this kind affecting merely the actual and potential directive correlations that exist between the current states of the animal on the one hand and the current states of the environment on the other (and indeed only the short term ones) leaving intact, therefore, the internal directive correlations, the internal regulations, etc." (1981, p 193) Consciousness without overt behaviour is the presence of the potential directive correlations and 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 an actual directive correlation the value of Yo is an actual member of the set So 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 satisfied the focal condition of person as Ek and Hk.

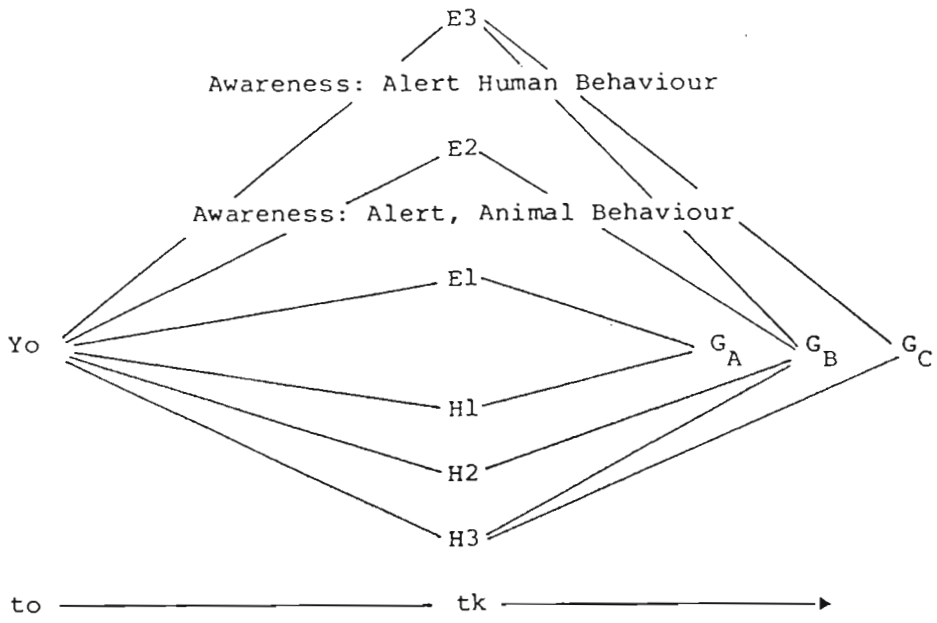
Thus the first directive correlation within the hierarchy would present Chein's definition of awareness as minimal spontaneous directed action. Ek here is of course a normally defined environmental feature or event. In order to satisfy the definition as awareness of awareness, the awareness in the original directive correlation must assume environmental status. In other words the actual or potential set so must include the behaving or aware self as an actual or potential member of So. It is not necessary however, for a formulation of our ability to behave consciously that an actual value be specified. Given our lesson (c) above that subconscious behaviour is common and consciousness a known potential in any circumstance it is sufficient to satisfy the definition that self may potentially assume Yo in an actual set So. The mapping functio P(Yo) = Ek may then define the original awareness, minimal behaviour as an environmental event.

We need only a single diagram, remembering that one may be conscious of purposes and even 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 2.3 shows a nested hierarchy of directive correlations for both animal and human adaptation. El, K - Hl, K = 0 specifies animal adaptation in respect of Yo an actual member of the environmental set So and GA, a goal. Level 1 therefore specifies adaptive goal-seeking behavior. For human awareness, the directive correlation is given by the condition where Yo is an acutal member of the environmental set So and

Figure 2.3

Consciousness as Adaptive Behaviour



the person behave adaptively such that $E2_K$ - H2, K = 0 in respect of Yo 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 Yo such that the response function P(Yo) = E3 is matched by the response function B(Yo) = H3. Similarly we may be aware of our awareness in respect of Gc, a set of ideals. The focal condition however, remains the same as in the case of purposes. As it would probably be maladaptive to be continuously conscious so it is maladaptive, if not impossible, to be continuously in a state of ideal-seeking (Emery F., 1977)

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 Yo in an actual set So 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, p 198) In such a case the self does actually assume Yo in an actual set So, so that 'we devote our behavior exclusively to it;' it being brought into stark figural relief.

The moment of consciousness then is an adaptation when the focal condition (F(E3, E2, El, Hl, H2, H3) = 0. (We must allow the possibility that at times we lapse into goal-seeking).

A further specification is necessary and we return to Johnston & 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 Yo and the back reference period exceeds tk-to, we would expect to see something like stage fright or at the extremes, perhaps unresponsive catatonic schizophrenia.

Both dimensions are therefore necessary in order to specify adaptation; becoming an environmental event such that we know ourselves as planners and actors who change the environment (Ll2 relation) and being constrained by the fact that such planning is embedded in doing, action. It is in this way that 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 field Yo we can respond adaptively to our own response function of awareness, perception. If we then, 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.

Such an explication takes us far beyond the simple model specified for animal adaptation. In particular it confuses the notions of affordance and effectivity, even as coimplicate properties of the ecosystem. We may begin to reassess these concepts by attributing some values to the variables in the model as they may be used to test the actual hypothesis here.

We have specified values of G as the hierarchy of goals, purposes and ideals. We will take as the coenetic variable the extended social field of directive correlations. Yo = L 22 where the values of Yo are the causal textures of this field. This application does not have the concreteness usually found in ecological animal studies but

> "the gap may well prove to be more apparent than real. As Gibson (1966) and Tomkins (1963) have argued, living systems probably learn and hence adapt because of their ability to react to the general and less variable properties of the environment, rather than because of their sensitivity to the concrete events and objects which do after all yield a constant flux of stimulation. Measuring organizational environments along the dimensions suggested by Simon, Ashby, and the others may be all that is required to realize Sommerhoff's general theory." (Emery, F, 1981, p15)

We will refer to this level of environment as E_E.

Using hierarchies of directive correlations, we can specify that there will be environments within environments as there are goals within

purposes and purposes within ideals. People live within organizations whose structures are genotypically defined by the nature of the design principle underlying them. Redundancy, necessary for adaptability, can be achieved organizationally in only two ways: by adding redundant parts to the system which is known as design principle 1, or by adding redundant functions to the parts (design principle 2). (Emery, F, 1977, p 92) These structures may or may not stand in an adaptive relation to any given causally textured field or environment. They clearly fit the notion of econiche.

"A description of an animal as an actor possessing a particular set of effectivities, or an effectivity structure identifies, in short, an econiche, which is an environment possessing the necessary support for those effectivities." A description of the ecological support for an effectivity defines an affordance which is a specific combination of physical properties of an environment take with reference to a particular effectivity. A description of the physical properties of an environment, taken with reference to the effectivity structure of an actor, defines the affordance structure of an econiche for that actor." (Johnston & Turvey, 1980, p 152) The emphasis here is on physical or more local environment, but econiche refers to a description rather than a locality. "Actor" and econiche are again coimplicative and cannot be defined independently of one another. It represents, therefore, a consistent and intermediate level of environmental analysis which we may translate from the purely physical to the social concept employed in the derivation of the L22. Econiche here is analogous to concepts such as that of 'task environment' . From here on, 'econiche', or the more commonly employed 'ecosystem' will be used interchangeably for our concern is with the ecological support for certain behaviors where the system boundary

conditions are specified as processes. This level of environment we will call Ee. For each environment (Yo = L22 or Ee) we must then describe the affordance structure of its embedded organizations in terms of the organizational structure and effectivities it supports, in other words describe the econiche (Ee).

Clearly dominant forms of organizational structures evolve adaptively in certain environments. They can be viewed as human effectivities as well as econiches. A further complexity is contained in the fact that while an organizational structure functions as an econiche which affords some kinds of knowing and learning, it also functions as a medium of communication. (Emery and Emery, 1976, Part III) In this capacity a given organizational econiche may either be compatible or incompatible in respect of some G with the technological media it employs, or indeed with the non-technological or given media, such as conversation. Econiches and media may stand in some adaptive or maladaptive relation.

As we have taken technological media as both a human extension and co-producer of environment, or now econiche, so they too may be viewed as either or any of affordance, effectivity or econiche. The unifying concept is that of communicating.

By communicating we shall mean the process of producing a change in one or more of the parameters of the choice situation, or purposeful state of another system (adapted from Ackoff & Emery, 1972, 1981, p 142) and/or one's own. The communication may be direct, as in a face-to-face situation, or indirect or mediated, as through a technological medium, such as telephone, television, or book. Communication may be a mutual or group process where changes in the parameters of the choices for

participants are simultaneously occurring. These changes need not, however, be identical in nature. "Social-communicative meaning or sense constitutes the basic unit of communication. In other words, communication involves the perception of what it is that the speaker wishes to convey and what motivates his/her utterance." (Luria, 1981, p 45) It consists of "a series of translations . . . (which) do not simply communicate information about the world; they define and express the relationship between the speakers. The expression of emotion or desire is subject to the same principles of selection in order for meaning to be expressed as any other kind of linguistic communication." (Clifford & Frosh, 1982, p 268-9) The notion that communication is at one and the same time a process and the development of human relationship is fundamental to traditional rhetorical theory (Arnold, 1982).

The literature makes clear that communicating is a transformati process. We therefore specify that the nature of the relevant response functions and mechanisms involved in adapting to an econiche of people, organizations, and media, in structured interdependencies within a textured field are those of communicating. Communication as response function defined over either the econiche or the person can be considered adequate or successful when it produces adaptive behavior in, or an adaptive relation between, the x's at tk.

A technology, therefore, can be considered to be maladaptive when, by its communication, it induces behavior which fails to satisfy the focal condition, induces consciousness which exceeds the back-reference period or seriously inhibits purposeful behaviour or consciousness during the period of the communication.

The definition of consciousness derived here has removed an impediment from analyses of human behavior which has been only hinted at in the work above. That difficulty has been to avoid the notion that for humans, what may appear as an affordance in one light, or at one level of analysis, appears in different perspectives as an effectivity, mode of response or adaptation. Now that consciousness is defined as the ability to directly perceive oneself as a potential or actual environmental event, the way is open to acknowledge and thus reduce the complexity. 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. All of the above concepts may therefore be collapsed within a single set of directive correlations with due specifications and allowing that the position or value of any given variable (Xx, k) within Xl-n, k will vary as the focus shifts between time spans and levels of analysis.

The possibilities inherent in this model, for maladaption as well as adaptive behavior, defined over the two critical dimensions of focal condition and back-reference period, emphasize the point that consciousness imposes the need for "a degree of unity with his actions, into his relations with others, and into his thoughts if he is not to be overwhelmed" (Asch, 1952, p 122) The notion of unity to preserve and communicate the content of consciousness is common but the evidence does not support Vygotsky's claim that such unity is totally given by experience, 'tacit convention' (Vygotsky, 1962, p 6). While unity may not always prevail, resulting in informational overload, (Emery & Emery, 1976) 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 to have a biological base. Unity or

adaption which is used in its sense of meaningful order, is established by the set of invariances, both ecologically and culturally determin[ed] which define the common world. As manifestations of a system principle or implicit order, they function as the moderators of consciousness, preserving the set of directive correlations and orienting its orderly growth. Media which distort or unbalance the awareness-consciousness relation towards disorderly or reduced growth will be found to be inhibitors of conversation and group life, as fundamental adaptations.

Because consciousness as the set of directive correlations is infinitely expandable both through the range Xl - n,k 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, p 269)

Clearly, individual human growth and development depend on the ability to differentiate and/or 'see' the possible X's within the set of directive correlations. We shall return to learning as perceiving. However, explicating consciousness in terms of directive correlations clearly allows for the two central themes in the literature; that principle which allows us to see ourselves as part of an organized field and the growth of complexity within the ordered, unified set.

The above formulation lends itself to other derivations, Imagination would become that activity where Yo belongs to a potential set So. We are conscious of our imagining when our self takes an actual value o[f] (E_E or Ee) in a potential set So. We will explore these further when we

examine what light this formulation throws on the troublesome concept of memory and not knowing.

5. Appropriate Grain of Analysis and Time-Scale of Adaptation

Having looked in general at the human condition and concept of adaptation, it is time to turn to specifics which are immediately available to the test of empirical evidence. Given that any temporal scale of description of the environment may range 'from milliseconds to millenia' (p 165) Johnston & Turvey (1980) opt for three practical time frames of analysis -- long-term adaptation, or evolution by natural selection, short-term or coordination of perception and action and medium-term adaptation or learning. While there may be excellent evidence for evolution over the long timescale, this frame simply cannot be of use here as the technology in question has been standard fare for only one generation. The decision which required justification here is the inclusion on equal terms of the short- and medium-term frames of adaptation.

Gibson maintained that a central issue for psychology was the grain of description and analysis. Subsequent work has supported the notion that while a fine-grained description of energy as given by physics and operated on by neural processes yields "a complicated, chaotic aggregate", a considerably coarser grain yields phenomena which are "coherent, orderly and systemic." (Turvey & Shaw, 1979, p 209) Both animal and environment-related statements must be equivalent in grain of analysis and they must be compatible. Turvey & Shaw advocate the 'doctrine of necessary specificity' -- there is a grain of description at which the patterned energy is specific to the environment and this is the grain that must be pursued, no matter how coarse. (1979, p 212) To use

other than the appropriate grain is to create misconceptions and even more pseudo-problems in psychology. Most of those with which we now ha to deal have arisen from the assumption and use of 'inequitable descriptors'; for example describing speech or conversation as sound at the level of physics, acoustic signals generated by vocal activity. The result of such inequities, the Gibsonians describe as 'unattractive hypotheses'; for example "that the meaning intended by the speaker disappears at some point in the communicative process, and that there is a point in the listener's brain activity when the neural process concomitant to the received sound acquires meaning." (Fowler & Turvey, 1982, p 16)

The doctrine of appropriate grain has been amply demonstrated in animal and plant studies, and has resulted in a further refinement. "The environment for a given animal is species-characteristic, and thus it not captured by a physical, observer-neutral 'objective' description. But it is not a subjective environment either". (Fowler & Turvey, 1982, p 9) It is no longer good enough to hypothesize a general principle at one level, test it on a species and generalize the results back up to the status of a species-independent law. In the realm of human behavior this aspect of the 'grain of analysis' argument is particularly cogent. Consciousness can no longer be denied or disregarded.

As noted above, the early Gibson chose to de-emphasize possible underlying mechansims in favor of developing a coherent psychological grain of analysis. As Pibram (1982) has observed, however, there is some willingness now on the part of the Gibson school to effect a reconciliation of theoretical framework and neurological mechani While detailed neurophysiological analysis cannot substitute for the

conceptual work needed, it does deal "with processes such as 'orienting, exploring, investigating or adjusting' over time exactly as Gibson's account required." (Pibram, 1982, p 370) . . . Precise mechanisms . . . are critical to coordinate structures." (p 374). There is no reason to suppose that the two levels cannot work hand in hand complementing and stimulating research. Through collaboration, research may be not only enriched but the disciplines may keep each other honest to a greater extent than has been observed over the last century. Such a belief is held by this author and it is clearly, if implicitly, the belief of Tomkins whose work is reviewed under learning.

Research by Brown (1970) suggests that perceptual, affectual and EEG states are similarly organized in the majority of individuals and that "similar chains of mechanisms process the data of both active perception and feeling states." The formation of EEG-feeling relationships occurs below the level of communicated awareness and degree of organization accounts for differences in abilities to conceptualize or bring to consciousness the coordinated response. (Brown, 1970, p 462) It would appear that "adaptation must be an integrated response by the entire biological system and it must be effected concurrently at all levels of biological organization." (Johnston & Turvey, 1980, p 165) It would appear that a systemic analysis of the effects of a widespread technology should consider all levels of bio-psychological function. Lack of convergence or divergent response between different levels of function would indicate almost certainly, problems in the reasoning which led to the hypotheses in the first place. In other words, different system levels of function must be co-implicative and able to be predicted, one from the other, if they are genuinely to be properties of the ecosystem. Different system levels of response in respect of a single overriding

hypothesis will also, therefore, function as internal checks of validity on results at any one level. Given also that co-implications identified earlier by Emery & Emery (1976) appeared to indicate consistency across system levels and a check by literature survey of the correlates of reduced cortical activity (below) is supportive of those indications, we believe a two grain level of analysis justified. In addition, a dual approach has greater potential power to generate hypotheses. We proceed therefore with Johnston & Turvey's short and medium term scales of adaptation.

6. The Short-term or Perceptuomotor Level of Adaptation

This has a back-reference period of seconds or minutes and covers, therefore, most ordinary day-to-day activities. Perceptuomotor adaptation involves a direct adaptive reaction to econiche structure that constrains the person's behavior to some particular reaction; such constraint is adaptive when the focal condition is satisfied (adapted from Johnston & Turvey, p 180). As Chein's analysis has shown, a perceptual act does not necessarily invoke consciousness; it is adaptive in a more basic ecological sense that that implied by theories which rest on a regressive model of indirectness mediated by inferences. "Perception works as an adaptive response because it permits the coordination of action in regard to a real environment, not because it delivers an equivocal central representation of that environment." (Johnston & Turvey, 1980, p 166) At this first level we see that constraints arise in perceptuomotor adaption" by virtue of a sensitivity of the perception/action system to information in the form of structured energy (such as light and sound), a sensitivity that is expressed as a modification of the state of the system, hence in the form of the action that it specifies." (p 181)

Two points are raised here: firstly the question of biological sensitivity to an econiche or affordance; and secondly, as corollary, the fact that such sensitivities are not generally under conscious control. Purposeful they may be, but not yet in a sense that would enable us to elevate such reactions to the realm of conscious psychological inquiry. Our first point here is significant in that the original set of hypotheses proposed by Emery & Emery were widely interpreted as a 'black and white' response to the television technology, although it was stressed throughout the discussion of comparative experiments that individual differences were responsible for the range of neurophysiological reaction (Emery & Emery, 1976, p 82-89). Adopting Johnston & Turvey's convention serves both to clarify and confirm that adaption is an ecological property, determined as much by the sensitivities and effectivities of the human actors, as by the technological affordances or econiches. The adaptivity of watching television by an individual will at any point in time, be a property of the total set of directive correlations.

However, while the perception/action system may be in an indefinite number of states, and the state of the system determines the current behavioral performance (Hk) of the person (adapted from Johnston & Turvey, p 181) there is no expectation that all or most of these states will be adaptive. Previous research has pointed to system states which are associated with televiewing and maladaptive in respect of learning. For television to be found adaptive over this short term level of econiche change, the constraints it imposes upon system state must satisfy the focal condition. We propose therefore that television technology will be found to be maladaptive in that it induces a set of system states all of which cannot, by definition, satisfy the focal

condition in terms of learning. We will expect, therefore, to find that empirical research has already determined that there exists a range of states associated with watching television. Range of individual sensitivity leads us to expect that the population will be normally distributed across this range of states. The fact however, that some people outside the modal range may show a system state some of the time, which does satisfy the focal condition, will only serve to emphasize the maladaptivity of the range of system states itself.

The second issue raised above is relevant to choice of level of system state. Because our focus is dual, that is both short and medium term adaptation, we may consider response function, system state, overall behavioral performance and focal condition at either level. For reasons of both economy and prior empirical indication, we choose however to deal with differing variables at the two levels where the commonality is given by the specification of coenetic and goal states. Perception operates irrespective of consciousness but cannot be divorced from learning which is a phenomenologically given property of human life (Emery, M, 1982, c), here defined as the growth of the total set of directive correlations over the individual life span. It seems reasonable therefore to restrict analysis of system state and determination of focal condition to the level of sub-awareness while reserving response function and behavioral progress towards goal state for the level at which they are most commonly understood as distinctly human attributes. On the assumption that there is an organizing principle for all levels of response, we should anticipate little difficulty in empirically correlating the two levels for coherent system function. As Johnston & Turvey specifically observe: "An animal is not a succession of instants; it is an extended event and in striving for a unified account of adaptation on different time-scales,

we have given explicit recognition to this fact." (1980, p 198) This leads us to agree that "developments in the neurosciences' conception of how the brain and nervous system(s) function are indispensible to cognitive psychology . . (and that) no cognitive psychology can be accepted as adequate which is at variance with known neuro-physiological functioning." (Weimer, 1974, p 437)

The system state will be described therefore, in terms of its neurophysiological characteristics and the hypothesis may be put formally as: CRT technology is maladaptive in that it induces a range of neuro-physiological states which fails to satisfy F (Ee,k,Hk) = 0 in respect of Yo and G as specified.

7. The Medium-Term Level of Adaptation of Learning

The processes and principles employed here of direct realism or adaptation are identical to those used above, but over the span of a life. Therefore, "learning works because it permits the development of effectivities that are supported by affordances in a real environment." (Johnston & Turvey, 1980, p 166) On page 183 we find: "An ecological account of learning requires a description of environmental structure as an integral part. The ecological support for learning . . . is, of course, the coenetic variable of adaptation . . . It is that aspect of the environment to which the adaptive response is made." 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 an effectivity. In the present context, however, it is more useful not to attempt such narrow functionalism. Because of the breadth of our specification of Yo,

we accept that one of our human effectivities is to create affordances which contribute to the evolution 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 becomes the growth of the total set of actual and potential directive correlations, or contents of consciousness, towards the implicate order.

The response functions which map the coenetic variable onto what has been defined here as econiche and which thereby support the phenomenological concept of learning have been generically defined as communication. As is made clear below, there are established adaptive communicative processes, that is, modes which conduce the adaptive learning spiral as defined here. The very fact that these may be distinguished raises the question of a set of maladaptive interrelations between coenetic variable, 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 spiraling growth which mimics adaptation towards greater purposefulness and the implicate order, but which is in fact mimicking the form, away from the implicate order or the control of an ecological systems principle. An appropriate model may be the malignant tumor which by its lack of differentiation leading to metastasis makes 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 concept and formulation of learning here obviously bears little resemblance to much of what is said of learning in standard texts where the assumption is that learning is a cognitive activity. That assumption and its derivative notions of learning are products of the mechanistic metaphor. Defined contextually such fragmentation is impossible, "All our experiences are colored by feeling" (Thatcher & John, 1977, p 113) and "our data show . . . that learning cannot be divorced from the total human system and that it is tied most closely to the affect or emotional system." (Emery, M, 1982, c, p (ii)) Thus, while we continue to use affect 'system' in Tomkins' sense, such useage 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, 1983) 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 1963, p 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.

Additionally, "it is the freedom of the affect system which makes it possible for the human being to implement and progress toward what he regards as an ideal state - one which . . . entails the maximizing of

positive affect and the minimizing of negative affect." (Tomkins, 1963, p 126) Ideals and affects are related on several dimensions and th appears to be an even stronger link between the positive affects of excitement and joy and the initiation of an ideal-seeking mode. Specifically, positive affect can be seen as the mechanism of diffusion or spread of learning. The summary of this argument has been presented as:

"(i) The ideal-seeking mode is the result of concentrated perceptual work where the mode itself and the consciousness and emotions it produces are innate capacities.
(ii) The process is motivated and powered by the affect system which we perceive as an ideal state when it tends towards a maximum of positive emotion; the state of joyfulness.
(iii) Such a state and mode can be only temporary but its effects carry over and are matured within everyday life.
(iv) Diffusion through joy is a product of the liberating and expansive nature of the experience itself because energy and joy are contagious." (Emery, M. 1982, c, p 213)

As ideal-seeking is conceived as one of our highest levels of function simultaneously expanding our understanding or capacity for wisdom, and guiding and simplifying our behavior over the long-term, its association with positive affect is normally conceived as a most adaptive one. Ideals satisfy Tomkins' criterion that a human "becomes freer as his wants grow and his capacities to satisfy them grow." (Tomkins, 1963, p 111) They represent through their action/affect relation the ultimate marriage of emotion and reason. However, the fact that affects may become bound to a maladaptive set, thereby mimicking and amplifying its properties, means it is entirely possible that artifacts, such as CRT technology, given what we already know of its effects, could create a econiche so heavily productive of positive affect that it represents a pseudo-ideal state. The tendency to maximize positive affect will l to time being devoted to being within that econiche and diverted away

from others. This fits many observations of the television phenomenon but bears little relation to ideal-seeking as defined (Emery, 1977). Our innate motivation for people and novelty (Tomkins, 1963) can be well satisfied by the ever-changing content and the emphasis on faces (Emery & Emery, 1976). Self-validation and self-fulfilment would permit the misperception that television is providing huge amounts of information and learning as in the expansion of purposes, and total set of directive correlations. Tomkins' analysis provides another perspective on the inherently rewarding nature of television and the fact that it pinpoints a flaw in an otherwise well-designed system. (Emery & Emery, 1976, p 92-93) Should an indivudal become enmeshed in such an attractive econiche it is clear that the choices made while within its influence will not reflect any need to act out or plan for future outcomes. Virtually cocooned by positive affect, the only ecosystemic relation of any import will be the Lll, internal dynamic. Learning for humans cannot be maintained under such a condition which is strictly goal-seeking (Emery & Emery, 1976, p 74)

By virtue of the fact that learning is an affectual phenomenon, Tomkins' work complements the neurophysiological explanation of why "the crisis of television only starts when you turn it off." (Emery & Emery, 1976, p 77) The principle of the oscillation of the affects states that the affects are dependent on each other to the extent that the cessation of one causes the onset of another. (Tomkins, 1963, 272-281) On one side of the dynamic is the smile of joy which occurs when an individual moves from a novel environment to one which is essentially familiar, or contains people or subjects which are more familiar than the novelty or complexity of the preceding environment. Familiarity results in a sudden reduction of the stimulation, and thus the smiles. (Tomkins, 1963, p

257) As familiarity appears to be one of the hallmarks of the viewing experience, we would expect that the most commonly observed affectu response would be the smile. On page 303 we find a discussion of the relation between energy level and affects: "low energy raises the threshold of positive affects and lowers the threshold of negative affects." Reduced cortical activity as the low energy system state correlated with viewing will result in an increased tolerance for and prolongation of positive affect, but we would suspect that the positive affectual state itself will be of low intensity; that is, interest rather than excitment or the peaks of joy, and also that the smile itself will be a low energy affair.

On the other side of the dynamic is the 'debt' phenomenon observed after long periods of positive affect. This consists of a fatigue which produces vulnerability to the negative affects of distress and aggression. (Tomkins, 1963, p 107) Returning from a televiewing bout to the real world is the equivalent in Tomkins' terms, of moving from an environment requiring only a low density of stimulation (reduced cortical activity) to one with a requirement for much higher density. This shift may cause firstly the distress or frustration of readjustment to greater complexity, and should the density of activation associated with this reach a sufficiently high level, may activate anger. (as above, p 256-7)

Tomkins' analysis at the medium term level of adaptation highlights two points of commonality between this level and the perceptuomotor. Firstly, the detailed neurophysiological argument made for impulsive and aggressive behavior following televiewing is paralleled by the princi of the oscillation of the affects. Secondly, and perhaps more centrally, Tomkins has lead us to acknowledge the low intensity smile of familiarity

while viewing, which again exactly parallels Krugman's 'characteristic mode of response' to the medium.

With the reassurance generated by these conjunctions, we may turn to another of Tomkins' insights, similarly related to energy and affect but specifically directed to intellectual activity. Using the notion of limitation of channel capacity for the reception, awareness, analysis and transmission of information, Tomkins argues that "Thinking can be interfered with not only by the feedback of gross muscle activity but also by an insufficiency of such feedback." Previous empirical studies have shown "that if one is completely relaxed with respect to the tones of the muscles which sustain posture, it is impossible to keep the thoughts sufficiently directed to initiate intellectual problem solving . . . such states of relaxation are conductive to the evocation of hypnogogic imagery, to the hyperamnesia of free association and hypnosis." (Tomkins, 1963, p 147) Affectual states may interfere with the purposeful activity of the perceptual system but are less subject to conscious control than are the gross muscle states. (p 147-8) A low intensity but rewarding state of positive affect which is part and parcel of a concomitant reduction in cortical activity and gross muscle tension (Emery & Emery, 1976, p 93-4) will have far reaching systemic effects, not the least of which is a reduced ability to perform consciously. In other words, should new evidence point to television's role in producing such a state of affairs, there will be further substantive grounds for hypothesizing that television, or CRT technology in general, is inhibitive of learning. Should there be coherent data to support the contention that television interferes with the ability to learn as defined by types of knowing, there will similarly be firmer ground for research directed towards its neurophysiological (and hopefully

neurochemical) effects conducted within the contexualist paradigm of pragmatic realism.

Tomkins' brilliant analyses of human affect and the funamental role it plays in our lives has in many ways served as a bridge between the short and medium-term analyses, because obviously his theory is systemic. But the convergence of theory as above, if not yet evidence, leads to a further conclusion which may be drawn at the ontogenetic level: regardless of whether television serves the purpose of learning as adaptation, it should certainly have a recognizable affective tone. On current indications this will be one of muted positive affect. Should the primary hypothesis be supported and maladaption evident at this level, the very fact that there is a distinctive affectual response to the medium rather than a normal oscillatory response to ever-changing content, will further support the direct evidence about lack of learning.

Analysis of the affect system has shown that there is a way in which the human system may be seduced into a vicious cycle of maladaption. At the level considered here, the key is of course the creation of environments which then function as coenetic variables 'driving' the directive correlative set. With this formulation we can see that purposes may well be diverted away from approximating a viable ecosystem as they will be defined in terms of a coenetic variable which is itself inimicable to movements towards the given adaptive or implicate order. Our final chapter in this part will take precisely this question. The critical test for the adaptivity of any human system will lie in its congruence with an environment which is itself adaptive. But firstly we must examine the concepts of <u>learning strategy</u> and <u>knowings</u>.

(i) The Choice Model, learning Strategies and Knowings

While learning is defined above as the growth of the total set of directive correlations, it is clear from ordinary useage that methods or strategies of learning are commonly distinguished. So too in everyday language are different forms of knowing. While at the perceptuomotor level we will use neurophysiological dimensions to describe system states, so at the level of learning which is concerned with changes in overall behavior (Johnston & Turvey, p 188) towards purposes, we will use the correspondency between the parameters of the choice model, learning strategies and knowings, to establish another perspective on adaptation. Learning strategies are the link here to environments and will be discussed in relation to them. Here we will take knowings as the focus of assessment in terms of their contribution to the orderly growth of the total set of directive correlations in terms of meeting purposes. We will return to learning strategies in the discussion of environmental types. Thus while we must discuss these complexities, they need not be reduced to the indirect kinds of mechansim which have characterized traditional and still current theories of learning. (Johnston & Turvey, 1980, p 199) A necessary digression below into the nature of remembering and forgetting -- the concept of 'memory' -- should serve to reinforce the paradigmatic distance which is involved here. Knowings (and not knowings) are useful in so far as they elucidate the process of extracting meaning from the ecosystem of which we are a part; in particular, the ways in which we may be misled into pursuing econiches which glitter with promise but present only dead-ends for learning and adaptation.

The correspondencies between learning strategies and knowings are as follows:

Table 2.1

Parameters of Choice, Learning Strategies & Knowings

Salient Parameters of Choice	Learning Strategy	Type of Knowing
L 11	conditioning	Knowing of
L 11, L 12	Meaningful Learning	Knowing about
L 11, L 12, L 21	Problem Solving	Understanding
L 11, L 12, L 21, L 22	Puzzle Solving	Wisdom

This table is extracted from the more exclusive one presented in Chapter 1.

Knowing of is tied only to the first parameter of the choice model, the probability of choice, which is related to information and familiarity (Ackoff & Emery, 1972, 1981, p 41) A communication which produces a change in the receiver's probabilities of choice in respect of a goal G is said to inform (as above, p 144). Knowing 'of' therefore in the mod above is a property only of the response function, communicating, defined over the systems arm. Such a communication on its own is clearly incapable of producing an adaptive response as there is no accompanying response function to map Yo onto the environmental arm which is, of course, necessary to establish the focal condition. It is a form of knowing which is ecologically incomplete or a-contextual.

Knowing 'of' relates to phenomenal experience but lacks the dimension by which we grasp the affordances of objects and events. In other words it is a form of knowing which changes effectivities without adequate perception of the behaviors indicated by the enviornment or econiche. Should a person be simply knowing 'of', the mapping function defined over the environment must be drawn from sources other than the immediate present eco-system. This information will have to be 'remembered',

'imagined' or in some way transposed from a frame outside the immediately given back-reference period. In Johnston & Turvey's terms, this is sufficient to mark knowing 'of' as maladaptive.

In strictly human terms however, we must query this proposition because transpositions across time frames such as in 'expecting' clearly serve an adaptive purpose and cannot be divorced from learning. What we can propose is that knowing 'of', because of the entry of the transformational process, will be subject to a greater risk of error and inaccuracy. This is elaborated below in discussing remembering and forgetting, but it is sufficient to note here that the incompleteness of the information available in knowing 'of' will not reliably result in the perception of an invariant, and therefore, any resulting actions will have a lower probability of appropriateness and effectiveness as they are less constrained by immediately accurate environmental information. For example, communicating knowing 'of' will more likely show the same inaccuracies and this becomes a critical point in the discussion of recognition and recall.

Knowing 'about' involves both probability of choice and the probable effectiveness of courses of action. The critical mode of communication is instruction or the mapping of Yo onto the environmental arm of the model.* A communication which encompasses both response functions establishes the conditions for an adaptive response, adaptivity being

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* This is not strictly as defined by Ackoff & Emery, who relate knowledge about only to probable effectiveness. However, should a communication instruct, it is difficult to imagine how it could fail to inform. Even the most curt command conveys familiarity with the speaker. Additionally, as we will use these distinctions in our analysis of the values of Yo and these are the parameters associated with those values (Emery, 1977) the more comprehensive form is appropriate.

dependent of course on the accuracy of the mapping. 'Knowing about' defined in this way is, therefore, the minimal adaptive form as it encompasses affordances as well as merely effectivities and, as such, is above all essentially itself communicable.

The distinction between knowledge 'of' (by acquaintance) and 'about' (by description) is generally conceded to be a critical one for conceptions of cognition. Weimer (1971) attributes it to Bertrand Russell but its origin in modern times is to be found in The Principles of Psychology (James, 1890, 1983) The Gibson school has argued strongly for such a distinction but has adopted the reverse terminology of 'of' and 'about'. In distinguishing direct realism from a propositional or inferential psychology of cognition, they argue that judgments depend upon the existence of perceptual experiences that directly draw upon the 'facts' of the world. (Shaw et al, 1982, p 193) Judgments are therefore 'about' something while perception is 'of' something. Certainly this form of language captures the desired distinction but without invoking an indirect cognition we may also speak of a judgment as an evaluation of a perception in relation to meeting purposes, which does not violate the Principle of Direction Perception.

The Russian school of Vygotsky & Luria have made a similar distinction between sense (knowing 'of') and meaning (knowing 'about') although the flavor of the theory is more socially and linguistically than ecologically oriented. Meaning is "a stable system of generalization represented by a word, a system which is the same for everyone". (Luria, 1981, p 44) Sense is "the signification of an individual instance of a word as opposed to the stable, objective system of relations" (p 44). Sense as a selective aspect of meaning which interests the person at a

given moment (p 45) comes close to our focus on probability of choice as it is this individuation of meaning that invokes effectivities and individual expressions of affects (p 45).

The 'facts' of the world entail the coordination of effectivities and affordances but certainly for humans there is a form of perceiving or knowing which does not deal with affordances as immediately, physically present -- as in imagining. It would appear more useful to preserve the conventional form to convey the difference between a communication which does ('about') or does not ('of') on its own, provide the complete conditions for an adaptive focal relation between system and environment. Thus while both forms of knowing are perceptual, we expect knowing 'about' to have a higher probability of being veridical and adaptive.

There is no necessity implied in either knowing 'of' or 'about' for conscious knowing. Animal perception or behaving operates in terms of probable effectiveness and is both communicable and communicated, but without spoken language. The team work of human and sheep dog is an example of both shared knowledge 'about' and interspecies communication as the result of meaningful affectual learning. On the other hand, there is no obstacle to our becoming conscious of either our knowings 'of' or 'about'; but as we have seen above, the perception which becomes conscious through knowing 'of' will be a new amalgum of an effectivity and a remembered or imagined affordance.

There is an implied necessity for consciousness however, in the next level of the hierarchy of knowings, and understanding as an awareness of the process of extracting and communicating meaning is reflected in both the common useage and dictionary definition (Webster's) as well as the

formal and technical definitions. As Waldrop (1984) has put it in his examination of natural language, understanding and artificial intelligence (AI) -- "Somewhere behind the surface structure of human language there lay an enormous body of shared knowledge about the world, an acute sensitivity to nuance and context, an intuitive insight into human goals and beliefs." (p 372) The problem for AI is that the machines do not 'understand' in the way in which people do; they cannot extract meaning from language in order to further or create purposes. Understanding involves apprehending the meaning or significance of what is known (Ackoff & Emery, 1972, 1981, p 47), in other words, being aware of an awareness. As the authors make clear in their discussion of this concept, it is a more comprehensive form of knowing than simply 'knowing how to' and is centrally related to the concept of <u>probability of outcome</u>. (as above, p 50)

Understanding has also to do with detecting a problem's solution in the workings of a real system (Fowler & Turvey, 1982, 2, p 6): in other words it represents an awareness of the difference between an adaptive or maladaptive relation between affordance and effectivity. Understanding then is responsiveness to whatever affects the efficiency of actions, potential or chosen, towards achieving a purpose; the process of judging the quality of the focal condition. More than this, the ability to understand is "The ability to <u>explain</u> the effect of changes in one's environment on the efficiency of one's choices." (Ackoff & Emery, as above, p 47, with added emphasis)

This makes explicit the tie of spoken language and consciousness. It also clarifies the notion that understanding is a 'doing', a manipulation of perceptions across the total set of directive correlations, involving

the perception of purposes. In this sense it approximates Chein's (1972) discussion of intelligence as a motivational and situational concept. It makes the link between the concept of purposeful and conscious and thus adds further rationale for Ackoff & Emery's distinction between active, multifunctional or multigoal seeking systems and purposeful systems (people) (1972, Chapter 2) Purposes are not given physical entities within environments as are affordances; their existence depends on our ability to attribute to Yo an imagined or expected value. Thus, being purposeful will share much of the character of expecting but differs in that purposefulness is more directly related to intensity of the motivating affect system. Understanding, as the first or lowest level of knowing which necessarily invokes the ability to be conscious, is not simply therefore an active state of being, but is in its own right a motivational force towards the expansion of the total set of directive correlations. Understanding itself becomes a purpose and powered by the positive affects of excitement and joy, has the potential to result in the fourth form of knowing, which we call wisdom, being wise, or acting wisely.

The concept of <u>wisdom</u> is ages old, a remnant of oral cultures which we have not lost (Emery, M. 1982, c). There is a remarkable degree of convergence between its old meaning and the more recent attempts to understand, define and formulate it. As we have seen Polanyi (1958, 1969) calls it 'tacit knowledge'. Jordan's explorations of the phenomenology of learning and Pirsig's search for quality, and sanity, both lead to "an undefined primitive, an entity that is perceptually given", (Jordan, 1968, p 146), a "preintellectual reality" (Pirsig, 1974, p 247) which is reality itself (Pirsig, as above, p 269). There is obviously a form of knowing of this reality; an ability to know <u>the unity of the</u>

knowings which are afforded by this pre-conceptual reality. Because there is no other reality (Pirsig, as above, p 247), what one learns knows from the exercise of this ability is that which every other person learns or knows (Jordan, 1968, p 146). Pirsig concluded that "what he had been talking about all the time as Quality was here the Tao, the great central generating force of all religions, Oriental and Occidental, past and present, all knowledge, everything". (Pirsig, as above, p 254) Quality "is the stimulus which our environment puts upon us to create the world in which we live". (Pirsig, p 251) Those expressions capture the fourth parameter of the choice model, relative intention; "that which relates the relative value of an outcome to other characteristics of a choice situation". (Ackoff & Emery, 1972, 1981, p 58) In this context it represents our intrinsic adaptive potential as sub-totality or unfolding of the whole towards the furtherment of the whole.

The revival or renewed interest in the concept of wisdom appears to have arisen from the fact that it is only when we are confronted with a choice between purposes themselves, the choice of long-term directions, that we need and must use an entirely different form of knowledge. (Emery, M, 1982, c, p 118) I have previously identified acting wisely with the seeking of ideals, as wisdom traditionally has involved oneness with the Earth and all her creatures. But the environmental force from pre-conceptual reality is perceived and experienced as coming from within us. We experience this external force as a feeling of harmony and beauty, (Pirsig, 1974, p 268) the ideal pertaining to the environment or field. It is directly perceived as the ordering principle of life. Those who know it also know that it is not subjective (Pirsig, p 269) but a reality of which we are a part.

In my previous exploration of this concept, I conceived the process of gaining wisdom as a perceiving of the unity of environment and deepest self through seeking the total set of ideals; where the ability to pursue these ideals represents a high degree of sensitivity to affordances. This knowing is therefore not mystical but grounded in the adaptive interdependence of affordances and effectivities.

Such a glimpse of something beyond the daily grind - a peak experience, or an intense insight into ultimate meaning - would be expected to have the power to reorganize the system of perceptions or knowings into a new configuration which itself increases the probability that further learning will hasten adaptation towards the unity so perceived. (Emery, M, 1982, c, p 120)

Having now redefined consciousness, it is no longer necessary to conceptualize wisdom as a bypassing of consciousness for the model (Emery, M, 1982, c, p 119-120) is readily amenable to the self assuming the value of Yo within the longer framework of ideal-seeking, rather than that provided merely by purposes. The difference between being conscious of our understandings and wisdom would be merely the difference between purposeful and ideal-seeking. Wisdom is the moment of consciousness when we perceive the total set of directive correlations and its timeless unity or essence.

Being wise in this formulation approaches knowing Bohm's implicate order. This underlying reality, like light, simply exists and enfolds all things. Merging with the light is the moment of enlightenment. (Bohm & Weber, 1983) This moment or sense of vision as simultaneously internal and external, an innate capacity to know the oneness of actuality, is

commonly attested to from many differing traditions (Gibran, 1923; Schumacher, 1973; Lao Tzu, 1955; Deikman, 1969, 1976; Tart, 1969) Th model therefore fits well with traditional theories and Bohm's new physics up to this point. Bohm has recently, though, postulated a super-implicate order and perhaps an implicate order beyond that in order to conceptualize a wholeness which has no beginning and no end. (Bohm & Weber, 1983, p 40-44). It may turn out that there are levels of perception beyond the awareness of awareness and Gs beyond ideal-seeking. In that case the model may be elaborated both in terms of level of awareness and time frame. However, that remains for the future and in the meantime, the model clearly differentiates four types of knowing:

(ii) Knowings: A Summary

Table 2.2 Knowings in Summary

	Parameters of Choice Model	Provide Focal Condition of Affordances & Effectivities	Necessity of Con-sciousnes	Range Time
Knowing of	I	No	No	Goals
Knowing about	I + II	Yes	No	Goals or Purposes
Understanding	I + II + III	Yes	Yes	Purposes
Being Wise	I + II + III + IV	Yes	Yes	Ideals (timeless)

These four knowings provide a framework within which a communication medium may be evaluated in terms of the knowings it induces or produces. The proposition is hierarchical with adaptation increasing as the knowings encompass more of the human potentials. However, in the vast flexibility of human behaviour there will be a time and place for ea The question of adaptivity for a communication medium is whether it can

produce different forms of knowing, including at least some of those which involve purposefulness and consciousness.

Previous television research has identified the medium with knowing 'of' and familiarity, and cast doubt upon its ability to communicate knowing about, understanding or being wise. In addition, it deals in iconic signs rather than concepts. It therefore individuates by representing structural properties which describe, but it cannot communicate the functional properties (affordances) which lie at the basis of conceptual explanation and understanding. (Emery & Emery, 1976, p 50) Television appears to be an excellent medium for conveying how something might look or feel as part of us, or as belonging to us (as above, p 49) and produces a deceptive feeling of understanding (p 107) but it cannot instruct.

Such a split between the first and other three forms of knowing is also significant in that only the first implicates a relative passivity in human terms. Knowing about, understanding and being wise are all characterized by mental and physical activity around a focal condition which is grounded in purposes associated with affordances given without transformation from another time frame. In other words, it is doubtful if knowing 'of' as a relatively frequent form can be counted as adaptive learning because it is only minimally related to human capacities. Also, as it is not supported by affordances in a real (i.e. immediately, physically given) environment, the extraction of invariants will be unreliable. A communicative medium which by replacing accurate knowing of the real environment with a feeling of familiarity with an environment drawn from the interdependencies of viewer and medium, can appropriately be called a maladaptive econiche. Congruent with this is the data

relating to affect; knowing 'of' tied to familiarity, appears to lack the characteristics associated with pursuit of novelty. (Tomkins, 196 Should an examination of television's effects in the main areas with which it has become associated, show it not able to produce any but knowing 'of', it will be maladaptive in that it denies the opportunity for learning as a process of exercising distinctive human competencies. We therefore propose: that television is a maladaptive econiche in that its viewing results only in knowing 'of'.

Testing for these knowings will be simplified by using the operational measures of recognition and recall but before we make this step it is necessary to explicate in the same model, the process of 'not knowing'.

8. Not Knowing: Consciousness and the Concept of Memory

In 1975 (Emery & Emery, 1976, pp 75-81) I touched upon the evider relating memory, memory loss, and the function of the cortex, particularly the left hemisphere. This indicated that memory was a system function with some forms of memory loss resulting directly from reduced activity in the prefrontal lobes. There was already at that time a little evidence that televiewing was associated with 'not knowing' when every expectation of its educational, informative nature was of knowing. People were simply not remembering what they had perceived. (as above, p 66) In terms of the S-R paradigm, television should have been more effective in producing knowing than either radio or silent movies because of its dual channel provision and closer approximation to reality. A traditional 'memory' would store the perceptions of television's content and have them available for retrieval as it would the real environment unless influences from sources such as the medium itself were to interfere with his normal processing. No attempt was made at that time

to conceptualize such a failure of memory apart from postulating a systemic diminution of left hemispheric cortical activity - in the terms of this work the 1975 analysis was purely at the perceptuomotor level of adaptation. Because we are here now attempting a coordinated exploration of television's effects at short and medium-term levels, we must also search at the psychological level for a formulation of remembering (knowing) and forgetting (not knowing) which has greater explanatory capacity in relation to television's failure to produce knowing. Our original thesis at the perceptuomotor level stands and indeed Luria has added new evidence particularly in relation to semantic fields.

Normally the meaning of spoken language dominates purely phonetic associations. By using the Pavlovian concept of the 'law of strength' Luria has related pathological states of the cortex, inhibiting or phasic conditions, to a reduced ability to discriminate. As James noted early on "Selection is the very keel on which our mental ship is built" (1890, 1983, p 640) The inhibitory or phasic condition is that seen in the normal population in states of drowsiness.

> "Naturally, when the cortex is in such an inhibitory state, all types of associations begin to appear with equal probability (or the weak associations begin to appear even more actively than the strong ones), selectivity in the operation of the cerebral cortex disappears, and the probability of occurrence of phonetic, situational, and connotative alternatives become equal. This is what happens in <u>oneroid states</u> when a person is almost, but not quite asleep or in conditions of <u>extreme fatigue</u>. In these cases, the inhibited phonetic associations of a word begin to surface, and selectivity is disturbed." (Luria, 1981, p 75)

In cases of the speech disorder, amnesic aphasia, word recall has lost its selectivity.

> "Instead of selecting a word on the basis of its semantic character we see all kinds of words surfacing with equal probability on the basis of phonetic, situational, and conceptual similarity . . . Textbooks often account for this

> form of disorder in terms of a memory defect. It is often said that such patients have too few memory traces. However, as we have shown, there are far stronger reasons for explaining this phenomenon by a surfeit of memory traces. These traces surface in the patient's memory not selectively but with equal probability, making selection of a word much more difficult." (Luria, 1981, p 85 added emphasis)

Forgetting as disruption of connections has turned out to be an incorrect hypothesis. Although Luria's formal language is that of associationism, the empirical work on which his conclusions are based shows clearly the predominant role of direct perceptual experience as we will see in the discussion of spoken language and conversation. Rather than speak of a surfeit of memory traces it seems therefore more economical to describe memory, its deficits or forgetting in terms of the processes which underly the difficulties.

In 1966 Gibson pointed out that the brain does not have to integrate successive visualizations in immediate memory. Continuing analysis of the phenomenal persistence of surfaces led eventually to the rejection of any such concept as a separate fragment, bit, called memory and memory trace. "When a surface is being concealed there is a memory of the hidden portion, so you might say, but . . . actually it is a simple case of the perceiving of the surface." (Gibson, 1975, Reed and Jones, 1982, p 396) As our perceptual systems are structured on design principle two, redundancy of function, there is every reason to believe the neurons of the nervous system follow the same rules. (Gibson, 1966, p 262-5) He 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, when we survey the evidence, memory as a thing or a noun has a

limited use. As Schwartz points out "neuroscientists have been looking for Plato's 'wax tablet' without success since the beginning of this century". Now using rabbits and conditioned responses Thompson of Stanford University has found an engram in the cerebellum. The evidence suggests the engram is intracellular, remaining stored in the cell but unable to be communicated when the neurotransmitter GABA is inhibited (Schwartz, 1983, p 74). While this engram has a specific site it is clear that the 'memory' so described is a chemical function. This conclusion can also be drawn from the work of Burback et al, (1983) and Lynch & Baudry (1984) discussed in Chapter 4. Similarly, Weingartner et al (1983) favor the view "that human learning and memory are determined by multiple and discrete psychobiological mechanisms. A disruption of any one of these component processes can result in superficially similar but nevertheless fundamentally different cognitive changes. 'Amnesias' can be seen as a final common pathway for a variety of cognitive dysfunctions". (as above, p 382, my emphasis)

The traditional concepts of storage and retrieval are associated with "a certain invariance of quality of that which is stored at one time and then retrieved at a later time" (Von Foerster, 1969, p4) Von Foerster's example of being asked what he ate on an aeroplane flight, to which question 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) have shown 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.

Cognitive psychology is now finally beginning to tackle the task of developing a much needed alternative to the approach of single autonomous developments of which memory as storage and retrieval was one element. Weimer (1974) argues for the 'motor' theory of knowledge which holds that we 'know' the world and its objects (and events) in terms of our actions upon it rather than by the relations among objects per se. Within such an 'active' epistemology, consciousness and memory as the modulation of information are central manifestations of meaning and adaptation.

For Franks (1974) conceptual memory is simply 'knowing'. He argues for deep structures of knowledge relations which when activated generate tacit meanings as in perception. All images have underlying tacit meanings and are not units of storage, nor are they mediations of behaviour. Franks' model is as shown here:

Figure 2.4

Franks' Model of Imagery (1974, p 238)

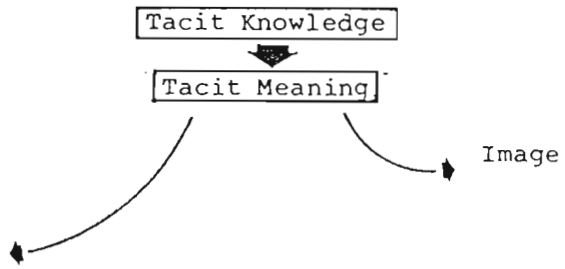


Image and overt responses are alternatives or different surface structures generated from a common set of activated tacit knowledge relations (tacit meanings). They are equally accessible to awareness. The underlying processes and deep structures are not however open to awareness and remain subconscious.

> "It is the processes of comprehension within tacit knowledge that causally lead to both imagery and the effectiveness of

memory: the images themselves do not determine memory efficiency". (Franks, 1974, p 239)

Van Foerster (1969 has developed a neural model based on a recursive function or functional 'hypothesis' which shows the dependence of the present behavior of a system on its history or previous experiences. It clearly shows that memory as a storage concept is unnecessary. Given differing values of this functional hypothesis depending on different purposes ('self-referential information') and/or relations between observed entities with respect to the observing organism, the system "compares new actions recursively on the basis of previous actions and, hence, on the basis of the history of the stream of external and internal information". (p 31) The model perceives, remembers and infers (or expects). "Memory is represented by the particular modus operandi of the central computer whose gross functional organization is determined and redetermined by evaluation of eigen-states or relations". (p 33) Such models or cognitive tiles may be assembled to form mosaics or "tessellations" which "as a whole permit the high flexibility in representing relational structures". (p 31) This model has much in common with the concept of deep structures reviewed above and incorporates memory into central processing.

Much of the above contains a certain irony 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 including the modern Gibson school (e.g. Hoffman and Nead, 1983, Hoffman in press)nor Jones (1976). In this latter work Jones has 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". (p 353) Her emphasis on nested hierarchies of time patterns is a direct precursor to the exposition here, 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". (p 347) These are directly equivalent to nested hierarchies of directive correlation with specific back-reference periods. Her concept of memory is explicated in terms of the activation of wave frequencies which differ in period according to pattern level. "Any memory for a micro-pattern can be derived from the memory span of events at the highest level of analysis". (p 344) Invariance is clearly implicated as the key concept with details or sub-patterns bei subjected to loss or rapid transformation. In this aspect she anticipates Goldmeier's analysis to which we now turn.

As was hinted at by Weingartner et al and demonstrated by Jones (1976) Goldmeier has also shown that memory cannot be separated in any real sense from knowing. Forgetting is intimately related to the nature of that to be known and its processing. In his preface to the scholarly The Memory Trace (1982) Goldmeier notes with some sadness the 'meagre base' and 'twilight' zone of memory studies. His tour de force should, however, begin to remedy such depression. Perceptual coding, he argues, serves as well as other purposes, the key purpose of meaningful data reduction. "Memory deals with the result of grouping, however arrived at. Perception extracts information from the stimulus array by zeroi in on one - occasionally more than one - grouping of the final percept

out of the gigantic number of possibilities in the stimulus array". (p 6) As he points out, data reduction or changing information has been virtually ignored in memory research and yet is the key to understanding the concept of memory (p 4) 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. (p 44) 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 (p 57). But this is an insufficient operational definition of singularity. "The most fundamental characteristic of a singular attribute is, however, sensitivity to change." (p 58)

The relation between the Gibson school and Goldmeier's work is clear from the following quote: "These findings call attention to a rarely considered aspect of animal perception. In a world of rigid objects, or at most continuously deformable objects, 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, p 63) Singularity is therefore the property of an invariance.

Singular features (case a) are precisely encoded, easily learned and accurately remembered. Near singularity (case b) follows his '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. In the third case (c) of non singularity the encoding is only approximate and is

not accurately reproducible. The singularities yield an instability of both perceiving and remembering. Supporting his theory with much empirical data, 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 non-sense syllables etc. p 87) There is also selective encoding but with spoken language, meaning rather the form of words normally has priority.

Singularity therefore determines recallability. This is illustrated by the fact that amongst other demonstrations, adding words to a picture which increases its self-consistency increases its recall although there is in absolute terms more to be remembered (p 94). Goldmeier, in elaborating the theory through the relation of singularity to t construction of schemata outlines the concept of "a global constraint that establishes a meaningful whole" (p 96, quoted from an earlier source). It is clear from his usage that this concept is what has been called above, the system principle; that which organizes and gives meaning. He shows how the moral of a story, for example, will be recalled although details may be 'lost' or reconstructed. It is this 'inner logic' directly perceived rather than externally imposed or learnt, which is remembered. "We enc ode what we perceive and remember what we encode". (p 100) This was similarly found in a study of Westerns (Emery, F, 1959)

Goldmeier also uses the concept of hierarchy as in hierarchies of directive correlation. But he stresses that we need not assume as some theories of memory, one global hierarchy. His hierarchies can be

local and often only temporary, subject to rearrangement as new material accrues (p 100). This aids in the process of developing encodings which are selective and parsimonious. The concise formulation of this theory he gives as: "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." (p 102)

Throughout his discussion of the formation of the memory trace the convergence with our hierarchial framework has become increasingly close. Singularity as a feature of invariants is contained within a dynamic hierarchy of directive correlations of environment and person; the adaptive interdependence of affordance (meaning) and effectivity. Over time with experience and learning 'memory changes'. His discussion of 'the fate of the trace' serves only to sharpen the convergence as he develops the theory of intrinsic stress as opposed to the 'fading' of memory.

> "Stress arises when the stimulus material does not permit a maximum of regularity or simplification, when it falls short of complete inner logic or has features that lack perfect singularity" (Goldmeier, 1982, p 108)

But as we track the argument through the empirical superstructure and arrive at his conclusions the theory of stress so developed is simply the process of application, (validation, p 241) of the law of singularity determined in Part I. These were clearly laws governing <u>perception</u>. Consider the following: "These ideas lead to the stress theory of the trace that identifies some traces as exceedingly stable and precise, others as unstable, subject to forgetting, lack of precision, and loss of

information. These traces are classified throughout this book as belonging to case (a) and (c), respectively. Other kinds of traces those intermediate between the two others, case (b), progressively change toward singularity and, when they attain singularity, become stable. When these traces have reached a stable state, their information content is decreased. In terms of the traditional correct-incorrect memory theory, memory in case (a) is correct, in case (b) incorrect; in case (c) it approaches chance or is forgotten". (p 241)

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. (the trace) is as Goldmeier remarks "a convenient abstraction". (p 239) Further to this is his discussion of the interaction and elaboration of traces into hierarchical trace systems which are governed by the same set of laws. What is extrinsic to an individual trace (perception) can be intrinsic to a higher level of trace system. Simply put, once we evoke the concepts of directive correlation and integrated hierarchies of directive correlation we have effectively rendered the concept of a 'memory' unnecessary.

The concept of time and space are inherent in the properties of a directive correlation and the back reference period may range from the glance to the time scale of evolution. The relations between causally determined interactions do not have to be related to some extrinsic framework of absolute time and space. That is, the 'memory trace',

storage, retrieval and forgetting are pseudo problems generated by trying to explain the adaption of living systems within the categories of the Mechanist metaphor (Pepper, 1966). Working within the contextualist metaphor, as here, we may grasp their lack of substance.

Memory is simply a property of such a set, that is, a property of consciousness governed by the same ecologically adaptive mechanisms as are other properties. What is a perception at one point in time will at other points in time and at other levels of the set, become a 'memory' remembering, or the basis for a creative idea.

Obviously now we cannot agree with Goldmeier that we still require a concept of a static or storage memory. (p 240) From his 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. (p 240)

Increasingly the literature supports such a position. For Brewer, 1974 (b) all of the higher mental processes are "intimately" related. Everything "that is known about psychic development indicates that its very essence lies in the change of the <u>interfunctional structure</u> of consciousness". (Vygotsky, 1962, p 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, p 10).

Remembering is a kind of knowing that relates animal and environment and entails the same issues as perception (Shaw et al, 1982, p 224, my emphasis). "In addition to detecting invariances, perceptual systems can be generative devices which construct perceptual experiences of certain kinds." (Turvey, 1974, p 168) These include dreaming and hallucinating. 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, p 169)

In addition to the notion of interrelation or the coherence and wholeness of knowing, perceiving, we can by adopting the correct grain of analysis accurately conceive of memory as a transformational process. By virtue of the 'doctrine of necessary specificity' (Turvey & Shaw, 1979) there no need for a context-free "quantity of the space-time manifold to which can be ascribed the status of 'region of perceptual information'" as distinct from that of region of memorable information. In other words, it is 'ill advised' to attempt to distinguish perception from memory by invoking linear concepts of present and past. "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, but the expectation is present. The future might be simply the depths of the implicate order which is and which is unfolding." (Bohm in Bohm and Weber, 1983, p 38)

The Newtonian moment is incompatible with the temporal grain of either perception or of the informational support for perception. (Turvey 1977) There is simply detection of invariants over time. (Gibson, 1967,

1973) These fall into two main classes, transformational and structural (Shaw & Pittenger, 1978). Memory has been shown above to be obviously transformational.

Similarly we may be clear that 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, footnote p 121)

We must agree with Trevarthen that "Memory is an aspect of the generation of consciousness" (Trevarthen, 1978, p 118)

In summary: Remembering is a transformational process or property of consciousness and the generation of consciousness, which 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 orderl growth of directive correlations.

It is possible then to attempt any more precise formulation of remembering and forgetting in terms of the model of consciousness presented above? The literature provides some futher insights into how that may be achieved.

Within our ecological formulation of knowing, memory cannot mediate because it must not contradict the postulate of Direct Perception. Remembering is a contemporaneous experience which specifies noncontemporaneous, strictly past, experiences. It must be carefully distinguished from the biological mechanisms or processes which support its occurrence. As with perception, memory must by definition be a property or process of an ecosystem. Working from the current state of knowledge about the human perceptual system, Mace argues that "The kind of experience-based 'memory' assumed to be operating (in knowing about height or distance) is the entire visual system, developed through the 'experience' of evolution to locate objects with reference to the ever-present ground plane" (Mace, 1974, footnote p 149) (added emphasis). Translating the spatial into the temporal we can specify the 'ever-present ground plane' as the moment of contemporaneous experience or the time at which the focal condition is satisfied. The transformative process is always therefore in reference to the current adaptive awareness or consciousness. As there can be little argument that the field of consciousness is rich and elaborate we can also follo Mace's direction for parsimony. "The more elegantly structured and

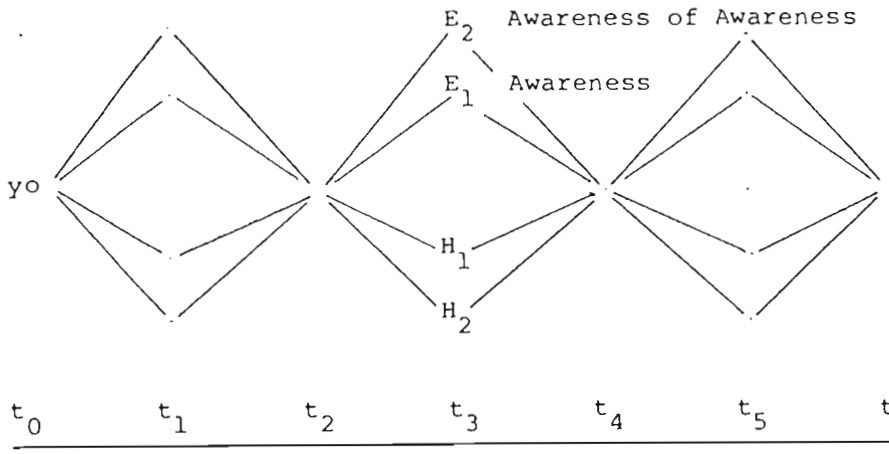
inter-related we can show environmental information to be, the more parsimonious could be the processing strategies evolved in such an environment." (Mace, 1974, p 148) We shall employ such parsimony in discussing the relationship between remembering, imagining and expecting.

Following their postulates for the linking conditions for learning and the generalization of knowledge, Turvey & Shaw present "Postulate III (Memory): An environmental situation X affords an activity Y for an animal Z at some later time t_k only if some situation W affords the same activity Y for Z at some earlier time t, where (X/Y:W/Y) if and only if X is mutually compatible with Z in the same way that W is mutually compatible with Z; . . . This final postulate proposes a view of memory as knowledge that persists by analogical extension (generalization) from earlier to later situations; the second postulate . . . can be used inter alia to propose a view of generalization by analogical extension over distinct perceptual situations. Hence the second postulate can be said to describe the necessary condition for perception -- knowledge, whereas the third postulate can be said to describe the necessary conditions for memory-knowledge." (Turvey & Shaw, 1979, p 219). We can now explicate remembering in terms of directive correlation.

(i) The Concept of Remembering

Figure 2.5 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

Figure 2.5 The Adaptive Acts of Remembering and Expecting



period t_3-t_2 whereby the adaptive act established a t_1, by a transformative process over the period t_1-t_0, is substituted for another possible adaptive act at t_3.

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 th perceiving can take place when the following conditions apply: If the value of Yo is an actual member of So 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 Y2 as an actual member of S2 stands in singular or almost singular relation to Yo and affords the same or almost the same adaptive act as 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

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_o, 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 terms of Goldmeier's theory of singularity, data-reduction and intrinsic stress, this formulation works well. Unless the values of Yo and Y2 in two eco-niches 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. While this in the long term may result in a particularly stable invariance, that perception may be vastly different from its immature form many transformations ago. 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. The greater the difference in the values of Y_{o-n} over t_{1-n}, the greater the transformation of the memory. Static rather than dynamic environments should yield less transformation and it follows that when the level of transformation is consciously perceived to be distressful as will happen in a particularly, or intensifying dynamic environment, 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.

'Deja vue' in this context (Emery & Emery, 1976, p 102) can be viewed then perhaps as the instance where the current properties of the eco-system 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. In these cases which almost always appear to invoke consciousness, the mapping function itself perhaps becomes most visible and accessible to conscious conceptual analysis.

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 maximizing the cortical firing rate (Haith, 1980, see above). 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, 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 or reminiscing during a boring lecture or conversation (awareness level) or deliberately thinking or remembering about something else (conscious level). The more undifferentiated the field the greater the recourse to daydreaming or

'distraction', time out from consciousness and purposefulness (Emery & Emery, 1976, part II).

To summarize here, we may state that when the perception we perceive at t_x stands in singular or almost singular relation to an extablished directive correlation at some time, t_{x-n}, we call such a perception a memory.

(ii) Explaining Forgetting

In order to account fully for established empirical data this formulation must also explain empirically established 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 eco-system, so must be forgetting. The first is the degree of singularity, patterning, or lack of it, in the eco-system and the second is the number of transformations a perception has undergone. As Gibson & Goldmeier have shown, we are part of and adapted to an orderly, structured world, not a random array. An eco-system with a high degree of randomness is not fully perceived as in 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 eco-system 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. 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 invariance. 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 an consciousness itself is elaborated, so we move to perceiving the finer features of the eco-system 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. This fits Luria's data very well although we do not need to invoke the 'trace'. 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 ha difficulty selecting the awareness most adaptive to our purposes. It will however, maximize 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 eco-system. 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 in the long run will increase the probability of entropy. Clearly to prevent forgetting and 'not knowing', it is necessary to maintain a high

level of direct perceptual contact with the real world of events, things and people.

We would therefore agree that helping educationally subnormal (ESN) children to remember entails training them "to listen carefully and selectively to information, then help them to learn how to construct integrated representations of what they have heard. This would enable ESN children to best use their limited abilities." (New Scientist, 1983) As these children's difficulties with remembering have been shown to be a question of their ability to select invariances and discriminate them from 'trivial details' (i.e. concrete or iconic) we can speculate that ENS represents: (a) effectivities which function closer to the oneroid than normal rate, and/or (b) overexposure to an environment or econiche which through lack of ordering principle inhibits the learning of selectivity. Intelligence, or at least one aspect of it, may be elucidated by this formulation. Indeed, any such randomized econiche, and we are proposing that television is such a one, may itself contribute to an oneroid or inhibitory state, the results of which mutual contribution will be judged as low IQ, reduced ability to learn, educationally subnormal, etc.

Weimer (1982) asks us to remember Penfield's discovery that the brain retains a record of virtually everything experienced. He speculates (p 349) that "perhaps what Penfield's electrodes activated was circuits of the neural holographic machinery's reference beam". He concludes "Holography, in which 'all things conspire' (Leibniz) in the interference pattern of wave fronts, may be the answer for the problems of memory and the initial encoding of information" (p 351). This presents no difficulty to a formulation in terms of directive correlations.

Increasingly, the evidence points to the concept of hologram at both the neural 'machinery' level and in terms of our conscious insights, but th psychological operations governing remembering and forgetting are not explained by such a postulate. Clearly many of the random elements we experience may be neurochemically recorded in some sense but the laws of singularity and invariances better explain why it is not adaptive to remember them. Economy is required of all creatures and none more than of humans with the burden of consciousness.

(iii) The Concept of Expecting

We return now to Figure 2.5 and examine a companion concept to remembering, that of expecting, or having an 'expectation'. Expecting is derivable from imagining and follows the same set of principles or laws governing transformational processes as do perceiving and remembering. (See for example Thatcher & John, 1977, p 260 - 263.) We have specifi imagining as taking place when Yo is a member of a potential set So. Clearly 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. Expecting clearly has a future reference -- we expect something will happen or that something would have happened. Because of its future reference it involves a potential set. 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. 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 fantasi 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.

> "Behaviourally, the evidence we accept as showing that the subject of our experience expects something, food or electric shock, is the same evidence we accept as showing that the animal remembers something or has learned something" (Gibson, 1966, p 279)

-- it has perceived an invariant. Gould and Gould (1983) have argued from their research on bees that the same processes which define intelligence in humans are present on a continuum which links all species; superficial differences are due to the nature of specialized needs imposed by the individual niche. Making an inference may be no more than a special case of expecting. No special or additional construction is required.

The often noted deficits of memory associated with watching TV (Emery & Emery, 1976) can now be clearly explained. If the hypotheses concerning television's maladaptivity in relation to consciousness and knowing of are found to be correct, then because remembering is a function of consciousness it will similarly show a disturbance in the direction of maladaptation. Normal transformational processes will be distorted. All of the following features have previously been discussed in relation to watching television and will influence the rate of remembering toward the forgetting or 'not knowing' pole.

(iv) In Summary: 'The Look and Forget Medium' (Winn, 1977)

If viewing is primarily oriented towards the medium the viewer will be confronted with an undifferentiated field of radiant light, which contains no information. Imposed upon this field is the constant signal given by the raster, an invariant but one which in itself is naturally, or in terms of evolution, meaningless. The immediate consequence at the perceptuomotor level will be the induction of a range of system states, the most frequent of which is expected to be one of reduced cortical activity; in other words, a low cortical firing rate. At the level of learning this state will account for television's failure to communicate knowings other than knowing 'of'. Both levels of analysis suggest, naturally enough because we are dealing with a coherent system, that real, immediate ecological perceptions will be replaced by perceptions arising from other back-reference periods as a necessary consequence of the attempt to optimize the firing rate and the search for meani While at the neurophysiological level the reaction is to the physical medium, at the level of awareness we perceive only the rapidly changing content. Because at the ontogenetic level we search for singularities, or invariants, the more rapidly changing the contents and knowings 'of', the more rapid will be the transformations necessary to complete the directive correlation. As argued above, the substitution of t se transformations for immediate perceptions will result in inaccuracies. As the invariant of television contains no information about affordances, the greater the rate of transformation over back-reference periods, the higher the probability that the perception of a particular item of information communicated by television will be forgotten, or be 'remembered' in a highly erroneous fashion. The longer the duration of viewing the more the replacement of these transformative processes wi act merely to keep intact, rather than also expand, the total contents of

consciousness, resulting in what may well appear as a stereotypical, if not archetypal perception of the learning of any given content. That is, the invariances which result from prolonged viewing will reflect meanings drawn less from the 'information' provided than from the lowest common denominator distilled from rapid, and quite probably unrelated, transformations.

Thus while forgetting in itself is not maladaptive, an econiche which is so highly demanding of transformative processes as to approximate the lack of selective principle displayed in the various 'forgetting' diseases, is maladaptive. Forgetting on this scale is transformation as a creative constructionist process gone wild. A communicative medium in the service of learning or education must by definition create the conditions for an orderly expansion of consciousness rather than a surfeit of focal conditions which result either in the lowest common denominator perception or an inability to remember an invariance or meaning at all. What we are saying here is that television, at both the levels at which we have chosen to examine it, has the potential to produce forgetting (not knowing) rather than remembering (accurate knowing).

We expect therefore that a survey of efforts to use television as an educational medium will show a remarkably high level of its resulting in not knowing, a lack of learning. There will however be evidence of some residual knowing 'of' and it is to the operational tests of these different knowings that we now turn.

9. Knowings, Recognition and Recall

This formulation clarifies the distinction between recognizing a recalling which is of course an old and very basic one. William James wrote of the conditions whereby a phenomenon may be recognized but not remembered; namely when the associates of the phenomenon "form too confused a cloud" (1890, 1983, p 633) or in the terminology adopted here -- when a perception, or awareness, lacks singularity. In these cases "all that the mind gets along with its object is a fringe of felt familiarity or sense that there <u>are</u> associates . . . Just such a tingling and trembling of unrecovered associates is the penumbra of recognition that may surround any experience and make it seem familiar, though we know not why." (James, as above, p 634) He reserved the term 'remembering' for recollection or recall.

The difference is between a non-singular and a singular perception invariance. In recognizing, the task is to pick the one among the many while in recalling, the one is given in awareness. Similarly, Turvey has exploited the distinction between tacit and explicit knowing to show how we may perceive directly some forms of meaning which are not known explicitly. Explicit knowledge about lower-order particulars may become accessible only after identification. Id tification may precede conscious experience and occur in the absence of any conscious experience whatsoever (Turvey, 1974, p 172). In other words, the ability to identify or recognize is unrelated to the essential features of the three complete forms of knowing and a case of recognition will not imply that such knowings are present. It can, however, in these terms indicate that some knowing 'of' may be present as this does not require either higher order extraction of invariants, purposefulness of consciousness.

The criticality of perceiving and understanding a context has had to be constantly demonstrated and is still being so demonstrated. Bransford & Johnson (in press, used by Bransford & McCarrell, 1974) show clearly that recall is affected dramatically by 'No Context', 'Context-After Story', 'Partial Context before story', 'Context before story' conditions. Telling a story twice without context produced low recall, non-significantly different from telling it once. (p 205) Further, more sophisticated experiments along the same line have shown that prior knowing of context is not sufficient to ensure total or even adequate comprehension. Any such knowing should ideally be in use, 'activated', through such means as conversation if understanding, or recall is to be elicited. (Bransford & McCarrell, 1974, p 207) As discussed above, knowing 'of' is deficient in context and attempts to communicate it, or recall it, will be subject to failure or errors.

Singer (1980) makes the telling point with an example on page 42 that the ability to recognize is also possible with a complete absence of first-hand or real ecological experience. Acquaintance or familiarity given through media is just as amenable to recognition. He continues then to state that

> "The problem with recognition memory is that it is not useful when one does not have the object before one for identification. Thus, in the many kinds of decision-making situations we face, we need the advantages of the verbal-and-organized-coding strategy in order to retrieve the information. Simple exposure to material cannot assure its efficient retrieval. Retrieval usually requires a more active process that is associated with taking the time to examine the material, perhaps to label it verbally, and then, also to replay it mentally in the form of some thought about decision processes." (Singer, 1980, p 42)

Retrieval or recall is obviously associated here with activity which was shown above to be a characteristic of being purposeful, not a feature of knowing 'of'. Singer's analysis is conducted within the storage and retrieval concept of memory, but his distinctions between the functions of recognizing and recalling are entirely congruent with those made here. Recognition is, as he sees clearly, the easiest type of measure (p 55), demanding little of human capacity, and certainly is not dependent on language or consciousness. It is identified with a phylogenetically primitive level of function. "Simply naming something without formulating a thought or idea, is quite artificial, whereas the expression of a complete thought or the formulatio n of an idea is the basic unit of communication." (Luria, 1981, p 116) The act of establishing recognition by non-verbal means such as pointing, is that much the less identifiable with human competencies and learning. Recall has to do with meaning, recognition does not. Concepts or conceptu learning cannot be measured by tests of recognition, they will record accurately only the most concrete, iconic aspects of any meaningful phenomenon.

From all the points made above, it becomes clear that knowing 'of', feeling familiar with is the only form of knowing that is readily matched with the process of recognizing -- both are primitive forms, of knowing and remembering respectively, or in other words, primitive or ecologically incomplete perceptions. When tests of recall attempt to capture knowing 'of' they will fail entirely or elicit inaccurate responses, part of the 'confused cloud', thereby showing that knowing 'of' is closer to 'not knowing' than it is to 'knowing' and that if it were not for the simple ability to recognize, the knowing 'of' would fact be forgotten.

While tests of recognition may be applied for all types of knowing, they will not be able to distinguish between them. Recall will effectively measure knowing 'about', understanding and being wise. The critical point here is that just because knowing 'of' can be elicited by tests of recognition does not in any sense equate it with the other forms of knowing. Simply because the thing, event, or idea known 'of' can be correctly identified from among a range of items does not mean that it is in any sense known 'about' or understood. It remains the same incomplete, fuzzy knowing. Adequate tests of meaning can only be conducted by recall, a category which will include 'behavioural', as well as tests of verbal explanation to show that affordances are perceived, and to which level of knowing the perception has been elaborated. To infer from a successful act of recognition that meaning and concepts are present and learning has been advanced will cause endless confusion, particularly in the field of education.

The connections between knowing 'of', recognition and watching television have been made explicit

> "What seems to happen (when we watch TV) is that we store a picture memory, an image memory, without words. There is no recall because recall is the word form of the picture. There is no recall because we have had only right-brain involvement. There is no left-brain involvement because no connections, associations, or thoughts occurred at the time of exposure. There is only a capacity -- or an increased capacity, if repetition occurred -- for recognition memory." (Krugman, 1977, p 9)

Krugman's continuing research into the effects of television advertising (Krugman, 1968) has led him to postulate a theory of passive learning (Krugman & Hartley, 1970) or of low involvement (Krugman, 1977). Here he argues that the nature of the effective impact of television,

particularly for "advertising on low involvement topics, objects of products, consists of the building or strengthening of picture-image memory potential. Such potential is properly measured by recognition not by recall. The use of recall obscures or hides already existing impact." Recall is the correct measure for the high involvement impact of such newspapers -- "very factual . . . left brain stuff." (Krugman, 1977, p 9) Low involvement theory entails the distinction between exposure and perception or, looking and seeing. "Looking at does not guarantee seeing because the mind may be elsewhere." (as above, p 10) Exposures which can be measured by recognition may be very brief and lacking in awareness. They are effective however in communicating commercial messages and aiding "in-store-triggered-purchase".

Clearly, education as we know it involves active learning (i.e. learning) not only to read but also to physically manipulate, to manipulate in time, and in all ways to know 'about' and understand. Rather than propose a 'passive learning' which is in fact a contradiction in terms, Krugman's low/high involvement is adequately covered by the difference between knowing 'of' and 'about'. Indeed, by his own admission, 'passive learning' creates barriers for what has traditionally been called learning, which is a constantly active process of extracting meaning. The "very special manner" in which "television teaches the young child to 'learn to learn'" may cause the child to see learning to read as intolerably difficult and "years later, remedial reading may make up some of the lost ground." (1977, p 8) Television may not only have little to do with learning, it may also actually militate against it. Krugman's example demonstrates a stronger more active form of antithesis to learning than the view that the only motivation television generates towards more viewing. (Emery & Emery, 1976, p 94)

The function of advertising is to increase consumption or at least buying althought this is of course disputed by the advertizing industry. I give their official definition in chapter 8. This may contain an educational or learning component, but in Krugman's terms above, need not, except at the passive level, identified with exposure rather than meaning and recognition rather than recall.

We conclude therefore that television's capacity to produce (mal)adaptive behaviour may be judged by its role and results in two of our major institutional, cultural functions -- education and marketing. Such judgement may be precisely predicated by the differential results of testing by recognition and recall. For education to be successful in terms of learning its results must be amenable to testing by recall. As above, tests of recognition will mislead us to believe that knowing 'about' or understanding is existent when only knowing 'of' has been tapped. When tests of recognition and recall give different perspectives on the success of television's educational function, only those tests of recall should be accorded validity. As accumulated television research has increasingly queried this medium's capacity to provide anything other than knowing 'of' we may hypothesize quite specifically that television will be judged to have failed as educational when measured by recall, and that its remaining credibility as an educational medium depends entirely on the fact that it has too frequently been evaluated by the invalid or inappropriate process of recognition. To this end we will conduct a thorough survey of television's educational function and the ways in which it has been measured and/or judged.

For marketing, Krugman has in many ways already spilt the beans. Convergences between so many of the above threads lead us to believe that

marketing today need not, and certainly not via television, bear any relation to learning or education, except perhaps by default. The success of television as a marketing tool does not need to be measured by recall: its success lies in the fact that the medium is superbly geared to deliver knowing 'of'. Recognition is in fact verifiable by the fact that we do go out and buy, impulse buy, make a 'decisionless' buy, in the supermarket. We will expect therefore that tests of recall of ads as Krugman notes, will be meaningless in that they will not reflect the power of the medium to create familiarity without invoking consciousness and thereby make choices which do not involve questions of effectiveness or outcome. Nevertheless, when tests of recall are applied to knowing of the contents of television commercials, we will expect to see the same failure of remembering as we expect of television wearing its educational hat.

By examining the effects of television in these two systems, one which functions to produce knowing 'about' and understanding, and one which depends on knowing 'of', we can by the difference between recognition and recall settle the question of whether television is adaptive at the level of learning. Specifically, we predict that it will be maladaptive in that only tests of recognition will be able to establish that it has produced any knowing at all and the knowing 'of' which <u>is</u> elicited is not a firm foundation for orderly human growth.

Appendix to Chapter 2. Footnotes to Jaynes

*1. Much of Jaynes' discussion of metaphor is useful and as Bohm points out physicists still find it necessary to employ metaphor in order to convey their ideas (1980, p xiii). "Metaphor constitutes the indispensable principle for integrating diverse phenomena and perspectives without sacrificing their diversity." (Berggren, 1962, p 237) Berggren's analysis of the use of metaphor in science to create and communicate abstractions shows only a difference in degree, in other words science has not been able to totally divorce itself from the power of the spoken language, to generate meaning. But the danger is that by taking metaphor or the scientific model out of its spoken and heard context it becomes reified, assuming a static reality. Familiar or "submerged" metaphors are the most dangerous (p 456) as can be seen perhaps in the case of behaviourism. Jaynes is also correct when he says "language is an organ of perception, not simply a means of communication " (p 50) but on the next page, uses a metaphor based on the concept of (written) language, text, as solid, unmoving, wearing away with time. Living (spoken) language does not wear away with time; it is always in a constant state of flux, change and enrichment in directive correlation with its environment. This is what leads people such as William Saffire of The New York Times to bemoan the 'destruction' of the language. Jaynes' own submerged assumptions about the value of written over spoken language belies his ostensible message and leads him to deny that there is a real space with a real 'I' who really knows him or herself as actor and knower. With something more than echoes of John Locke his statement "there is nothing in consciousness that is not an analog of something that was in behaviour first" (p 66) dispenses with imagination and creativity and makes it extremely difficult to 'imagine' where the theory

of relativity could have come from, even if some of the processes of its gestation were 'unconscious'. Curved space-time, like the neutrino and the Devil (Berggren, 1962) is not 'in' behaviour.

*2 We must reject this thesis because as Jaynes himself in his series of objections and replies makes clear, it stands or falls by virtue of the evidence supporting it. I will not deal with all of these but one is illustrative of the problem. "Objection: If the bicameral mind existed, one might expect utter chaos, with everybody following his own private hallucinations. The only possible way in which there could be a bicameral civilization would be that of a rigid hierarchy . . . Yet the Iliad does not present any such picture." (p 79) To this "very telling" objection he replies with a discussion of the linear B tablets which implied a rigid theocracy. Objection therefore overruled. Why, however, did Jaynes choose to ignore the fact that there was a massive body evidence concerning preliterate people still existent and therefore on the basis of his thesis bicameral, without consciousness? Inuit, Bushmen, Australian Aboriginals etc., all fit his specification and the observation of their social structures requires far less guesswork and speculation than his selection of data. As above, these presumably bicameral people did not have bureaucratic social structures; just the opposite. If there is any correlation in history it is between the growth of literacy and bureaucracy in the Western world.

Incidentally, Jaynes' discovery that there were no words for consciousness or mental acts in the early Greek literature strengthens the case of those who claim that some of the actors were heavenly bodies, the dramas essentially cosmic rather than purely human. As "a rag ocean has thumos" (p 69) -- motion or agitation -- so can the sky and in

such catastrophic scenes no amount of human free will could have changed anything. If the gods were cosmic phenomena there was no need to go so far as to attribute consciousness to them.

Chapter 3 Established Adaptations and Maladaptations: Associating and Disociating

The model of consciousness, learning and communicating presented above has allowed us to derive hypotheses of television's effects as an econiche which is maladaptive in terms of learning. There appear to be established adaptations which fall neatly within the same framework and which may be contrasted with the analysis of television. We deal here specifically with our propensities for group life and spoken language. Group life or the group is identifiable as econiche while spoken language is the form of communicating or mapping function. The proposed adaptation is 'associating'. As the following evidence shows, effectivities for spoken language and group life are biological givens, and coimplicative with people, groups and spoken language as affordances. By establishing associating as an adaptation for the development of hu purposes and capacities, that is, for learning, we can take the further step of examining television's proposed maladaptivity in the light of the behaviour it replaces. This is of course the 'substitution hypothesis' which, in its purest form, holds that there is nothing inherently wrong with television; it simply leaves too little time for other activities which are highly valuable.

In addition, we argue that the absence of associating called 'dissociating' is maladaptive, and that television not only reduces the opportunities for associating, but also makes a direct contribution to dissociating. Thus is the maladaptivity confounded.

1. Associating: Conversing as 'Phatic Communion'

Malinowski gave the name 'phatic communion' or 'verbal togetherness' to speech which is used as a social cement (Farb, 1973, p 24 - 25). That group life and spoken language are coimplicative properties of the human ecosystem is definitively demonstrated by the nature of conversing:

> "A conversation can proceed only when:
> . The same (or a similar) context is present in the participants,
> and
> . When the context possess for each, the property of being also the context for the other." (Asch, 1952, p 162)

Asch identified four parameters of 'effective' or 'influential' communication:

1. the face-to-face situation takes on the character of an objectively ordered field open to the participants;
2. the mutual confrontations attest to their basic psychological similarity;
3. a mutually shared psychological field emerges; and
4. individuals become more open. (Asch, 1952)

As for Gibson, noted above, "the persistent, ever-recurring observation of the relation of consistency among our experiences is the ground for certain universal axioms at the basis of social existence. The first is the axiom of the objective character of the surroundings." (Asch, 1952, p 129)

Flowing from the same premises of our capacity to comprehend and respond to the lawful invariances of experiences and actions, is the second property: our psychological unity in our perceptions, motives, thoughts and purposes which we discover and continuously confirm through social

experience. Consequently we are drawn into relations of "mutual relevance" such that one's actions and those of others become associated on all planes including the affectual. "A great range of emotions and attitudes. . .require an intrinsic reference both to others and self." (Asch, as above, p 133) The emergence of a mutually shared field not only provides their definition but also requires their control. Greater embeddedness through conversation is both a result of and a condition for emotional maturity in terms of both differentiation and expression. Conversation is thus a regulative as well as a communicative behaviour as the linguists have explored in more detail below.

These conditions provide for the fourth. "This has perhaps been the fact most difficult to grasp about psychological interaction: that it is a process with an intrinsic social direction that has its locus in individuals." (p 62) Rather than lose identity the process "requir that each participant retain his perspective and assert his individuality." (p 163) As psychological interdependencies grow, so the individuals may become more open, sharing more of their perceptions and behaviours as they also become further differentiated and organized. Confidence and trust both arise from effective communication supporting Chein's thesis that "a behaviour is a motive of the behaviours it includes." (Chein, 1972, p 23) A person "becomes freer as his wants grow and as his capacities to satisfy them grow." (Tomkins, 1963, p 111) Conversation as influential communication is one such capacity. Television may be similarly judged as (in)effective communication and we attempt this below.

Asch's description is as he pointed out "in phenomenal terms" a required further study in behavioural terms. This has been provided by

the linguists using 'discourse analysis'. They have begun to rediscover the complexity of conversation; in particular that the commonsense distinction between words and action is thoroughly misleading. In conversation people are using words to act on each other, to deal with one another -- it is not just a linguistic form (Labov & Fanshel, 1977, p 30, 59) "The meaning of a sentence is not captured by linguistic symbols and relations; rather meaning is the integrated tacit perceptual meaning structure. The linguistic structures form a communication device for directing meaning formation." (Franks, 1974, p 250) "Conversation is not a chain of utterances and actions bound together by a web of understanding and reactions" (as above, p 30). There are shared understandings and reactions because of the existence of tacit, invariant rules about interpreting and producing linguistic acts in conversation -- these rules are quite obligatory. In other words they are functions of an econiche.

Once speech is seen as a social transaction carried out with words it comes as no surprise that it is governed by the same sorts of tacit compelling assumptions as govern ABX systems. (Emery & Emery, 1976, p 20) 'Discourse analysis' has shown that conversational use of language is guided by rules that people appear to implicitly understand and follow. These rules govern how one formulates request, responses, narratives, turn-taking, challenges, retreats, defences and, most importantly, relative rights and obligations. There is evidence that these rules just come along with the use of language for discourse, at a pre-school age, and no more have to be learnt than do the perceptual illusions. However, we may be no more conscious of our observance of these rules than the cyclist is aware of the rules his musculature follow in order to maintain his balance in motion. We converse with others within these complex

rules by simultaneously conveying many different messages, at many depths, and yet consciously tuning in to only a narrow band of what is being broadcast and reacted to. (Emery & Emery, 1980) Conversation is not simply a form of communication but active purposeful communicative behaviour, fulfilling the conditions for effective communication and resulting in certain knowings. As in our dealings with the physical world, these knowings are directly given and do not have to be taught. They are learnt over the course of developing as a member of the human group.

> "The higher mental activities -- conception and purpose, memory and imagination, belief and thought -- so far as these are distinctively human, are found to be closely dependent on speech. They are fundamentally social in origin, being due indirectly to the development of conversation, which it is argued has the primitive function of preparing for concerted group action. Conversation is shown to have a characteristic structure, adapted to its function, and it is this structure which makes possible the organized activity of thought, in which it is reflected. (de Laguna, 1927, 1963, p xi-xii)

Humanity is not totally conferred, it requires learning. What and how we learn determines which cultural variant of humanity we become and a primary mechanism for this learning is spoken language, particularly conversation. Children who are not spoken to show behaviour commensurate with that of 'Wolf Children' who have been totally deprived of human contact. (Farb, 1977, p 12 - 14) Spoken language itself is not only our most powerful and active learning medium but it is also clearly in many aspects a ritualistic behaviour. In this it cannot be separated from the totality of human behaviour. (Farb, 1973, p 362) All language is structured by rules which are unconsciously learnt simply by belonging to a particular speech community.

> "Any transaction between two human beings -- an exchange of words, silence, or a mutually intelligible gesture such as a

> wave of the hand -- conforms to rules and conventions understood by all the members of that speech community . . . Stereotyped phrases, which nevertheless offer important social benefits, are found in one form or another in speech communities around the world." (Farb, 1973, p 25).

Spoken language and conversation are most clearly delineated when contrasted with literacy. The alphabet came into being in the same era as the basic assumptions which can be seen to fuel much of our modern Western scientific culture; the era of Euclid. (Emery, M., 1982, (c) Part I); Ong (1967) and McLuhan have dealt in depth with the changes wrought in the sensorium and culture by this revolution. Writing and literacy differ from the spoken word in three main respects. I have dealt with these in detail previously (Emery, M., 1982c) but the critical points here for speech lie in its ability to center us in reality, the whole with its movement and change. Human speech is always a powerful, meaningful event which of itself conveys spheres of meaning and affordances. The 'word' both duplicates and analyzes the world (Luria, 1981, p 38) "To understand another's speech, it is not sufficient to understand his words -- we must understand his thought. But even that is not enough -- we must also know its motivation. No psychological analysis of an utterance is complete until that plane is reached." (Luria, 1934, 1962, p 151, quoted p 7, Wertsch, 1981, see also Arnold, 1982) In addition, Luria's insistence that it was not possible to distinguish between affect and cognition makes it clear that speaking, conversation and consciousness are central and indivisible features of the human system.

Althhough in any language people command a vast repertoire of moves -- that is, a virtually infinite number of things that they could say in many grammatical combinations, nevertheless the number of possibilities

is severely limited by the situation in which the speaker finds himself -- "the 'ecology' of language". (Farb, 1976, p 6) This metaphor emphasizes that the function of language is to relate its speakers to one another and to the world they live in. In a world where sound and hearing is dominant "the mind is enabled to relate actuality to itself". (Ong, 1967, p 22) Schizophrenia is rare amongst illiterate cultures. Written language destroys the nexus between reality and the self, (Ong, 1967, McLuhan, 1962) dampening positive affect. Arnold concurs with Ong that speech has a special presence and power, and with Luria on the centrality of affects. The "very special kind of stimulative presence . . . is an affective presence very little attended to in psychological or other communicative research." (Arnold, 1982, p 135)

Spoken language or 'the word' is not fully realized except as a dynamic social act. It has the power to change perceptions and affective relations. "In the fashioning of consciousness the great instrument is language" (Caudwell, 1937, p 171) -- spoken language. Speech, unlike print, is always assumed to be meaningful. We place unqualified faith in the utterance of another. This of course is the source of the damage caused by attempts at non-social speech which may become endemic in periods of dissociation or cultural transition. (Farb, 1973, p 66) Speech is a most powerful behaviour, the rules and meanings which cannot be divorced from the continuing learning of the cultural system. Language spoken to an infant while s/he is breast feeding instantly stops the child's sucking. The mother's speech results in an orienting response that inhibits instinctive processes. (Luria, 1981, p 91) As instinctive behaviour is characterized by the comparative absence of medium-term directive correlations (Sommerhoff, 1969, p 186) we can see not only that learning as a medium-term adaptation clearly has priority

in development, human speech is critical to such learning. The ear is faster than the eye and the power of the spoken word lasts longer. Tone and the rhythm of speech are two at least of its qualities which aid learning and render it easier by ear than by eye. Ries and Trout (1983) concluded "That a word is worth a thousand pictures."

The Russian empirical work has established that the consolidation of the regulative power of adult speech becomes firmly established only when the child is about 3½ years old, in the same period as the maturation of the anterior cortex. They have also established that the stimulating power of human speech has ontogenetic priority over the meaning of the words spoken. Up until this same critical stage this applies to the child's own verbalization as well as those of others. There is no necessary organized connection between their regulative speech and accompanying motor behaviour. The development of the independent volitional act involves subordination of the child's behaviour to his/her own speech, which development occurs within an adult-child speech relationship, or in other words, conversation (Luria, 1981, 90 - 103)

It is clear that the Russian experiments do not support Piaget's theory of development. At no stage is a child unconnected from his/her world, gradually becoming socialized to learn that speech is a means of communication. The child is not born autistic or egocentric but is a social being who uses social speech from the very beginning. A baby's ears have been functioning in utero and "more recent studies indicate that by the time they are born, babies already prefer female voices." (Friedrich, 1983, p 55) "A baby already knows which sounds communicate . . . so a child can put all of his energy into learning how to use the rules of the language." (Peter Eimas quoted in Friedrich, above)

"Babies can detect the relationship between mouth movements and the sounds they hear . . . essentially, babies are lip readers." (Andrew Meltzoff, quoted in Friedrich, as above) Human speech is as directly perceived at this stage of life as at any other. People are intrinsically affordances for communication and learning.

The case of Genie illustrates the crucial nature of conversation in human learning and development. Genie was a normal baby born into a home characterized by "imprisonment and seclusion . . . extreme abuse, neglect and isolation." (Curtiss, 1977, p 5) This does not fully convey the depth of the inhumanity that was Genie's lot in life for 13½ years -- physically restrained, receiving "practically no auditory stimulation of any kind." There was not much for Genie to touch or look at (many details of horrible abuse are omitted here) . . . "Thus minimally exposed to humanity, and most of that the most hideous of human behaviour, Genie grew into a pitiful creature" (p 7) -- "unsocialized, primitive, hardly human . . . surprisingly, however, Genie was alert and curious . . . she was intensely eager for human contact and attention (p 9) . . . all in silence . . . Except for a few words, Genie never spoke". (p 10)

"Genie was faced with learning her first language when she was 13 years, 7 months of age". (p 11) For five years, up until the time of writing, Genie went through what must be one of the most intensive and carefully planned and evaluated learning experiences ever devised. It was less than successful in redressing the damage sustained by the first few years of Genie's life.

Tests indicated "the absence of brain damage", (p 229) but "Genie grew up in an environment devoid of verbal interaction. Never, or practically

never, having witnessed the performance of these socio-linguistic behaviours, she did not develop them". (p 233) "It appears, therefore, that communicative competence may be a separate aspect of linguistic functioning, one not dependent on most other linguistic abilities, but rather dependent on the absence of social and/or psychological disturbance. Genie's lack of competence in this area, therefore, is probably not a function of her more general linguistic limitation. Her conversational incompetence is instead a manifestation of her social and psychological impoverishment and abnormality . . . The fact that Genie has right-hemisphere language may be a direct result of the fact that she did not acquire language during the "critical period". Lenneberg (1967) suggested that "For language to develop, the necessary requirements are only two: (1) a human brain and (2) sufficient exposure to language during this critical period between the age of two years and puberty". (p 207) It suggests that after the critical period, the left hemisphere may no longer be able to function in language acquisition, leaving the right hemisphere to assume control . . . "Genie is both linguistically and non-linguistically, a right hemisphere functioner." (p 234)

Genie's 13½ years devoid of human interaction left her left hemisphere mute, underdeveloped and minimally capable of normal developments.

Speech later takes on in addition, a more strictly intellectual function but again its development supports the ecological approach. In a classical association experiment, Luria (1927) found that children from five to seven years rarely produced an 'associative' response. An associative response consisted of giving a related noun -- 'dog-cat', 'sun-moon'. "Associative responses began to appear only with adolescent or adult subjects". (Luria, 1981, p 120) Young children gave

'predicative' responses of verbs or adjectives -- 'dog-bark', 'house-burns'. Response times for predicative responses also were much shorter than those for associative responses. Verbs and adjectives express the affordances of things, nouns. Vygotsky makes this crystal clear: "when asked to explain a word, a child will tell what the object the word designates can do, or -- more often -- what can be done with it." (1962, p 78, my emphasis) A dog becomes meaningful when it barks or plays. Predicative here is therefore an expression of the co-implicative definition of a noun. Both the developmental sequence and the response times "support the notion that associative responses are not the first ones to appear, as most psychologists still think. Rather, predicative responses appear first . . . His conclusion was "that paradigmatic (associative) responses are quite different from syntagmatic (predicative) responses." (in that) "they are more artificial . . . Predicative responses involve not only a different psychologi structure, but also belong to a different form of speech activity. It is linked with the child's natural practical activity, i.e. with more natural forms of speech processes." (Luria, 1981, p 120, emphases are mine.) Such a simple test has shown that early normal speech reflects in its structure the direct extraction of meaning from the environment; and that the more abstracted generic relation of noun to noun, which is a later addition to this adaptive function of communicating affordances, can be learnt, but only through a long and difficult process. This certainly involves a grounding in literacy (Emery, 1981) but here Luria himself is not clear. His assertion: "if the word is the element of language, the sentence is the unit of living speech", (1981, p 116) ignores the fact that people do not always enunciate sentences. It also contradicts other data he presents. Spoken language does have 'integrated coherent structure' conveying an idea or intention but it is

not that of text. Indeed, he cites the example of where the rules of written language are transferred to oral language which becomes "hypergrammatical", "dead", "deprived of elements of intonation and gestures". (p 167)

Further evidence of the difference between literate and non-literate speech and thought and the power of formal education is contained in his discussion of syllogisms. Again this is contrary to Piaget (but Luria is polite. Note however that Vygotsky published a substantial criticism of Piaget, 1962, chapter 12) The following table shows clearly that Piaget's stages are not fixed and immutable but very much a product of experience and training.

Table 3.1

Percentage of Correct Solutions of a Syllogism

	3-4 years	4-5 years	5-6 years	6-7 years
Before learning	0	4%	20%	98%
After learning	0	52	96	100

(Luria, 1981, p 206)

If a child's experience has not included the derivation of a conclusion from a syllogism, they will base their conclusions on the direct experience they have had.

Similarly, in studying non-literate peoples, they found that the premises of the syllogism are perceived as isolated, without logical connection, and answered on the basis of direct experience. S's often added the phrase "I know this myself" indicating the mobilization of available information. When the syllogism involved a place or event outside of direct experience they usually refused to answer and suggested the psychologist ask someone who knew about the place or event.

A second group who had recently become actively involved in the mainstream culture showed a mixed approach. "They were connected partly with the system of logical relationships and partly with concrete epxerience". (p 208) A third group, even more culturally integrated showed no difficulty with logical reasoning.

Table 3.2
The Operation of Deriving a Conclusion from a Syllogism

	Type of Response		
	Refusal to Answer	Conclusion with additional concretization	Formal logical conclusion
Subjects from backward regions, non-literate	54%	39%	7%
Collective Form, active members	5%	30%	65%
Pupils of elementary schools or those attending courses	0	10%	90%

(Luria 1981, p 209)

These two tables illustrate the following:

(a) concrete and logical thinking are both based on experience, direct and indirect respectively

(b) ecological perception, spoken language and concrete thinking, are three sides of a way of life; oral culture

(c) the processes of analytical abstraction and logical inference which result in generic concepts, i.e. divorced from direct perception (Emery, F., 1981, a) are properties of literate culture which may be successfully induced after age three years.

The ability to abstract rather than extract meaning is not an automatic step in human development and there is no fixed set of ages and stages at which it may be learnt, with the exception of minimal neurophysiological maturity.

Spoken language is the original adaptive communicative mode which maintains and enhances the embeddedness of people-in-environment. Literacy is the foundation for generic concepts which allow us to make huge leaps of imagination and understanding, but at the cost of devaluing individual, immediate knowings and distancing ourselves from the world in which we must live. The destructive consequences of accepting indirect knowing as the epistemological basis of learning and education have been fully explored by Emery, F. 1981(a). However, the advantages conferred by literate understanding, as long as it is kept in check, make the contrast between TV and print a particularly powerful one. We expect therefore that comparisons of learning and knowings derived from televiewing and reading will highlight television's failure as an educational medium.

(i) Deep Structures of Conversation

Luria's confusion between text and utterance is similarly obvious in his discussion of the Chomsky school. Calling Chomsky's basic hypothesis "rather unconvincing", a "nativist hypothesis", he argues that language is formed through the child's actual dealings with reality, a position supported by much field and experimental evidence, although it is only half the story.

Chomsky argued that there are deep structures in the mind, 'givens' which lead to basic speech structure. These lead to the communication of

relationships as expressed in events. As we have seen the normal human child is adequately-, if not well-equipped for the task of human learnir and that there are innate sensitivities which orient communciation and learning towards growth and the enrichment of choices. Certainly from recent evidence these are 'hard wired' but not to the sentence form. Thoughts may be completed in speech but take on a different form in writing. Literacy may have simplified the "conversion of sense to meaning" (Luria, 1981, 152) but it has not destroyed either the primacy of speech activity, the mystique that is the power surrounding the spoken word, nor the evidence relating to the existence of deep structures.

For Halliday (1978) "reality is created through the exchange of meaning -- in other words through conversation. The exchange of attention which begins at birth already has some of the features of conversation (p 90). Those very early acts of meaning show a 'proto-language'. Trevarth (1978) also has found the human infant "to possess outlines of a highly integrated primary intentionality . . . the capacity to originate coordinated acts that are directed to express a specific line of experience." (p 120) Again contrary to Piaget, he shows that imitation cannot develop without a specialized innate neural mechanism for intentionality and growth which guarantees sociability. The specificity of imitation in the neonate proves they possess "the template for recognition without having benefit of learning by association for rudimentary reflexive sensory-motor schemata". (p 128-9) This built-in identifier is closely and functionally related to the mechanism that causes their own communication. Similarly, they show the outline mechanisms necessary for conscious control of spontaneous acts.

Human infants show a highly elaborate form of activity specifically adapted to communication with other persons; a higher level or 'mode' of operation than those dealing with inanimate objects. This clearly has "very special significance for human intelligence" which is not "the achievement of an individual child" but a "social phenomenon". (p 125) From observing infants communicating, he suggests that perception, cognition and the development of voluntary action interact with "very powerful psychological mechanisms that ensure social cooperation in human intelligence" (p 125). They show astonishing precocity in their sensitivity to people and in their powers of expression which influence attentive adults strongly. "Mother and infant engage in highly regular, conversation like exchanges in which it is clear that the infant exercises the primary control of events." (p 126) And this at two to three months old! The regulator of this complex 'intersubjectivity' is the affect system, emotion. (p 127) "The evidence for an innate mechanism for communication in infants is overwhelming. Clearly we have only begun to understand its complexity. From birth, infants detect persons and by six or eight weeks of age they begin elaborate acts that function only in the regulation of interpersonal transactions". (p 129) An underlying generative structure functions not only to produce these acts, which share the same form and timing as those of adults, but also to detect like behaviour in others. Through intending, to communicating and then to knowing the physical world, appears to be the order of growth. "Humans are innately social. They are 'socialized' in the sense that plants are 'photosynthesized'." (p 132)

Genie had been deprived of light and water.

Bickerton (1983) has identified a deep structure within spoken language. His observations and analysis lead him to conclude that "the structure of Creole arose without significant borrowings from other languages". (p 119) Within a single generation a "consistent and uniform language" developed out of the "linguistic free-for-all that was pidgin in Hawaii". That is, there was no adequate model as "pidgin lacks many of the building blocks possessed by all native languages". (p 117) His evidence is not confined however to Hawaii. "Creole languages throughout the world exhibit the same uniformity and even the same grammatical structures that are observed in Hawaii". (p 120)

"The evidence from creole languages suggests that first-language acquisition is mediated by an innate device of a rather different kind from that suggested by Chomsky. Chomsky's innate universal grammar makes available to the child a wide range of grammatical models from amongst which the child must select the best match for his/her language community. Bickman specifies a "single and fairly specific grammatical model" (p 121) and shows that all children begin by speaking a creole language (p 121). Their parents however speaking English, French, etc., convince the child through conversation that modification of this basic language structure is essential in order to be an accepted member of the current human group or culture. This is a gradual process which may encounter some resistance.

Bickerman's evidence is exciting as he isolates key features of this universal grammar. Firstly, "the only languages that allow negative subjects with negative verbs are creoles" and secondly, "no creole

language distinguishes questions and statements on the basis of word order; the difference is marked by intonation alone." (p 122) Children from different linguistic communities which do not employ these forms, systematically err towards the creole form. Thirdly, "The distinction between stative and nonstative verbs is fundamental to creole languages" and children in the process of learning English do not make the systematic mistake of confusing them, which logically they would be expected to. Similarly, point four, they do not experience difficulty in distinguishing between specific and nonspsecific reference which is a feature of creole. As he points out, in English for example, such distinctions can be subtle but children as young as three make them correctly 90% of the time. (p 122) Basic child grammar and creole languages may have much in common and it is possible that these represent the manifestation of a neurologically determined program of child development.

Similarly, Goldin-Meadow and Mylander (1983) observed that deaf children were able to develop a structured and productive communication system without a conventional linguistic model. Testing showed this development was independent of any parental mediation. The gestural system has the basic structural properties of language and suggests "that the child has a strong bias to communicate in language-like ways". (p 373)

Such break-thoughs promise much for our understanding of spoken language as one of the peculiarly human adaptations. We would expect that as this research continues it will be found that creoles depend to a large extent on verbs and adjectives rather than nouns; in other words they favour the rheomode.

Spoken language and conversation have thus been established as adaptations springing from certain 'givens', potentials or sensitivities established over phylo- rather than ontogenetic time-span. Environmental and econiche characteristics will certainly affect their phenotypic appearance, if they appear at all, but establishing their existence as genotypes serves to clarify and simplify the task here: these adaptive potentials and distinctive competencies may act as benchmarks for other effectivities. Our capacity to produce and tolerate certain levels of some maladaptions should not blind us to simple structures which may be hidden amongst the complexities. The evidence around us should be sufficient to alert us to the consequences of disregarding the limits of human adaptability (Goldsmith, 1981).

(ii) The Human Group

The econiche identified with conversation is the group. Perhaps the most classical, although neglected, work is that by Greco (1950, 1981). Greco "The individual apart from the group, or a need that is incompatible with group living, is inconceivable". (1950, p 2) Humans are group animals inseparable from a panorama of group ties maintained by group cementing processes. One of the most fundamental, at least, is that of conversation, as we have seen. I have previously surveyed the evidence for this view and this presentation merely summarizes that position (Emery, M. 1982c).

Anthropologists are now re-achieving a consensus on adaptation for human relationships which also converges towards the concept of design principle two, redundancy by virtue of the multiple functioning of the parts. We are bio-psychologically adapted to living in small intimate face-to-face groups with permeable boundaries where each member of the

group, with only few exceptions, is a reservoir of the essential knowings of the group. Cooperation and collective responsibility define everyday life. Within these groups we may fully express our proclivities for social bonding using conversation and a wide range of affects.

The division of labor, the organization of work, and the mobilization of environmental resources depend on sharing. Control and coordination of the unit are also therefore collective responsibilities. Leadership is characteristically non-authoritarian and conducted through a process of conversation. Socio-technical research has also established that democratic group structure is the most appropriate form of human organization for learning and growth, which confirms anthropological observations.

The purest form of adaptive group life appears to be hunting and gathering which accounts for most of the known human existence. These cultures were also characterized by a reverential attitude towards nature and her forces, learnt and taught through practices which were oral-aural, musical, celebratory and joyful. Naive realism or eco-philosophy (Skolimowski, 1978) was the system or organizing principle (Emery, M. 1982c).

(iii) Conversation at the Level of the Group

As well as overt conversation there is another form of communcation, at the level of the group. Bion (1952, 1959) discovered (re-discovered) a set of phenomena that operate at the level of the group. Very briefly, he discovered that when people come together they establish a group very quickly -- we know this happens regardless of whether of not there is a leader. But in the beginning, it may be an immature group lacking in

self-confidence. For our purposes here, I will put Bion's analysis in the context of communication and learning rather than therapy.

Bion postulated that in any group it was possbible to discern three Basic Group Emotional Assumptions, quite separate from the healthy, well functioning work (W) group. These he labelled dependency, fight/flight and pairing. All three he saw as modes which preserve the group, maintaining its identity. In terms of promoting learning, dependency has least, and pairing most potential. The most important features of the pairing state coincide with the realization of Asch's four universal tacit assumptions that underline human face-to-face communication reviewed above.

Pairing leading to the fully fledged work group provides the conditions for excitement and joy as

> "group learning involves the sharing of individual perceptions or knowledge towards an end or purpose which itself evolves as a group product. This product enhances the probability of the survival of the group, through which development, meaning accrues to the individual contribution. Through the act of sharing knowledge towards newly created and creative common purposes, individual contributions also merge into the new knowledge of the group. An individual may not remember contributing a particularly formative perception but experiences joy as the group synergizes all perceptions towards a novel insight or sense of direction. Group learning enlarges the intellecutal and affective domain of the individual consciousness such that deeper perceptions and wisdom are freed to play their role in the creative process. Through such personal enlargement individuals themselves are in the process of creation". (Emery, M, 1982, c, p 173)

This level of conversation is known as The Music of the Group (Bion, as above) and behaving at this level is clearly an innate human ability. Without it we could not sustain a group life, but today its practice is largely conducted without consciousness. It is however, another level at

which we directly extract meaning from perceiving the environment which is in this context, the human group itself.

(iv) Deep Structure of the Group

It would appear today that there is good reason for the repeated observation that democratic group structure is the adaptive organizational form for communication and learning. There is convergence of opinion (Sommerhoff, 1974; Tomkins, 1963; Bion, 1959; Caudwell, 1937) around the view that the structural characteristics of the democratic form are those which also characterize the organization of the central nervous system. (Emery, M, 1982, c, Part 11.4) In other words, there is a system principle covering both short and medium-term adaptations and which shows that "All wholes (including the brain) transcend their parts by virtue of internal coherence, co-operation, openness to input". (Ferguson, 1980, p 169) The wisdom of that statement has been recognized by many who have worked with forms of neuroses and psychoses (Greco, 1950, 1981; Palazolli et al, 1975, 1981). Clinicians, empiricist psychologists, neurologists and physicists are increasingly blurring boundaries as their perceptions lead them back to the hologram, the universal in the particular. Despite all else, we are ourselves; our effectivities governed by the ultimate hard realities of the universe in which we live. There are limits to our capacity to adapt, and technologies which function to inhibit biologically given adaptive modes such as conversation in pursuit of group life, may erode those very capacities as they simultaneously seduce us into believing that thing is medium, and that we have the power to rise above the ecologically determined limits. As written statement is not reality (Olson, 1975, p 370), nor need be 'television land'.

(v) Querying the Adequacy of Naive Realism

Before we conclude here, it may be fitting to examine a position which criticizes naive realism at the human level.

Proffit & Halwes (1982) maintain that the Gibson approach has ignored the fact of human culture and that this limits the theory of affordances to perceptual events not influenced by culture. This, they propose to overcome by the concept of contract. "Cultural constraints take the form of agreements . . . the form of agreements is specified by contracts" (p 304) (and) contracts specify mutual obligations. An obligation is a presumption of what ought to be the case." (p 306) It is only when an event in one context is perceived in another and found not to be what it ought to be, that we become aware of such contracts. The nature of the examples used to illustrate this concept case some doubt, however, on the necessity to introduce a mediating variable to account for culture.

Two points may be made about the first two examples, the ostensible pencil which would not write because it contained rubber rather than graphite and the brick that blew away. First, Proffit and Halwes write of our sudden awareness of a contractual obligation of the class of pencils and of the class of objects called 'bricks'. But surely only two purposeful and probably conscious systems can enter fully into a contract? The instances involve human deception, an affordance given by our capacity to imagine and create. As the examples stand, they are clearly in the class of illusions which, as the Gibsonians have pointed out many times, does not deny direct perception but ir fact confirms it. The fact of optical illusions confounds any attempt to correlate what humans see with available physical, optical information. Percept

systems function discretely and finitely at the ecological level, not at the level of Newtonian-derived abstractions.

Second, both examples depend on the fact that only visual perception was employed when clearly the tactile mode would have established that the 'brick' did not afford the breaking of windows. Again, visual illusions are commonplace and veridicality of an affordance is established in everyday life by the consistency provided by one or more other modes such as smelling or touching. It does not seem necessary to interpolate contractual inference in order to arrive at the concept of belief.

The next set of examples concern the perception of speech, and particularly culturally distinct languages. A series of experiments has established the following:

(i) listeners can distinguish sounds (phonemes) on a broad, natural continuum and label them

(ii) listeners cannot discriminate (above chance level) two stimuli labelled as members of the same phoneme category although physically they are just as different as a between-category pair of stimuli (my emphasis)

(iii) listeners are more confident of discriminations that straddle a phomeme boundary

(iv) without change in the stimulus there is alternation or perceptual change of the category of the stimulus at a phoneme boundary

(v) people who speak different languages have different patterns of categorical perception, i.e. they have difficulty in making all the appropriate sound discriminations for somebody else's language

(vi) speech skills learned and practised in experimental or therapeutic situations don't transfer well to everyday behavior because -

(vii) communicating with speech involves meaning, and the meaning is what the listener is focusing on. When the listener focuses on the speech itself instead of the

meaning, the range of acoustic patterns heard is narrowed.

Do these findings imply a need for contractual inference in addition to concepts already encapsulated within ecological realism?

Only in recent years have humans heard speech synthesized so precisely that a boundary sound could be articulated. Is it physically possible for humans to produce (naturally) such a sound? If it is not, then there are good adaptive evolutionary reasons for the first set of results as above. Clearly if there are 'deep structures' for speech such discrimination of artificial sounds will not be found among them.

Results (v) - (vii) can be explained by learning and familiarity, the dimension of probability of choice. Of course there is cultural learning and it is sometimes particularly resistant to awareness and unlearnin (Hall, 1976). But we do not enter into a contract with our cultures, we are born into and carry them. We can no more accuse our culture of failing to live up to its side of the bargain than we can choose our biological parents. We therefore can not have contractual agreements with our speech community. These are our continuities which in large part define our distinctive character as cultural groupings. Proffit & Halwes are correct in describing cultures as patterned constraints; probability of choice is that dimension which expresses precisely such a need for economy in human life, else we would be overwhelmed by choice. And while one stays within one's own culture this parameter is largely subconscious, for the same good economical reasons. It is only when a different set of <u>expectations</u> is incurred by virtue of living in another culture or by taking part in a laboratory experiment where you are required to shift 'attentional focus' that such economies on both the

ontogenetic and phylogenetic scales of adaption come to the forefront of consciousness.

Results (ii) and (iv) can be seen as the result of direct perception of a class of sounds which are not part of the natural environment in which we have evolved. Lack of discrimination is a direct result of the fact that we perceive meaning, as shown by (i) and (iii), and (v) to (vii) as variously expressed. Certainly phonemes may exist as "a conceptual form and not as a part of the acoustic signal", (p 317) but in conversation they are not consciously heard at all. We simply attempt to 'understand' what the other person is trying to say, and why, and through such learning across cultural barriers we may become more aware of our linguistic and cultural limitations, but this is a transformational process, not a stochastic one.

At the heart of many such implicit criticisms of the Gibsonian position is the lack of distinction between extraction and abstraction (Emery, F. 1981, a) Proffit & Halwes reveal such lack of distinction in their leap from 'ought to be' to 'contract' to 'concept', and then to beliefs, "relating contracts to other contracts. Thus we have a mechanism of what may be called 'conceptual transcendance' to account for the 'absolute' nature of generic terms". (p 308)

At another grain of analysis we may cite the literate societies' confusion of oral and written through failing to note the primacy and power of oral language (Ong, 1967) which is supported by Luria's demonstration that non-literate people do not and cannot refer to generic concepts. But it has not yet been demonstrated that literacy can replace the spoken word.

There is sufficient evidence available to reject an intermediarist theory of artificially induced behaviors, or failures of adaptive behavior. Given that such failures occur we should not necessarily conclude that the human organism is lacking; only perhaps that we have the ability to create econiches which defy all known biological rules for adaptation.

2. Maladaption: Dissociating

The reader is referred to Emery (1977) and Emery & Emery (1976) for a full discussion of this phenomenon. What follows here is merely a summary.

At the ontogenetic level, (Emery (1977) proposed a set of maladaptive scenarios, so called because their development actually lessens the chances of reducing the turbulence of the field. (Emery, F, 1977, p 32) As noted above, television has already been implicated in the scenario of dissociation, one of the passive set which derives from the second parameter of the choice model, probable effectiveness. Basically dissociation is a denial of the directively correlated nature of the action of others in achieving purposes within the ecosystem, thereby reducing complexity of choice. The resulting fragmentation or privatization is a phenomenon which may be discerned at both the individual and cultural level (Emery & Emery, 1976, p 65). By denying the role of others in effective action, the individual enters a crisis of responsibility as there is no longer any reason for his or her cooperative action toward shared purposes.

Dissociating is therefore neither new nor esoteric. It is the failure of the 'productive orientation' which relates person-to-person and person-to-world (Fromm, 1963, p 14); the denial of life as a dynamic event

which takes place between organism and environment, a denial of the trend towards homonomy or state of harmony with super-individual units, the social group, nature . . . etc. (Angyal, 1965)

> "As Angyal argues, autonomous behavior is generally supported by rational logic while homonomous strivings are more deeply rooted in our non-rational nature. It may however just appear this way because the tendency in the last three thousand years has been to prevent us knowing of the rational framework behind the homonomous trend. However, in The Sane Society (Fromm, 1963) the balanced integration of autonomy and homonomy results in an ever increasing expansion of self through more participation and better relatedness to superordinate wholes. Thus people and their worlds grow together. The correspondence with the concept of wisdom is striking". (Emery, M, 1982, c, p 163)

In brief, it is maladaptive to be 'an island unto oneself'. (John Donne, and see also Laing, 1959, p 25)

Such a state of mental illness is painful if not unendurable (Neumann, 1954, p 439) unless it is possible to escape from reality into a state whereby the illusion of associating is created and maintained. This was the thrust of discussion in A Choice of Futures - that television through the play of the medium on the parameter of probability of choice creates familiarity with a totally mythical world and in so doing moves from being a system within the environment to an econiche within the environment. To the extent that one remains cocooned within this econiche, so the real type IV environment will appear even more complex and uncertain. To the extent that the televised econiche replaces the environment, so will personal competence be lost and therefore the probability of effective cooperative action will be further reduced. We can speak of a dissociative cycle which begins as a personal response (Emery, 1977, p 43) and ends as a cultural spiral. (Emery & Emery, 1976)

Because we have postulated that television acts primarily upon the first parameter of the choice model perhaps we should consider that the most probable scenario arising from heavy viewing may be that of segmentation; simplification of choice by division into 'them and us', the basis of 1984. Similarly, as television would appear to reduce affectual commitment to purposes or de-emphasize the relative value of intentions, so it should manifest itself in the scenario of superficiality. Some aspects of these scenarios can in fact be discerned from the literature about the effects of television but we cannot regard them as contenders for the most probable maladaption, partly for the reason above, namely that dissociation is essentially a personal response to relevant uncertainty while segmentation and superficiality are bound more closely to waves of cultural change. Additionally, there is the point that dissociation is an amplifier of other maladaptive strategies (Emery, F, 1977, p 43). By its very nature as a fragmenter of consciousness a purposefulness, it highlights segmentation and superficiality as characteristics of its personal mode.

We do not specifically consider the active maladaptive scenarios here as they are by definition at variance with our hypotheses concerning television as inducing maladaption at the perceptuo-motor level. This approach is clearly indicative of a reduction in function from response to reaction (Ackoff & Emery, 1972, 1981, p 25) and is therefore incompatible with leadership strategies which expand opportunities for association (Emery, F, 1977, p 33). Adaptive leadership is a function of energy and activity borr of excitement and joy (Emery, M, 1982, c, p 214-218) while the common features of these passive maladaptive scenarios include their ability "to sap the energies that are available to and c

be mobilized by the larger systems". (Emery, p 66, of Emery & Trist, 1972, 1975)

However, for a culture locked into a dissociative spiral there is a very real danger of an active maladaptive leadership moving in to fill the vacuum. Large-scale systems decomposing under dissociation will create demands for order on the same scale. Such effects will be as highly visible within political systems as within more strictly 'social' spheres. The sapping of energy and will clearly implies a reduction in active mapping functions such as conversing in the service of community, and political life also will drift away from participation, both direct and by representation.

In Summary

Dissociating is the progressive breakdown in ecological wholeness or reduction of the total set of directive correlations, a process itself opposed to ecologically given propensities. Therefore, we expect that correlates of television viewing will show evidence of dissociation in the sense of reduced associating, cooperating, personal competence in these, and distortion of perceptions of reality. In addition, there will be evidence of some flattening of affectual response (superficiality) and a tendency to differentiate out parts of the total ecosystem as belonging or not belonging within the reduced perceptual field (segmentation). The possibility of emerging active maladaptions cannot be ruled out.

Chapter 4 Some Correlates of Reduced Cortical Activity and Individual Differences

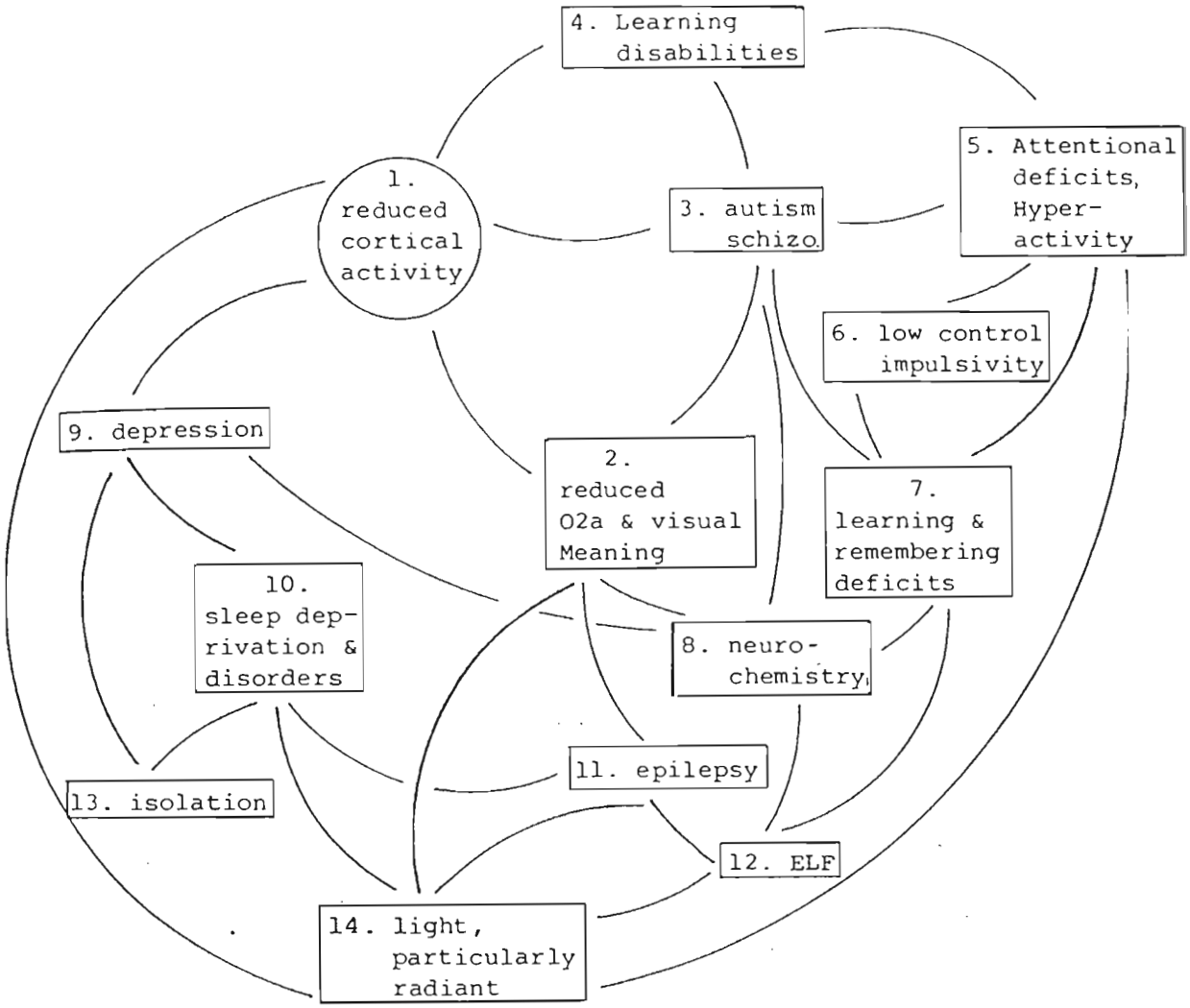
Our deliberations and hypotheses up to this point have been couched in general terms. The data in this chapter bears upon two particular other aspects of the state of this art: the dimensions of individual sensitivity and further implications of any slowing of cortical activity. In this way we may gain a fuller appreciation of who is at risk and also generate some further hypotheses which are amenable to empirical testing. As "the brain can no longer be examined independently but must be viewed within its ecological context" (Walsh, 1980, p 178), it is only to be expected that there will be systemic effects of reduced cortical activity covering all areas of psychological, neuro-physiological and chemical function. Together with personality as conceptualized here, are the critical variables of gender and lateralization which affect both environmental sensitivity and particular forms of responsiveness. We attempt both therefore to sketch the ecological system while acknowledging a range of response.

1. The Ecological System in Action

Firstly, we examine some interdependencies of affordances and reduced cortical activity. Three particular environmental dimensions are taken to be relevant: light, complexity and ELF as a specific new complication to the picture. The following Figure 4.1 is illustrative only of the extent of systemic and ecological interdependence to be found. There are, for example, exogamous sources of depression such as unemployment, which are difficult in neurochemical terms to differentiate from the endogenous. The concept is that of equifinality.

Figure 4.1

Correlates of Reduced Cortical Activity



The figure is schematic; many links are well established, others less so. It does, however, illustrate the ecologically systemic reality with which we are involved.

(i) Affordances

Here we examine very briefly the three dimensions of the figure which appear to afford specific connections to the focus and some of its corollaries. Some of these are also established in the following text.

(a) Light. This is of course one of the most fundamental dimensions of our world and must be expected to be of the utmost significance for our adaptation. (Wurtman, 1975) It is the central feature of the technology under review here, and some special effects will be noted, such as on the reproductive system (Chapter 11). A myriad of studies in this field encompassing light--dark cycles, natural and experimental; circadian rhythms, sleep-wakefulness research, slow wave and paradoxical sleep cycles, and specific structures and functions of neuro-transmitters for mediating such cycles, have been reviewed by Borbély (1978). "It has been increasingly recognized that in addition to affecting rhythms, light may exert also potent direct effects on behaviour, and in particular on the states of vigilance and activity." (Borbély, 1978, p 2) Magnitude of effect is tied not only to periodicity but also to light intensity. The direct actions of light on activity and vigilance levels and its zeitgeber (synchronizing) action on rest-activity (RA) and sleep-wakefulness (SW) cycles are inter-related. Responsiveness to light itself also shows a circadian rhythm. An ultradian sleep cycle has also been investigated whose period may be defined by the recurrence of paradoxical sleep (PS) episodes (p 4).

Apart from the sexual hormones, other pharmacological mechanisms have also been implicated, including growth hormone and various members of the corticosterone group. Borbély elaborates on these connections in his section on "Molecular Mechanisms: the Pineal Gland as a Model". the physiological and chemical processes of this structure "(a) exhibit a circadian rhythmicity; (b) are influenced by the lighting conditions; and (c) underlie specific behaviours" (p 22).

Already identified are the anatomical pathways through which light influences pineal processes, the neurotransmitters and receptors and the sequence of steps between the receptor activation and the increase in the activity of the enzyme serotonin--N-acetyl transferase (NAT). Obviously for the animal kingdom, much of this system can be precisely described. For humans it has been noted "that light may regulate 'the tone' of the . . . sympathetic nervous system." (p 23) Nor, by any means are the effects confined to the visible spectrum. A new medical fraction, photoimmunology, has begun to unravel the "complex interaction between ultra-violet radiation and the immune system". (Honey, 1983) Ultraviolet apparently changes the balance of 'suppressor' and 'helper' cells; these latter initiate the immune response. Such new links in the pattern are constantly being discovered.

In terms of the relation of cortical activity and nature of visual stimulation (1 and 2 in Figure 4.2) we will briefly review the work of Cooper, et al (1966), Phelps, et al (1981, a & b), and Engel (1980) in Chapter 11. This together with EEG studies, will show that observed level of cortical activity is related to the difference between radiant and reflected light as affordances for meaningful information. Their particular use of oxygen available (O2a) in tissue as a measure of metabolic cortical activity links them to both the work of Duffy, et al (below) and the biochemical sub-system. Specifically, lowered available oxygen is a precise measure of lowered cortical activity, itself more frequently found with simple (radiant) light sources and cholinergic blocking, leading to macro behavioural problems of learning, remembering and social conduct. Bossom, et al (1981), examined the correlation between biochemical indicators and EEG by sampling every 15 minutes of a six hour period and concluded that "changes in blood chemistry parallel

the EEG changes". (p 274) With each of the critical dimensions discussed here, we note that there are precise chemical substrates.

(b) Extra-Low Frequency Radiation. Not only do electro-magnetic experiments support the notion of a total system function, they also confirm our embeddedness in the biological environment. Bise (1982, p 53) reports that he found 'very sharp windows at very, very, low intensities' but only when the antenna was placed next to the left side of the head and only at noon and midnight. Midnight produced the highest percentage of actual brain wave changes.

The first significance of ELF for any frequency below 10 Hz is that one is never out of the 'near-field' of the signal whose wave length is about the diameter of the earth. Secondly, "biological entities produce or operate on or work with extremely low frequency signals. 10 Hertz f example, is the most ubiquitous biological frequency on this planet. ELF at 9.41 Hertz is a signal that we find in the ambiance. It's a natural frequency, we evolved in it, moreover solar activities seem to enhance that particular frequency. If we take a transducer, submerge it in the ocean, then listen acoustically, we will immediately recognize the dominant signal at 10 Hertz. It's a biological frequency that's used not only electrically, but even acoustically by most living creatures. From a biological point of view, these properties appear to be the most significant." (Byrd, 1982, p 54) Sensitivity to ionization can be measured by changes in the neuro-hormone transmitter serotonin. (p 57)

The relation between the electrical and biochemical resonances of VDUs is also instructive. "The various balances of chemicals in the blood a the body, like serotonin and prostaglandiens yield wellness. People who

have these out of balance report symptoms like irritability, anxiety, headaches, neck and back pains, asthma, apathy, depression, nausea, fatigue, hesitant judgment and uncertainty of observations" (Byrd, p 44). With ionizing radiation within a field of 20 volts/meter (equivalent to the output of a VDT) with exposure of less than two hours there was a 25% decrease in the amount of cholinesterase in the blood of rats and rabbits -- a drastic difference.

> "Cholinesterase, is among other things, a chemical that destroys the acetylcholine at the synaptic junctions and nerve transmission. The destruction of that amount of acetylcholine has not taken place in the mechanism, in the nerves themselves, but in the blood. This dramatic decrease would have a tendency to allow the acetylcholine to operate more since it would be destroyed less, which has an exciting tendency, something that would cause hyperactivity." (Byrd, 1982, p 45)

Not only does this serve to establish the relatedness of this spectrum with the systemic picture but the role of <u>calcium</u> ions also is effected, with a 16 H_z signal with 5-7 volts/meter field -- much less than emanating from a VDT. At this low level there was a calcium efflux which must affect the natural immune mechanisms of the body. (Byrd, as above, p 46) The role of calcium has recently received attention in the mainstream literature. It has been shown to decrease significantly and rapidly in the period before a single epileptic spike and is obviously a critical element of the triggering mechanism for spontaneous and manipulated synchronous paroxysmal events. (Pumain, et al, 1983) It is implicated in remembering (see below)

Minimal exposures to ELF radiation for healthy adult animals are in some aspects, reversible. Longer term trends in animals exposed in utero showed "a drastic degradation in their intelligence". (Byrd, p 47)

(c) Complex versus Deprived Environments. There has been a long tradition of work on complex versus isolated (stimulus-deprived) environments and their effects on growth and development. The trend has been towards a fully ecological or adaptation model encompassing the "dynamic webs of relationships" (Walsh, 1980, (a) p 77). As Emery & Emery's 1975 conclusion that television represents perceptual deprivation rather than enrichment will be seen to be substantially validated in Parts II and III, we may now look more closely at some of the correlates of a deprived environment. These are summarized in the following table. Walsh (1981) makes it clear that isolation means 'lack of associating with' as he notes that provision of toys and other animals outside of an animal's cage has little effect. Also, enriched (E) versus impoverished conditions produce marked, consistent effects independent of the sensory mnodality by which the animal learns of its environment and thridly, "grouping of animals produces more marked effects than the provision toys and other sensory objects in isolation". (Walsh, 1981, p 134)

Table 4.1

Effects of Environmental Complexity
(from Walsh, 1980, (a) & (b), 1981)

- ⌓ cortical weight (particularly occipital) (1980, b)
- ⌓ neuronal nuclear and perikaryonal size, dendritic aborization, numbers of dendritic spines and glial cells (1981)
- ⌓ in vitro oxygen consumption (1980, a)
- ⌓ ratio of non-specific cholinesterase (CLE) to acetylcholine sterase (ACLE) particularly occipital (1980, a)
- ⌓ Ratio of RNA to DNA concentration (1980, a)
- ⌓ protein (1980, b)
- ⌔ amount of norepinephrine (1980, a)
- ⌔ cortical serotonin (1980, a)
- ⌔ hypothalamic dopamine (1980, a)
- ⌓ facility in problem solving with ⌔ in errors (1981)
- ⌓ SWS + REM and total sleep time (1980, a)
- ⌓ protection against subsequent isolation (1981)

Bigger differences are found in males than in females, and females therefore appear less susceptible to environment change, especially impoverishment (1980, b). While these replicated findings are drawn from animal research, there are some obvious correspondencies with human studies, as would be expected. Sex differences for example, parallel the greater vulnerability of males to epilepsy.

(ii) Some Specific Neurochemical Indices

Norepinephrine is released by the sympathetic nerve endings and acts on the postsynaptic B-adrenergic receptor. Sympathetic nerve fibre activity and norepinephrine release are high during darkness and low during light.

Sympathetic activity is inhibited also by electrical stimulation of the suprachiasmatic nucleus (Borbély, 1978, p 22). Vogel, et al (1968) suggested that increased neural norepinephrine may contribute to the slow waves observed in automatization phenomena (see chapter 13). The most often described response of norepinephrine is a reduction in the maintained firing rate via B-adrenoceptors with an increase in membrane resistance. (Van Dongen, 1981, p 133) Research on extra low level radiation such as from VDUs, shows that "there are specific 'window' frequencies that can trigger unique physiological effects, such as a slow-down in production of noradrenaline and other neurotransmitters" -- one such frequency is approximatley 15 Hz. (Kuhns, University of Ottawa, letter, 14 Feb. 1983)

Another interesting aspect comes from Woodman, et al (1978) who found higher levels of noradrenaline in response to anticipation of stre among a group of aggressive maximum security patients. This group was disproportionately responsible for violence against strangers and in light of the hypothesized relation between heavy viewing, impulsivity and aggression (Emery & Emery, 1976) provides another empirical lead.

Over and under stimulation have been correlated with adrenaline and noradrenaline by Frankenhauser, et al (1971). Adrenaline excretion decreased slightly over time in the control condition, showed a slight increase during under-stimulation and a pronounced increase during over-stimulation. Noradrenaline excretion decreased both during the control condition, and during understimulation, and increased during over stimulation. We would expect that during viewing, the results would be similar to the understimulation condition. There were however differences in subjects with different baseline readings which could

reflect basic personality differences. O'Hanlon & Beatty (1976) found that task duration was a factor in determining the noradrenaline/performance relationship on a similar CRT vigilance task but was not in production of adrenaline. Significantly more noradrenaline was excreted during test than rest conditions.

The complexity of the noradrenergic system is exposed by Mason, 1981, and Osborne, 1983. However, some relevant findings are clear. The syndrome of forebrain noradrenaline depletion in rats is increased distractability, a perseveration of inappropriate behaviour and a failure to filter out irrelevant stimuli. Mason asks of the relation between this syndrome and hyperactivity or 'attentional deficit disorder' and also schizophrenia. The neuroleptic drugs which block dopamine receptors are established treatment, but noradrenaline in excessive concentration is now also implicated. Detailed work continues on the neurotransmitters in schizophrenia (Memo et al, 1983; Nemeroff, 1983). There is also evidence of an increased flicker fusion frequency in schizophrenic patients and this weight of evidence would support Luria's emphasis on the importance of selection mechanisms, which obviously have a neurochemical profile: "NA systems of the brain play a very direct role in filtering at primary levels of the sensory tracts" (Mason, 1981, p 293). "While stress activates the ascending NA systems, intense stress causes a 'functional lesion of the NA system'" (as above, p 294). In both dreams and psychoses the noradrenergic locus coerulus is known to be firing least actively. (p 294)

There is one other particular datum in the literature which tends to support a hunch of this author, namely that B-endorphin is co-released with adrenocorticotropic hormone (ACTH) in animal stress experiments.

This co-release is now confirmed in humans and is consistent with previous observations of it in response to conditions such as hypoglycemia. (Risch, et al, 1983) Now that there is confirming evidence from TV epilepsy studies that the whole experience may present rewards (Emery & Emery, 1976) a test for the release of endorphins is in order.

All of the above represents no more than indications of what ultimately the effects of heavy viewing may be found to be in neurochemical terms. As such basic groups as serotonin, acetylcholine, adrenaline, noradrenaline, etc., can be routinely measured, there would be little obstacle in demonstrating changes due to sustained televiewing. Testing would preferrably be conducted under real life circumstances with baseline measures established and accompanied by measures of personality, laterality and viewing history. As we would expect that a distinctive profile of viewing will emerge from nuclear scan technologies, so we would expect that a modal pattern of biochemical flows will also consolidate. We would expect a diminished excretion of norepinephrine with sustained viewing with perhaps a sudden burst at the cessation of viewing, particularly for those personality types known as objectivisers or those as above, who have less control over impulse and/or aggression. We would similarly expect an <u>increase</u> in serotonin commensurate with increases in melatonin (see more in Chapter 11). Despite the complexity of the material with which we are working, there does appear to be a human system response to unique econiches. We can no longer regard ourselves as apart from or above the world in which we live, or from those particular niches which we have created.

(iii) Other Correlations

The following discussion elaborates other relationships identified. The story may begin from our core: (1) Reduced cortical activity, which has been studied by Duffy, et al (1980 (a) and (b)) in relation to developmental dyslexia. Estimating this problem now at an incidence of 3-6% (which figure has crept up in recent years) they describe it as a "relative underactivation of frontal systems" (p 417) in which both alpha and theta frequencies are overpronounced. Higher mean theta values were found throughout with only one exception, and although a bias was found towards dysfunction in the left hemisphere (L.H.) alpha was also over-abundant in both hemispheres. They found such physiological aberrations to be more widespread than previously suspected, particularly amongst normal children and concluded: "dyslexia-pure may represent dysfunction within a complex and widely distributed brain system, not a discrete brain lesion" (p 417).

Duffy, et al (1980 (a)) make a point of saying that this form of dyslexia is not due to educational or environmental deprivation, but they present no evidence to this effect. Their follow-up article in which they report on a method to successfully discriminate dyslexics from 'normals' 90% of the time, refers to "consistent neurophysiological differences (which) accompany the known clinical differences between dyslexic and normal subjects". But as the children they have worked with are 'normal' within the accepted neurological limits of the term, and as they accept this limitation as shown in the following quote, it is clear that we may be dealing with a scale of sensitivities to environmental affordances.

> "The known clinical overlap and statistical association of dyslexia with the 'hyperactive syndrome' and 'attentional deficits' (5) might be explained on the basis of some yet unspecified frontal lobe dysfunction." ((a) p 419)

As we will see below (TV epilepsy) the medical or clinical model has had difficulty with cases that do not fit a conceptual framework of normal-abnormal and the use here of 'dysfunction' is an attempt to bridge a paradigmatic gap. Other research shows clearly that it is possible to find 'consistent neurophysiological differences' in 'normals' and that these may be associated with environmental states. The link to other macro behavioural syndromes is, nevertheless, acknowledged. One dimension of hyperactivity, attentional neglect, is recognizable as part and parcel of the reduced cortical activity syndrome.

The relation between (1) and (3) Autistic and Schizophrenic behaviour, comes from the work of Franzen and Ingvar (1975). Comparing schizophrenics with normals at rest and during testing, this team, using ^{133}CBF found a pattern of consistent differences. In the pre-central region of schizophrenics they found a correlation of $r = 0.59$ ($p < .05$) between low blood flow levels and increasing symptoms of inactivity, autism, withdrawal and indifference (p 1030-1031). In post-central regions in schizophrenics they found normal or above normal reception of sensory messages leading to overinclusion phenomena. Schizophrenics appeared to suffer from defective transmission within the mediothalamic frontocortical projection ystem with a low resting level of activity in frontal structures and an inability to activate these. Such an imbalance between regions produces a state called "hypointentional and hypergnostic, since the low activity frontally correlated with inactivity and autistic tendencies and the high activity postcentrally correlated with cognitive disturbance." (p 1027) Such a state inhibits the translation of messages into behavioural programs for frontal structures. For the non-psychotic control subjects "mental activation caused a

distinct, significant flow increase both postcentrally and, expecially, in frontal regions". (p 1029)

Soh, et al (1978), also using rCBF, concluded from studying aphasia, that inactive tissue can be expected to have a reduced and rather more constant flow than normally functioning tissue and that specific patterns of increase in rCBF correspond to certain types of mental activity. they provide details on the various aphasias which confirm many previous clinical observations.

More generally, the field of learning disabilities (4) has received what appears to be increasing attention, particularly as the new research technologies have held out hope for isolating specific and remedial focii. Teachers' reports and complaints about the effect of TV on children's school performance (Senate, 1978) have centred on readin writing, spelling and generalized inattention. Part II herein will confirm that TV is not an educational medium and that heavy viewing is negatively correlated with a variety of performance variables.

Dyslexia appears not only to share some of the factors of reduced activity, but has been shown to be a dysfunction associated, statistically at least, with a reversal of cerebral asymmetry (R.C.A.). While R.C.A. occurs in about 10-12% of the population at large, Hier et al (1978) found 42% of their dyslexic sample showed uncontrovertible evidence of R.C.A. which they concluded is a risk factor similar to that of being born male. All subjects suffering from developmental dyslexia were neurologically normal and no simple or single cause could be, or has been, discerned. (p 90) They did, however, note and this provides a further link into the lateralization debate (below), that those with

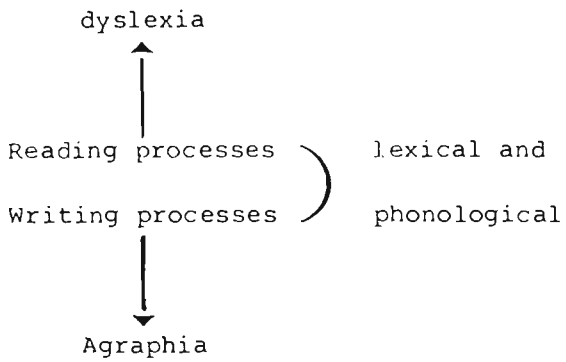
brains wider in the right than the left parieto-occipital region showed a lower mean verbal IQ. Forty per cent also reported delayed speech acquisition (p 92) which is reflected again in Ludlow's (1980) statement that "disordered development or lack of development of particular language-related brain regions could be a basis for language disorders in children" (p 502). Incidentally, she puts incidence at 3-8%. Ludlow also reviews and summarizes the lateralization literature putting emphasis on the relative differentiation of LH as compared to RH structures in language expression and comprehension. "Thus, the dyslexia and verbal disability of the 10 patients with reversed cerebral asymmetry . . . may be a partial reflection of the mismatch between hemispheric specialization for language and structural asymmetry of the hemishperes." (p 92)

Gale et al, 1978, also show good ability to recall is associated with higher activity in the left than right hemisphere which they conceptualize as "a reflection of effort" (Gale et al, 1978, p 169)

By 1980 the Rosenberger team had confirmed the system of relations between RCA, developmental dyslexia, autism, and delayed speech and reinforced Duffy, et al's observation that asymmetries and associated learning deficits have little or no relation to brain damage or loss of tissue. (p 303, see also Johnston et al, 1981) They speculate further that "many so-called learning disabilities might be better described as cognitive styles, or distributions of talents that do not happen to coincide with what the society demands at a particular stage of formal education." (1980, p 303) This statement may be not only a corrective to our excessively left-brain oriented culture, but also issues a challenge to the medical model implicit in the contention of Duffy, et al, that

developmental dyslexia is not due to educational or environmental deprivation. Cultural conventions in today's environment may well be forcing perceptions to move from 'different' to 'disabled'. This point is made very directly by Tenttouten, working from the neurosociological literature. (1979, p 50) However, in normals, reversed asymmetry is more common amongst left handers and the consequent deficit as shown by conventional tests may result from the localization of a higher cortical function in a hemisphere which is anatomically unsuited for it. In other words, despite the corrective applied by Rosenberger, et al, (1980) there is still doubt about the benefits of televiewing accruing to a sizable minority of children who have a particular or idiosyncratic form of central nervous system organization. Much more work needs to be done on the effects of the CRT on the hemispheres but evidence to date (Chapter 11) suggests that the reduction of fast wave activity is greater in the left than the right.

Concurrently, other teams have attacked the same problem of learning disabilities from other perspectives. In a study of a patient with left parieto-occipital damage (one of the areas where TV appears to reduce activity) Beauvois et al (1981) concluded that there is partial independence of the linguistic mechanisms used in the production of oral and written language and that there are two independent processes involved in writing. Part at least of the lexical processing involved in reading is different from the lexical processing involved in writing; i.e. the orthographic knowledge necessary for word recognition in reading is different from the orthographic knowledge required for correct spelling in writing. A summary schema looks as follows:



Essentially, if there are TV induced dyslexias, or agraphias, these may be of either lexical or phonological derivation. From teachers' reports, the most likely hypothesis, given that auditory processing appears to remain normal despite some interference from generalized decreased environmental vigilance, is that TV affects particularly lexical processing with the substitution of phonological processes. In other words, the spoken language rules remain intact but their translation into lexical form is inhibited. This would explain decrements in the ability, for example, to spell.

Shallice (1981) with a case complementary to Beauvois et al's, confirms that phonological routes for reading and writing are distinct. Writing deficits appear to give rise to syndromes very analagous to those of the acquired dyslexias. The correspondencies between teachers' reports of learning and attentional difficulties and the relation between these, and reduced cortical activity, particularly in the left hemisphere, together with an apparent increase in the estimate of proportion of learning disabled children, should perhaps prompt more detailed attention being paid to teachers' observations.

Attentional problems (5) or neglect while clearly a dimension of some learning disabilities and autism, is also tied to hemispheric

lateralization and full circle back to reduced cortical activity. (Conners, 1971, p 426-7) There is a convergence in the literatu towards the view that the right hemisphere plays a special role here. Watson et al (1979) found that patients with unilateral neglect including hemispatial agnosia and emotional flattening were suffering from sub-cortical lesions usually associated with RH cortical destruction. These lesions induced inactivity of RH mediated processes which was shown by RH EEG slowing. Heilman et al (1980) concluded that the RH (parietal lobe) is dominant for both attention and intention. It attends to stimuli presented on both the right and left sides, and prepares both sides for action. Confirmation has been provided by Mesulam (1981). The intact RH is more active and efficient than the left in attentional tasks and shows superior performance on tasks of vigilance. RH function may also involve the entire extrapersonal space while the left almost always is concerned only with attending to the contralateral right hemispac Most directed attentional tasks involving either hemisphere will generate greater activity in the RH. Mesulam however, goes much further towards the systems view with evidence that even narrowly focussed attention appears to require the integrated action of a complex network, and that such a concept is needed.

These data are all consistent with the analysis made by Emery & Emery (1976) and in Chapter 11 herein, and further explain the educational and behavioural deficits which will be the focus of Part II.

Such a perspective has been similarly adopted by Holtzman et al (1981) in their discussion of two separate but integrated hemispheres, each of which is provided with bilateral visual representation for the allocation of attentional resources. They argue that a distinction can be made

betwen spatial information as it is used for the control of attention and that used for explicit stimulus location. Increasingly, research uncovers greater complexity and specificity while at the same time discovers the need to consider the systemic properties of the brain.

In a detailed review article, Messer (1976) has surveyed the constellation of factors involved in or correlated with reflection-impulsivity. (6) While modifiable to some extent, this dimension is consistently implicated in a range of behaviours which are themselves relatively stable, such as field dependence-independence. (Witkin, 1951) For the limited purposes here, we note particularly the close relation between impulsivity, inability to sustain attention, hyperactivity, aggressive tendencies and some data suggesting a bias towards male sex. This would be entirely consistent with the sex bias in dyslexia and other learning difficulties. "Impulsive tempo is one factor contributing to poor school performance whether it is labelled as general learning disability, school failure, or a reading problem." (p 1043) More extremely, children with diagnoses of brain damage, epilepsy and mental retardation have also recorded high scores on impulsivity tests. There is also some evidence that 'short term memory deficits' or forgetting, is correlated with this syndrome as would perhaps be expected given these other relations. Personality characteristics appear consistent and suggest "a link between psychopathology and conceptual tempo". (p 1043) Impulsivity can be seen as revolving around lack of cortical maturity and control.

Remembering and its deficits (7) obviously fit within the systemic overview developed here. Watson & Heilman (1979) mention work on bilateral thalamic lesions which have induced memory defects (p 693) and

these are tied to reduced cortical function through the RAS. Cerebral blood flow studies of 'transient global amnesia' (TGA) are reported to reveal focally reduced flow in the middle and posterior temporal regions. T.G.A. is manifested by loss of memory for recent events, inability to recall recently learnt material and confusion with regard to current situation, although consciousness is preserved and personal identity is retained. (Shuping, et al, 1979) Obviously, while TGA is a clinical syndrome, the meshing of forgetting, learning difficulties and reduced blood flow (reduced activity) mark it as a natural analogue for the direct effects of CRT technologies.

Drachman et al (1979) have shown a further link between the pattern of memory and cognitive changes shown with age, and those induced by cholinergic system (12) blockers by injecting young subjects with scopolamine (an anti-cholinergic) before a dichotic listening test. These results suggest that a failure or decline in function of the cholinergic neurons may well cause much of the memory and cognitive impariment seen in the aged, and more generally relate reduced function of the cholinergic pharmacosystem and consequent reduction of acetylcholine to disturbances in learning. Should lowered cortical activity be directly tied to reduction of acetylcholine, another link in the system of CRTs' effects through biochemistry could be made clear. A new biochemical theory of memory has recently been published which proposes a calcium proteinase-receptor process matching the conditions imposed by the behavioural features of memory (Lynch & Baudry, 1984). It bears out the process-oriented analysis of memory enunciated above and integrates it with the empirical evidence relating increase in calcium to epileptic phenomena -- brief periods of high frequency activity. The consequences are extremely long lasting and we would expect that

validated models of television epilepsy will confirm that much of it is the result of an habituation, or learning sequence.

If we now examine the track through (1) to (5), starting with the work of Robinson & Szetela (1981), we find that the interdependence of subsystems increases in complexity. Figure 4.1 is a vast over-simplification even of the sample literature surveyed here. Robinson and Szetela have established that the more anterior a frontal lesion (read reduced activity) the more frequent and severe the resulting depressive state. They tie this directly to the fact that the closer any disturbance to the frontal pole, the more there is interruption of the catecholaminergic pathways which results further in a more profound drop in brain norepinephrine levels which leads to the behavioural expression of depression. Patients with frontal LH injury showed more frequent depressive reactions than did those with frontal RH damage whose predominant response was rather one of indifference. They confirm in the course of their research that "there is a large literature that supports the association between catecholamines and depression in humans" (p 451). Brennan (1978) reiterated the suggestion that the cholinergics play a role in sleep regulation. Osorio et al (1978) had established two cases showing slow saccades, no REM but a new sleep state without dreaming (p 227). The EEG of these children showed mild background slowing. As part of this study they suggest that saccadic eye movements and certain stages of sleep may share the same neural circuitry. Meyer et al (1980) also speculate that there is a central mechanism involved in sleep disorders. While a characteristic feature of depression is disturbed (reduced) sleep cycle, Bennet has observed the effects of sleep deprivation. For some this is a risk factor for epileptic seizures. But light sensitivity is

also a factor in manic depression (Levy, et al, 1981) as it is in some cases of epilepsy.

This has been only the merest glimpse of the complex web of interrelations which may be culled from the literature. Many such cross-sections could be taken but it is to be expected that several of the same sub-sets of correspondencies would appear. Human and ecological phenomena in general appear to be overdetermined. It is also to be expected however, that different people will be more or less vulnerable to various triggers within the set and it is to this concept that we turn to complete the picture.

2. Individual Differences

Discussion at the Ottawa Forum on low level electromagnetic radiation also highlighted the extraordinary range of individual human sensitivity, including the fact that there "are people who for some unknown reason have their own electromagnetic systems within their bodies . . . tuned into specific external frequencies" (Kuhns, 1982, p 37). This results in various resonances, with some acute results for these sensitives. Variations in sensitivity to light and other fundamental EM characteristics of our world are commonly observed. There are documented cases of sensitivity to electromagnetic phenomena preceding the Carolinga earthquake in central California (Philadelphia Inquirer, 9/5/83). We have every expectation therefore that we will find a continuum of both reactions and responses to this technology. Here we examine briefly some of the critical dimensions of individual difference in relation to CRT technology within the open systems appreciation of personality.

personality is conceptualized as the two necessary relations of sensitivity to affordances and extent of effectivity or acting upon the environment. It is not therefore perceived as "an unobservable intervening variable that is invoked to explain choice, but as an observable function that describes how an individual converts a choice situation into an expected relative value for himself." (Ackoff & Emery, 1972, p 117) These observable tendencies are named Subjectivizing - Objectivizing, and Externalizing-Internalizing, respectively.

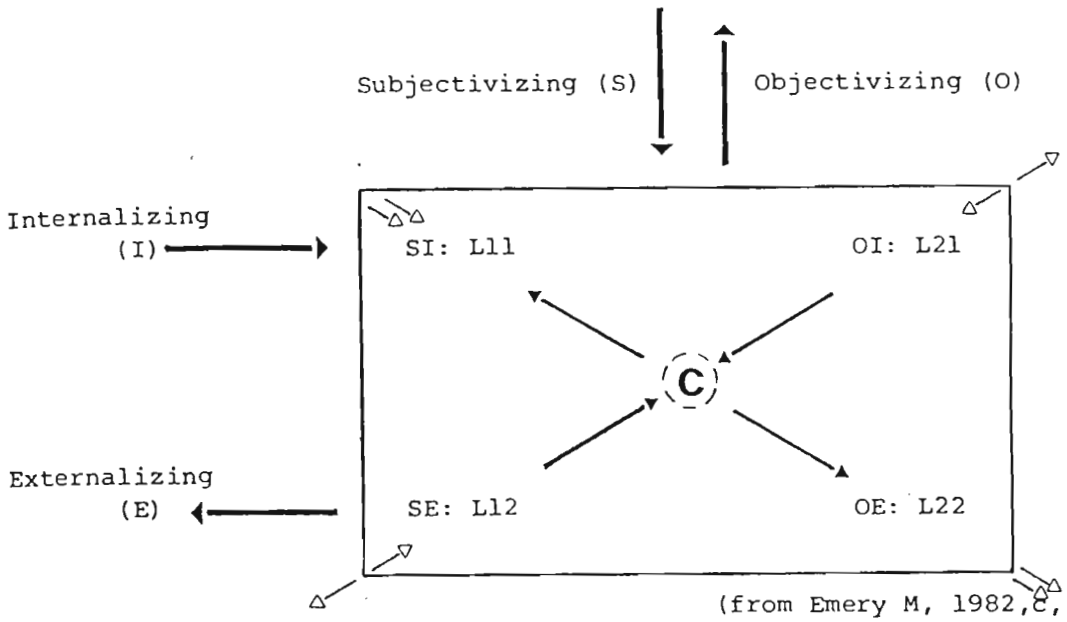
Taking each dimension separately, we find an Objectivert . . ."is one who is responsive to his environment; a subjectivert is not. Hence the objectivert is more likely to be aware of what is going on around him and to be influenced by it. The subjectivert is more likely to be influenced by his own thought and feelings than by his environment." (as above, p 120) The critical difference is thus that the objectivert will be more oriented towards and sensitive to others and the external sensory environment, 'external realities', while the subjectivert is more oriented towards introspection and the world of ideas and issues, the 'inner psychic realities'.

On the dimension of environmental effectiveness we see that "An externalizer is one who tends to change his environment to suit his needs. The internalizer adapts himself to his environment . . . The externalizer will try to organize a group of which he is a part, to lead it; the internalizer is more likely to be a follower." (as above, p 122)

These dimensions are illustrated in Figure 4.2

Figure 4.2

The Personality Space



(from Emery M, 1982, c, p 190)

The resultant 'types' may be either pure or mixed in terms of their inner or outer directedness. Subjectivizing Internalizers (SI's) and Objectivizing Externalizers (OE's) are pure in that they respectively tend to inner and outer worlds. OI's and SE's show a mix of tendencies. This is shown by small arrows at the outer corners.

Whether, therefore, we consider the CRT as either affordance or econiche we can see that objectivizers will be more sensitive to it. To the extent that it is found to induce passivity it will accentuate tendencies towards internalizing. Externalizers are likely to become quickly bored with viewing and find things to do while television is on. The most vulnerable type will therefore be the OIs.

The personality types are not equally distributed by gender and there are proportionately more females to be found in the OI box and more males in the SE space. (Emery & Emery, 1980) The fact that SEs will tend to resist the effects of the medium and in fact cling to activity and literacy could well be the reason that new variants of the family such as teletex and teletext have failed. One study sampled only young men in high salary white collar jobs, a majority of whom could be expected to be externalizers, and found decreasing interest in using the service for electronic newspapers over the experimental period. (Friendly, 1982) New Scientist (1983) has noted that the problem with teletex is persuading those who form the market to use it. Similarly with teleconferencing, "separate studies by Bell Canada and the University of London (concluded) that people who first meet via videoconference stand a higher-than-average chance of disliking each other". (Brody, 1983, p 59) As with videophones and all associated variants, there has been quiet but stubborn resistance to use, despite all the promise.

Early vigilance studies agreed that extroverts should manifest a greater tendency to vigilance performance decrement with time. E-I was considered as a dimension of sociability. Bakan et al (1963) found no decrement over a 48 minute task with introverts using the MPI. The difference between introverts and extroverts was more likely due to superior performance of introverts with respect to normals than to inferior performance of extroverts with respect to normals. They also found that while both groups tend to underestimate time, the introverts were more extreme. This suggests that the extroverts found the task more monotonous. Extroverts are more interested in the external world than their own inner workings or, tend towards objectivizing rather than subjectivizing.

Davies & Parasuraman (1983) surveyed the vigilance literature and found that most studies confirmed Bakan et al's result. Impulsivity as well the lowered sensitivity and the greater sociability of extroverts has been implicated. Circadian rhythm also appears to vary between extroverts and introverts with introverts performing better in the mornings and extroverts in the afternoon. Extroversion has also been correlated with sensation seeking and vivid mental imagery. A range of factors concerning attention and response to environment and/or greater need for external stimulation are clearly involved in vigilance performance decrements. Field dependence has also been found to be correlated with extraversion which supports an environmental sensitivity argument.

An English team has consistently found differences between introverts and extroverts using a variety of measures relevant here: EEGs in the alpha beta and theta frequency bands (Gale, et al, 1969), vividness of imagery and EEG alpha band (Gale et al, 1972); number and variety of elements in complex pattern recognition (Gale et al, 1975). Their measure of introversion-extroversion is made with the MPI which is not comparable with the scale derived (Emery & Emery, 1980) to meet the Ackoff & Emery formulation. Despite this, the findings, for example, that extroverts with eyes closed show greater alpha activity than introverts, particularly in the lower ranges (Gale et al, 1969) and that of a negative correlation between vividness of imagery and extroversion (although they argue against this result) are consistent with objectivizing as the sensitivity dimension of 'extraversion'.

An example of the link between RH dominance, environmental awareness and objectivizing, particularly OI behavior, has been provided by Reeves,

1983. A comparison of RH dominant children with symmetrical normals showed the RH children to equally demonstrate "common sense judgment, personal responsibility, social awareness and sensitivity to the needs of others" (p 230). This was in spite of considerable environmental stress, or limited academic success in school brought on by their LH, verbal-analytic deficits. The social pattern is very much that of the objective internalizer who will 'adapt' rather than 'act upon' to change. Reeves concluded that RH functions have greater significance for adaptive behavior in terms of these 'coping skills' or 'social intactness'.

More closely aligned to the present concept is the work of Prifitera (1981) and the Analytical Psychologists. The common root of Jung's typology is operationalized by Prifitera in the Myers-Briggs Type Indicator. This was correlated with lateralization of eye movements. Eye movement research, where Left Movement (LM) indicates Right Hemisphere (RH) dominance, has found consistent differences in personality with lateralization. Prifitera found males and females to differ only on the thinking-feeling (externalizing-internalizing) dimension (p 156) and could find no correlations between eye movements and personality for women. For males however, LM or RH dominants scored towards the intuitive and feeling (subjectivizing and internalizing) ends of the axes (SI type), while RM or LH dominants scored within the objective-externalizer (O-E) box. These results concern the extreme or pure types and this combined with the failure to find correlations within the women's sample, probably indicates that eye movements are not a particularly precise index of lateralization. However, the study adds to the coherence of the emerging set of relations.

Studies cited by Prifitera (1981) and the many discussed by Springer & Deutsch (1981) conclude in the main that female brains are less lateralized or specialized than those of males. An exception here is Gale et al (1978) who found evidence that females have more clear-cut patterns of hemispheric asymmetry than males. Males on some occasions showed no asymmetry at all. Weinstein (1982, p 61) has discussed the possibility that "specific neurotransmitter mediated arousal systems in the brain may also be lateralized," and sex differences in binding by serotonin I receptors have been found in rats. Should they be confirmed in humans, they will help to explain the etiology and distribution of depressive syndromes (Fischette, et al, 1983). Closely related is the apparent specialization of the LH in the overproduction of the neurotransmitter dopamine which is now implicated in schizophrenia. This latest finding supports a relation between schizophrenia and left temporal lobe epilepsy, (New Scientist, 3 Nov. 1983) and epilepsy is itself predominantly a male phenomenon. (Springer & Deutsch, 1981, p 123) As we see below, one of extreme manifestations of sensitivity to CRT technology is that of epilepsy. There is obviously a difficulty here as we are proposing that as more females are objectivizers, they should be more sensitive to environmental influences, but in the most extreme case, they are not. We cannot resolve this here, but simply note that while personality is not conceived here as an Lll or 'inside the skin' phenomenon, its dimensions have often been tied to neurophysiological functions. Seidman & Mirsky (1981) have, for example, discussed the relation of personality disturbance with laterality and extent of temporal lobe epilepsy.

Laterality or hemispheric differentiation of function is currently an area of research ferment, the outlines of which we explore briefly in

this context. Tsunoda, cited by Brabyn (1982) has argued that hemispheric dominance for a range of sounds and affects is established by the nature of the mother tongue. Japanese and Polynesian languages which heavily feature vowels, are associated with left brain dominance for both vowels and consonants and natural sounds. Other language communities appear to process these, with the exception of consonants, in the right brain. Brown & Lehmann (1977) found that nouns were responded to by the RH while verbs were processed in the left. The results were less extreme for European men than for the women. One possible implication of these studies is that language centers in the LH may be better equipped to deal with the rheomode, the flowing speech of verbs (Bohm, 1980) than with today's more static Western version which is dominated by nouns.

The real controversy in laterality studies arose in 1979 when the Gevins team announced that with new rigorous and analytical controls, they failed to find hemispheric specialization for verbal and spatial tasks. Replicating experiments, but excluding all 'artifactual' data derived from "other than mental influences on the EEG patterns," (Gevins et al, 1980 (b) p 1006) they found no activity patterns which could distinguish traditionally defined right and left hemisphere functions. Davidson & Ehrlichman (1980) contested their conclusions on several grounds including that of shortness of task duration (6 to 15 seconds) in the replication. "The rapidity and possibility of random task presentation in experiment 2 might have prevented the subjects from adopting a consistent cognitive set". (p 1005)

These criticisms are valid as far as they go, but there is a fundamental weakness in the approach which Davidson & Erlichman appear to share. Firstly, there is the assumption that there is a cognition or mental

activity which exists in pure form absolutely separate from every other form of activity. This is of course the central distinguishing feature of the first epistemological paradigm. Secondly, there is the belief that only by so impoverishing the experimental environment, by restricting time and possible responses, is it possible to capture this pure entity. As discussed below, such a belief results in the creation of a type I environment. From this, as with previous conditioning experiments, we can see that what was recorded was the bare minimum of adaptive response possible after the richness of the normal behavior had been stripped away. The 'pure cognition' Gevins et al recorded stands in the same relation to adaptive behavior as the type I field bears to a type II. Indeed, as with evidence of conditioning, the 'pure' EEG patterns are the artifact, not the essence. They are merely the residue which remains after the possibility of a full exercise of our higher mental functions, a systemic response, has been removed. The Gevins team has continued to discover more micro aspects of the pure electrical response (Gevins et al, 1981).

In the light of the second paradigm which would explore the question of lateral specialization as the subjects were free to make the best possible perceptual-action attack on the tasks, Gevins et al's conclusions are unacceptable in the same sense as are B.F. Skinner's insistences that all behavior is conditioned. Many, if not most, of the lateralization studies use conditions appropriate within the paradigm of direct perception and have overwhelmingly found hemispheric specialization (Springer and Deutsch, 1981).

Original convergences, such as the importance of the RH for color perception, continue to be confirmed. (Pirot et al, 1977) The newer and

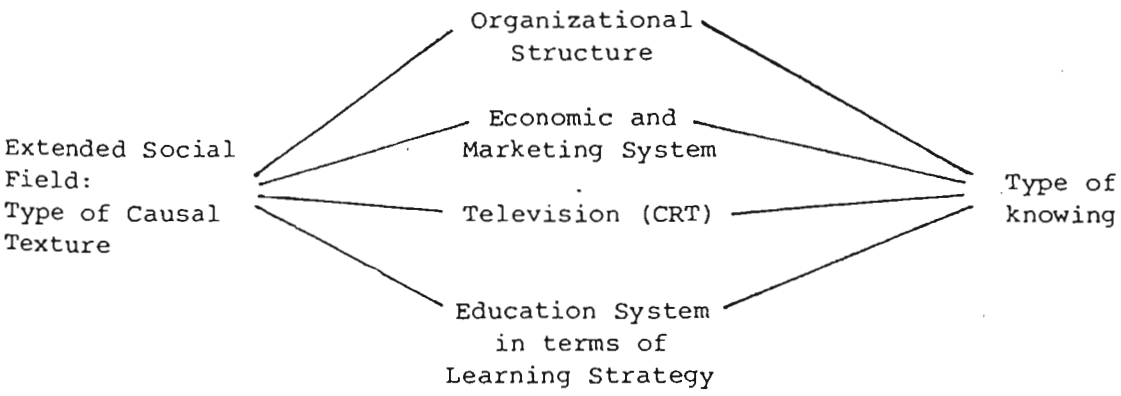
more precise technologies of nuclear medicine are also finding comfirmatory evidence of lateralization. (Cooper & Crow, 1975; Carmon et al, 1975; Ingvar, 1975) At another level, Karl et al (1980) found RH dominant people, or those preferring a 'non-discursive mode of information processing' experienced more intense emotional arousal while viewing violence than LH or discursives. Hemispheric bias affects the very extraction of meaning itself and should be included as a dimension of our range of effectivities. We proceed therefore on the basis of this latter body of evidence to expect that individual reactions and responses to CRT technology will be influenced by the relative dominance of their right and left brains.

All future testing for the effects of CRT technology should incorporate the key dimensions of individual sensitivity. In particular, the open systems personality test should be given a trial in relation to perceptuomotor phenomena. Clearly there is sufficient evidence to sustain expectations that a range of both reaction and response to CRTs will be found.

Chapter 5 CRTs in the context of Causally Textured Environments

Having derived testable propositions about the (mal)adaptivity of TV at the level of learning, it remains to reintegrate these within the large frame specifying the values of Yo. This frame has been defined by the extended social field, E_E = L22, where the values of L22 are taken to be the causal textures of the field. We may therefore specify a range of directive correlations flowing from the set of causal textures identified.

We will use the collapsed model of x's at t_k which allows us to model the human flexibility of perceiving an X simultaneously as affordance and effectivity. Having identified the importance of organizational structures and two institutional systems within and between which the knowings from television may be tested, and also having identified learning strategies as the link between knowings, the choice model and environments, we may examine television as an X within the following schema:



By identifying the forms of the Xs which are appropriate to each value of Yo in terms of causal texture, we may gain another more comprehensiv

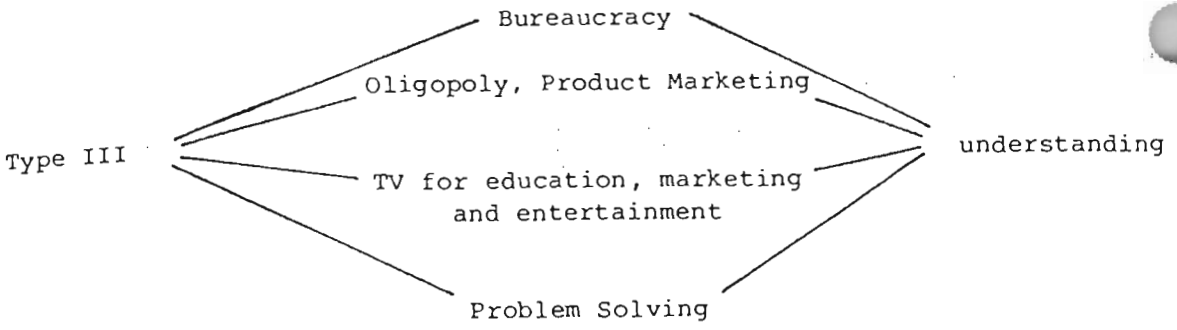
appreciation of the role of television, historically and in terms of the current and possible evolutions of the field.

Five types of environment classified by causal texture have been identified (Emery & Trist, 1965) and are still in process of clarification and elaboration (Baburoğly, 1982, and personal communication, 1983). Causal texture is "The extent and manner in which the variables relevant to the constitutent systems and their inter-relations are independently of any system, causally related or interwoven with each other." (Emery et al, 1974, p 20) It has so far been identified as follows:

Type I placid, random
Type II clustered, placid
Type III disturbed, reactive
Type IV turbulent
Type V vortical

Of critical importance here is the evolution into and out of the current type IV environment; the probability of a return to a modern version of a clustered and placid texture, or a further disintegration into something approaching a type I or type V. A type IV field is by definition unstable. In order to highlight the importance that the media assume in our cultures, the discussion here will begin with the recent past, the type III field, trace the emergence of type IV and then speculate on possible futures. In each case, a summary of the argument will precede the discussion, describing the predominant appropriate function of each system.

1. Yo = type III, Disturbed Reactive



A type III, disturbed reactive environment probably first appeared as a socially determined phenomenon about 1790 with the advent of the world economy. It was certainly fully fledged by 1895 when a great wave of large organizational acquisitions took place. These were triggered by technological break-throughs in the fields of energy generation and communication. (Emery, F. 1977, p 16-20) The West with a cosmology rooted in Euclid and Aristotle had put their newly discovered capacity for abstracting generic concepts and logically infering at the dispos of this world view. Undoubtedly, the emergence of the scientific renaissance accelerated this figure-ground reversal from the old oral cultures. The distinguishing features of a disturbed reactive environment are large systems in competition for resources to further fuel their own growth and ability to out-manoeuver the competitors.

Emery has argued the emergence of the disturbed reactive environment created the conditions whereby the West resorted to and adapted an ancient model of organization, historically more prevalent in the East. They created bureaucracies on a massive scale, pervading all areas of life. Bureaucracies are organizations designed on the principle of the redundancy of the parts. These parts, whether they be people, sections of organizations or huge organizations themselves, must be "standardized, interchangeable and to all intents and purposes indistinguishable from

each other." (Emery F. 1977, p 9) The epitome and the symbol of the 'success' of this cultural evolution is the ultra-short cycle assembly line. (Emery F. 1981, b) In bureaucratic structures responsibility for control and coordination is taken from those who perform the tasks and given to the next level up the hierarchy. Thus is established a hierarchy of personal dominance, and a process of de-skilling in the mobilization of human potential.

This bureaucratic or first design principle (redundancy of parts) can be and has been used to structure any unit, regardless of purposes. It was applied not only to the major institutions of our society such as schoool, church and family, but to large business and service concerns and also to the multitude of processes involved in the planning and running of local community affairs, union and political machines and sub-machines, war and leisure activities. "The cry of the urban crisis is really the echo of one which began with the Industrial Revolution." (Goodman, 1972, p 66)

While the organizing principle of the type III field was that of bureaucracy the mature economic form was oligopoly rather than monopoly. (Emery 1984; Glaser, 1983) This was a consequence of the awareness that environmental events relevant to oneself were also relevant to the survival of similar others, and that these were also purposeful.

Marketing which is concerned with affecting choices or transactions (Glaser, 1983) took on its unique and systematic properties in this environment. Glaser has in fact argued "that the marketing system is an effective form of organization at only one level of environmental complexity." (1983, p 14) the type III. In this its finest hour,

By including the fifth postulate which contradicted perceived reality, Euclid opened the way for a form of knowing which could not be known or learnt except by an intellectual process divorced from naive realism. Because this postulate could not be derived or extracted from direct observation it provided the foundation for an elite, the literate who were to specialize in such abstract knowing. Valuing knowledge unable to be derived from perceptual experience had two effects: it devalued the experience of the ordinary person and it had to be taught. In this way another element of stratification was introduced and institutionalized. Elites developed within elites. Emery (1981,a) traced the evolution of this paradigm of learning through the philosophies of Locke, Berkely and Hume to the pedagogy of Herbart, the empirical psychologists such as Pavlov and Skinner, to the present. 'Paradigm One learning' is that which is held to take place through the processes of association, abstraction of generic concepts, repeated observation and/or replication and 'memory'. This paradigm, and its epistemological assumptions, takes as axiomatic the need for analytical abstraction and logical inference. As the mind was believed at birth to be a tabula rasa and capable of receiving only discrete sensations, it was necessary to build into the paradigm the concept of logical inference. Only then was it possible to move from the association of sensations to appreciation of meaning and of relations such as cause and effect. The task of education in this paradigm is therefore the distribution of accumulated knowledge. To achieve this distribution effectively, it was of course necessary to disabuse individuals of any faith in the validity of their own idiosyncratic perceptions. That it was successful in this purpose has been attested to by Schumacher (1977, p 11).

It also required the stressing of the importance of memorizing established associations and knowledge of the rules of classification and taxonomic hierarchies. Other requirements followed logically, such as externally imposed discipline. From these epistemological assumptions and the derivative requirements of a critical disciplined and literate mind, it is possible to deduce the evolution of most of the characteristic and highly stable features of the Western system of formal education: the teacher-student relation, timetables, standardized curricula, the nature of the reward and punishment systems, etc. This paradigm is practiced at every level of education and across every division of our culture. (Emery, F. 1981(a)).

Apart from destroying certain basic human rights and dignity, bureaucratic structure whether in education or business, affects human communications. The genotypical structural relations which define a bureaucracy cannot provide Asch's conditions for effective communication, and replaces them with three of its own, namely asymmetry, egocentrism and 'them-and-us'. The structure itself acts as a medium and imposes on the message which it carries, the form of itself as medium. There is little hope of attaining honest co-operative communication through a medium which induces competition, suspicion and me-firstism. (Emery & Emery, 1976, Chpt. 13)

The marketing and education systems, particularly the priority for teaching of science, were perhaps two of the most spectacular achievements of the mature type III era. Both embodied in almost pure form its principles and ideals. The emphasis upon science and the concept of advertising as educational were part of a concerted effort to understand how the world works and the role that well informed citizens

marketing was at the leading edge of defining the image, profitability and market-share of the bureaucratic organization. Marketing, seen in this context, becomes the executive arm of an organization whose purposes were governed by the ideal of Plenty. (Emery, F. 1977) In a disturbed reactive environment the marketing system was relevant to adaptation in two ways. By adding a product it could change the consumer's actual choice situation and/or by communicating about a product it could affect selected parameters of the decision-making process. Glaser's (1983) analysis shows that both the parameters of probability of choice and effectiveness were utilized with the success of such marketing being measured by the degree of brand loyalty. (p 23)

At the planning level (Ll2) the disturbed reactive environment demanded that tactics and strategy form the basis of operations. "Hence the concept of the advertizing campaign" (Glaser, 1983, p 23) Conceived as a weapon to aid in the fight for growth and survival in this environment, the advertizing campaign was nevertheless serving some minimal educational function. While such operations acted upon the probability of effectiveness as well as merely imparting a sense of familiarity they were an aid in solving the problem of how to move towards 'more and better'.

The learning strategy appropriate to the type III environment was that of problem solving as in playing chess, and it was in this environment that the bureaucratized educational system also flowered in mature form. After a long evolution, linear logic attained in the classroom what business had achieved in the market place.

(and consumers) must play in that quest. Progress or development, civilization, are now almost synonomous with literacy (Olsen, 1975, p 372). There was a powerful belief in the rightfulness of this epistemology and the fact that if followed wholeheartedly, ultimately we would arrive at 'the truth', having also made substantial progress towards the good, plenty and a better order (Emery, M, 1982c, p 194). But the paradigm and its tool literacy, provided "meanings out of context" (Olson, 1975, p 367) where context or reality is the unifier. Characteristic behaviour in disturbed reactive environments is simulated behaviour (Emery, F. 1977, p 9) as in the experimental laboratory. The proliferation of products for the mass market simulated the good life as the minute yearly changes in the American automobile hid the lack of fundamental change in design. In its search for understanding the scientific metaphysic, embodied in type III, managed to distance the consequences of its means from the physical reality and more fundamental psychologics in which it was embedded. Clearly there is a very close relation between the effects of bureaucratic structures in any system and dissociation. Both rob people of their right to exercise responsibility and concern.

A communications medium appropriate for a type III environment will share the characteristics of the predominant organizational econiche and function in the service of the major institutions. Television should therefore be part and parcel of bureaucratic culture, providing the conditions for hierarchical dominance, deskilling and dissociating. The conditions themselves will approximate asymmetry, egocentrism and segmentation. Information and power will be securely held at the top and the selection and shaping of information will proceed in a manner commensurate with the purpose of maintaining and enlarging that power.

In short, this medium in a disturbed reactive field will become an oligopolistic industry sharing the distinctive features of other larg systems who co-inhabit the field.

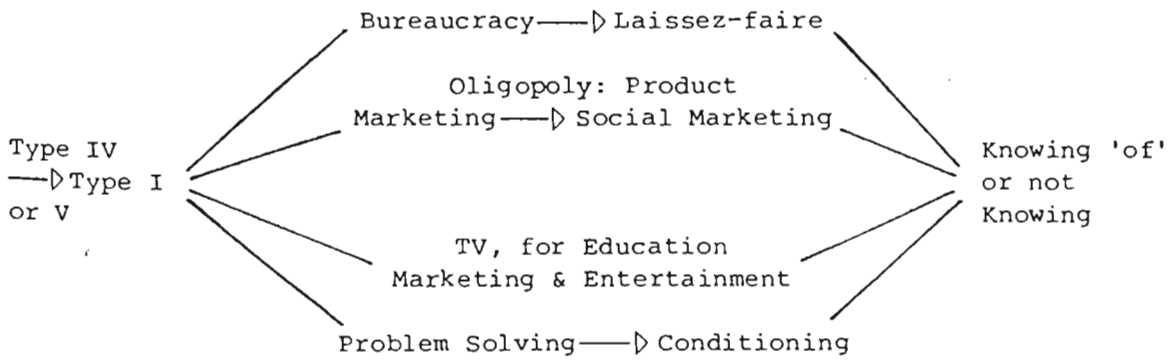
As econiche it will map a simulation of this reality onto behaviour with similar if not identical results, springing from either or both, the medium or content. In the service of type III marketing it should lead in the battle of survival, bringing the advertising campaign to the state of an art form where recognition of brand is primary. For education it must deliver knowings of, about and understanding in the sense in which literacy has achieved this. Thus while it must to some extent distance understanding from directly perceived reality, it must also induce generically conceptual as well as iconic knowing.

There is however, another function for television in a type III field a its success in fulfilling it will guarantee its competitive status as a large industry in the field. Living and working within bureaucratic structures results in loss of vitality and positive affect. Energy and will to associate, dwindle. An appropriate medium will not only simulate but subtly distort the representation towards the positive affects. This will kill two birds: that of the gap in time created by the reduction in associating, and that of the affect deficit created by the often intense but negative bureaucratic dynamics. This function is of course, that of entertaining, relieving the pressures and frustrations of type III life. It will do this the more effectively as it is undemanding, requiring only a passive response, although the invitation should be of pseudo-participation. To the extent that it will achieve these ends, television will be an adaptation to a type III field.

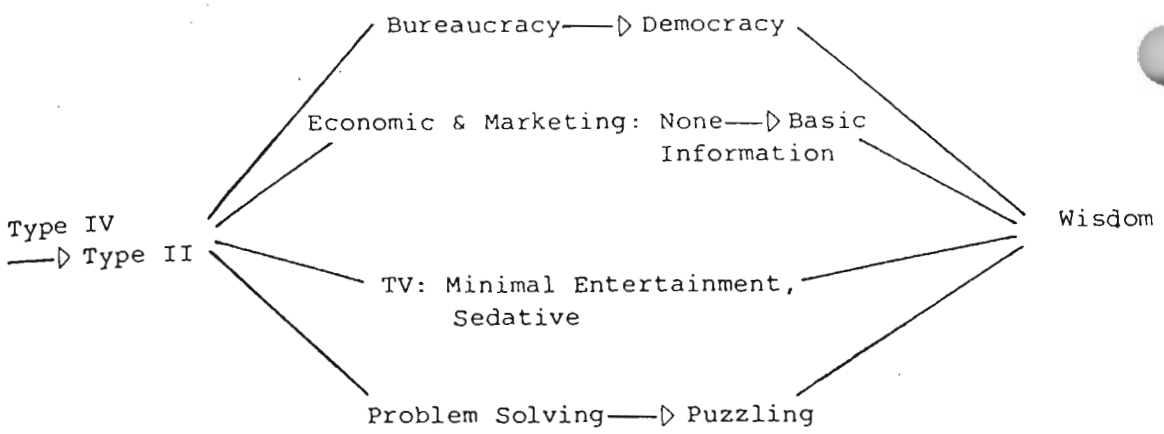
But the type III itself is not adaptive. The large systems, their transactive processes and the logic which spawned them, had consequences unintended and far-reaching. In this era which removed from people the opportunity for responsible decision making about their own affairs, lay a flaw which ensured that the type III environment would be in the West, a brief historical abberation. People are purposeful, not limited simply to adapting to the environment as given. Bureaucratic structures robbed people of the conditions under which they could fulfil their basic nature and potentialities. It was inevitable that once people could see through the smokescreen of hidden assumptions which bound them, they would act in their own interests to undermine the bureaucracies and reassert the old values. "This power of men over men, exercized by a simple act of will and congealed in a property right is not freedom . . . It is only a delusive shortcut in which humanity was for a time lost." (Caudwell, 1949, p 114, see also Booker, 1980, p 27-31) This epistemological paradigm which advanced so far in the West as to perceive humanity in its own image of fragmented and redundant parts, carried its own self destruction.

2. Yo = Type IV: The Evolution into and out of Turbulence

(a) Towards Maladaption



(b) Towards Adaptation



Two diagrams (a) and (b) are required here because a type IV field is by definition transitory. This type of environment like the previous disturbed reactive one is dynamic, not placid. But "unlike the disturbed reactive environments the dynamic properties do not arise just from the interaction of particular systems but from processes that are set off in the environment itself." (Emery, F. 1977, p 9) In other words the current social field or environment is producing change by its own dynamism and by this process creates relevant uncertainty for the increasingly inter-dependent systems within it.

The reaction to the unexpected consequences of the large scale exploitation of the physical environment which disturbed long ecological chains and balances, together with a re-assertion of values centred around non-dominance, heralded it in. First noted as emergent in 1962, (Emery & Trist, 1965) it entered into international consciousness in the period 1967-69, and has now become an accepted and continuing phenomenon. Its evolution has been traced in broad terms to 1977. (Emery, F. 1977) Behind this movement, Pirsig sees the phenomenon of science as it actually functions - "Through multiplication upon multiplication of facts, information, theories and hypotheses, it is science itself that is

leading mankind from single absolute truths to multiple, indeterminate, relative ones." It has produced 'anti-science -- chaos' (Pirsig 1974, p 116). More than this, the resultant of these emergent changes in the field amounts to a recentering of civilization or cultural revolution. (Emery, F. 1978, Mead, 1972, p 88) The fuel for this revolution lay in the demise of two silent assumptions that had provided the historical rationale for the persistence of hierarchical domination. (Emery, F. 1978; Stavrianos, 1976, p 138) The breakdown of these assumptions concerning the need for patriotism and 'doing without' clarified the nature of the choices being faced, and a choice in basic organizational design is now so inevitable that there is no question but that people will make the choice, even if they are not conscious of doing so. They cannot hope to adapt to turbulence without restructuring their organizations along the lines of a design principle which is based on redundancy of the functions of individual parts, not redundance of the parts themselves. (Emery, F. 1977, p 91-100) And there is quite a bit of evidence that this is exactly what is happening (see for example, Williams 1982, p 19-29). Known by many names, it may amount to a new, more directly participative, democratic order (Magill, 1970). The ubiquity of bureaucracy in the type III has guaranteed uncertainty and possible change on the same massive scale, as the change in system principle implicit in this revolution is that from variety-decreasing to variety-increasing organizations. It is that change expressing the move from a concept of people as mindless cogs in a machine (redundant, replaceable parts) towards that of people as multi-functional, truly human and caring; capable of seeking ideals at the level of people-in-environment. One aspect of this is a return to a more adaptive concept of how we perceive and know, as herein. Also, the change has, as

I have shown elsewhere (Emery, M, 1982c) resulted in a set of visions with extensive commonality.

Thus while the type IV field creates opportunities for new visions and actions towards stability and adaptation, it is only to be expected that conservative forces should rally around the defence and maintenance of the type III. Attempts to prolong the geno- and pheno-typical features of hierarchical domination are widespread and should be expected to continue to arise from those who have gained most from the controlling institutions of the previous era. There are grounds for optimism in drawing conclusions to the turbulent field (Emery, M. 1982,c, p 130-133) but here we must confront the very real choices facing us in terms of our major institutions. Thus transitional sets (a) and (b). Let us begin therefore with the demands which flow from the type IV and the ways in which the institutions under consideration have attempted to eith accommodate or assimilate them.

In the previous predictable environment it was good enough and effective enough to have standard plans and standard designs for all organizations. The historical uniqueness or character of an organization, or a community was irrelevant in the fact of a planning and decision making process which focused only on some of the dimensions of decision making. The race toward conformity suppressed awareness of the fact of character, style and culture which embodied the values inherent in the historical development and situational characteristics of an organization. Without consideration of these facts, quantitative cost-benefit analysis seemed equally applicable to all human projects. (Emery, F. 1977)

Marketing in this environment must be radically different if it is to aid in an organization's survival. Inevitably the marketing system becomes interwoven with the extended social field. Consumers as the object of interest become an inadequate focus as societal values shift and change, creating in some places vortical currents. The importance of forecasting values has gradually been recognized but as Glaser points out "paradoxically, by the time the consumer researcher has realized the significance of the social changes and gathered data, the 'trends' discerned will probably have changed their forms and emphases." (1983, p 25)

While there is growing recognition of the problem, marketing principles and methods have been slow to follow. This is evident in the debate about the value of targetting. Given that the traditional, basically demographic frameworks for segmentation can no longer be relied upon, there are those who search for new hard data taxonomies (for e.g. Dhalla & Mahatoo, 1976) and those who being more aware of the cultural shift, have attempted to accommodate it by examining its explicate faces; values, attitudes and lifestyles. (Reynolds et al, 1977; Roberts & Wortzel, 1979; Kassarjian, 1971) And the system principle of the new culture is beginning to show through. "While brand proliferation seemed to suit the affluent and expansive 1950s and 1960s, declining disposable incomes in the economically troubled 1970s have put this marketing ploy increasingly out of joint with the times. Consumers pinched by inflation are more and more looking for bargains in basics rather than new faces on old products." (Macdougall, 1979) "In the last two years, the U.S. consumer has gone through a spiritual transformation that has resulted in new buying patterns . . . the seemingly insatiable appetite for convenience and variety in products has changed to a clearly marked

preference for basic values." (Harper, 1976, emphases are mine.) For marketing now there cannot be 'business as usual' (Kelly & Scheewe, 1975) and Culwick has argued for de-marketing (1975). But when we examine what Cullwick means by this, we see that perhaps the marketing system has not in fact come to grips with the turbulent field, and also perhaps that it "may be neither necessary nor sufficient for business organizations operating in a type IV environment." (Glaser, 1983, p 26)

As the marketing system and the turbulent field jointly evolve, new patterns of behaviour have emerged. We have witnessed reductions in the product life cycle, the advent of 'fad' marketing. At the same time a growing cynicism about private enterprise and concern about the public interest, the right to know, 'truth in advertizing' (Kangum, et al, 1975) and related issues have accelerated government intervention into business and market conduct. The backdrop is a growing prejudice against marketing per se (Steiner, 1976) which undoubtedly relates to its role as flag carrier for the type III environment. Increasingly in the current type IV environment, the real choice appears to be between buying and not buying, smoking or not smoking, as the value base in terms of health for example, widens the gap between those options and diminishes the real choice between brands. Hence the emergence of the concept of social marketing, which appears to some as a genuine alternative, to the product and image marketing of the oligopolist system. We will return to this concept after discussing the appropriate form of learning for a type IV field.

(i) Learning in the Type IV Field

The strategy of learning appropriate to a turbulent field is that which focuses on all four parameters of the choice situation. To survive in

such a field the field itself (the L22) must be perceived and conceptualized. This can be defined as the task of learning to re-order perceptions within new conceptual frameworks, or perceptual reconstruction where the ground becomes the figure. This is the essence of puzzle solving (Emery et al, 1974) or learning to learn. It is that form which engages us in searches beyond our cultural assumptions and conventional 'wisdoms'. 'Puzzle Learning' is unlike problem solving in that until each piece is individually located and placed, it is not possible to determine which piece must be found next. There is no one starting point and no necessary set of steps which, if followed, will solve the problem as determined by the defined set of starting conditions (Emery, F. 1977, p 125-6). It is dependent on a function of perception because all possibilities must be searched, not just the accepted conceptual probabilities. It is learning to be creative. The way back to a harmonious or placid, clustered type II environment where meaningful learning is the primary requirement may involve traces of all of these learning modes but none other than puzzling provides the means whereby new direcctions can be glimpsed and grasped.

There is another aspect of the turbulent field which requires that we go beyond the concept of individual lea ner-in-environment. Because "it is doubtful that individual systems can by their own efforts successively adapt to such richly textured fields," (Emery, F. 1977, p 11) learning must encompass a dimension of inter-system or group dynamic. The unit of analysis then becomes the learning group, community or network.

Two other perspectives complete the new concept. Firstly, as the focus within a type IV field is the set of parameters for decision making, reconstructive learning must encompass planning. And as planning within

a type IV environment becomes active (Emery et al, 1974) such learning is then by definition experiential, learning by doing. The unit of analysis is then better described as the learning planning community. Secondly, adaptation within a turbulent field includes the notion of power to motivate to transform the field itself. The learning strategy must be that which convinces the learners that they want to learn and do more about the quality of life, improving it for themselves and others so that an evolutionary spiral of learning and transformation is set in motion. This can be described as the process of cultural change leading towards the Learning Society. (Hutchins, 1968; Husen, 1974) The practical focus for transformation is the organization-in-environment and the transformation itself is from organization-in-environment to learning planning community; or, in other words, from organization to learning environment (Crombie, 1981) or more precisely, to an econiche which affords puzzling. This is in essence a process of restructuring in ter of the second design principle and I have argued elsewhere (Emery, M. 1982,c) that democratic structure is the most appropriate form of human organization for learning to act wisely. In its application, this learning planning process is known as Searching and the discrete event which brings the new community into being, as the Search Conference. (Emery, M. 1976, 1982,c)

It has been argued that previous challenges to the existing type III paradigm of education have failed to effectively change it because the core of the paradigm lies not in practices per se, but in its epistemological assumptions (Emery, F. 1981a). Only processes such as Searching which mobilize direct perceptual knowings can mount such an effective challenge and lay the foundation for the adaptive process learning to act wisely.

The danger in a type IV field is that relevant uncertainty will increase more rapidly than awareness of the availability and value of the new epistemology and current demands for a return to the 3Rs may intensify. In its most extreme form this would be a return to simple stimulus-response, rote learning or conditioning, which the type III education system itself had to supplement with other practices in order to achieve understanding. Additionally, attempting to impose this on a generation, heavily infected with the tenets of the cultural revolution, could only increase the conflict which presently exists.

Television has no role to play in learning to act wisely which is by definition both highly participative and ecologically experiential, unmediated. There is however, one possible minimal role that television may adaptively perform although it is a corollary to the learning process itself. Searching, for example, particularly as a new experience, is intensely demanding and can present a substantial risk of overload (Emery & Emery, 1976, p 76; Emery, M. 1982,c, Part III). Taking a little television at the end of such an experience has been found to aid in 'unwinding' and reducing this risk. As light relaxing entertainment it fulfils the function of sedative or tranquillizer, and appears less dangerous than comparable chemical forms.

(ii) Social Marketing

Having argued, in agreement with Glaser, that traditional marketing has little if any adaptive function in a type IV field, and with the core dimensions of an adaptive learning strategy identified, we may now consider the adaptivity of social marketing in this environment. Social marketing was originally defined as

> "the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution, and marketing research. Thus, it is the explicit use of marketing skills to help translate present social action efforts into more effectively designed and communicated programs that elicit desired audience response. In other words, marketing techniques are the bridging mechanisms between the simple possession of knowledge and the socially useful implementation of what knowledge allows." (Kotler & Zaltman, 1971, p 5, with my emphases)

They saw it as a much broader concept than social advertising and social communication with its roots in accepted informational approaches to social change. Fox and Kotler (1980) trace its development over ten years and exemplify four elements which are missing from a pure social communication approach: these they identify as 'sophisticated marketing research', product development, use of incentives and facilitation. "Social marketing involves coordinating product, price, place and promotion factors to maximally motivate and facilitate desired forms behaviour." (Fox & Kotler, 1980, p 26, my emphasis) Regardless of the fine distinctions made between these forms, all fall clearly into the classification of 'pro-social' marketing, rather than commercial marketing which "frequently supports and encourages present habits including those that are potentially harmful" (Fox & Kotler, 1980, p 30).

What is actually being done here? A process of learning to act wisely consists of people directly perceiving in context and participating to evaluate and create choices with which they will have to live. There is very little sense of this in social marketing, the goals of which involve the concept of a right or socially acceptable or conforming choice. Decided by whom? Such an approach obviously creates two classes of citizens: those who know and those who should know -- or a class of experts and a class of proles? The experts will be those who have the

political or institutional right to attempt, in whatever way, to persuade others of the value of their choice. To the poor and the disadvantaged, social marketing can now bring the right choice -- the one they haven't previously been exposed to or have rejected. As these are the people who are most often at risk, the end may be considered to justify the means. But the implications for a future society of using social marketing are clear and quite totally opposed to an educational approach. The end point is not increased choice but restriction: predetermined choices by others, rather than personally or collectively determined choices.

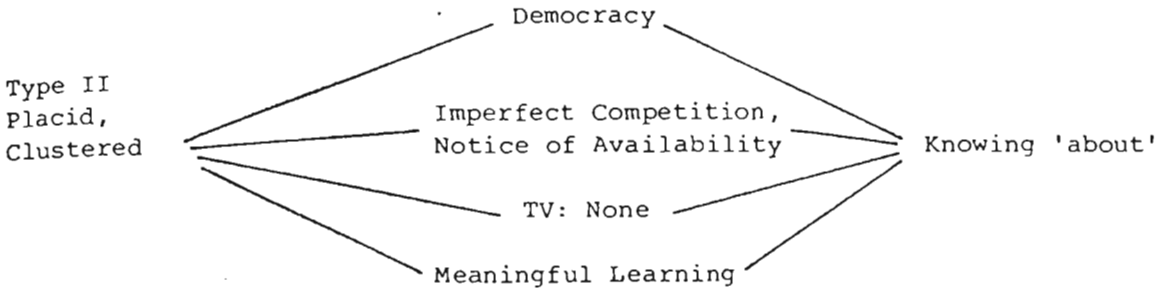
This is a blend of evangelicism and synoptic idealism (Crombie, 1972, Emery 1979), the active maladaptive scenarios which spring from probable effectiveness and relative intention and whose passive counterparts are dissociation and superficiality; those maladaptions most frequently correlated with heavy viewing. As such, they share more in common with the type III teaching paradigm than the type IV learning to learn. The concept clearly contradicts the principle of direct ecological perception and knowing, and is neither a participative nor creative solution to what the proles may be perceiving as <u>their</u> problem. Contraception is not an answer to overpopulation when the problem is how to survive without a large family. Expert knowledge dissociated from personal realities has caused more problems than it has solved. (Personal communication with defector from W.H.O.) In a turbulent field, social marketing actually militates against an adaptive response at the level of learning and as we shall see, through its use of television as primary vehicle, again poses the alternative of knowing of, conditioning, rather than wisdom or puzzling.

Briefly we return to Cullwick's (1975) concept of 'de-marketing' by which he means "developing major changes in consumer orientation . . . creating new attitudes that relate to emerging social value patterns and that specify action alternatives for consumers." (p 51) This is no more or less than social marketing. Despite these best efforts to perceive and conceptualize the shifting value ground, the underlying ideology and process remains that of the type III education system. It is simply another form of information transfer, the shaping of 'tabula rasas' or the filling up of little bottles. Social marketing has adopted the most typical ploy of 'educational reform' -- it has changed the curriculum! Genotypically, it is type III. It could therefore, well assume the status of contributor to intensification of the type IV environment. Television may pursue social marketing but its outcome is entirely predictable -- it will be maladaptive in that it is a mismatch of environmental affordance and human effectivity. No focal condition will be satisfied in this fashion.

The future of the type IV field is limited as people seek the means whereby they may stabilize and recenter it, or merely attempt to escape its fundamental discomforts. (Toffler, 1970, 1975; Bell, 1974) Alternatives entail retaining the basic structures of a type III (but the flaws in that were what led to the emergence of the type IV), make a genuinely adaptive move towards a type II, placid, clustered environment, or risk a retrogression into a type I or type V. To these we now turn, but even with this limited discussion, it has become clear that a major benefit arising from awareness of turbulence has been the emphasis put upon the nature, enjoyment and responsibilities which are part and parcel of human living. Many are reawakened and interested to explore the

dynamics of their world (Thompson, 1973, p 145; Freire, 1972, p 81) but other possibilities also loom large.

3. Yo = Type II, A Clustered, Placid Field



If, as seems possible, we may be looking forward to a new variant of the type II placid clustered field, it is important to explore the possible directive correlations between CRT technology and this field, remembering of course that the coenetic variable from which these possibilities will spring is the resolution of the future of the turbulent environment.

The essence of a type II environment conceptualized as a broad social environment which is patterned so that "goals and noxiants cluster in ways that are lawful"; that is, not randomly, but according to the deep cultural assumptions about and perceived structure of the environment. The appropriate form of learning in such an environment is meaningful, having to do with such structures. Planning need only to be 'satisficing', devising strategies for maximum access to goal objects and minimum exposure to noxiants. (Emery, F. 1977) As the blinkers of the assumptions and ideals which formed the infrastructure of the type III environment fall into disrepair, long accumulated evidence about the human past is being re-appraised and reconstructed. As the birthday of homo sapiens is pushed back in time, we begin to appreciate the strength

of our associative nature, our spoken language and proclivity for group life, as discussed above. For a long era there was a stable an predictable world. The work of archeologista and anthropologists leaves no doubt that at earlier times there were such social environments. (Boyden, 1973; Mitchell, 1975; Keesing, 1979) Within this environment people could build forms of organization and culture which fulfilled basic human needs and enabled them to live in harmony with the physical environment. In this environment the "relevant objective is that of 'optimal location'. Given that the environment is non-randomly arranged, some positions can be discerned as potentially richer than others, and the survival probability will be critically dependent upon planning to get to those positions." (Emery, 1974, p 24) Arguing from these criteria, Glaser (1983) concludes that an adaptive business organization would need a production and distribution orientation rather than a marketing one as sales and profits are not dependent upon variations i the product. Market segmentation needs only to be concerned with gross criteria associated with the richness of the location. "Data on personality, lifestyle, and other such esoterica will be irrelevant." (Glaser, 1983, p 21) Advertizing is simply the function of informing the consumer that the product is available.

In the old type II cultures, meaningful learning proceeded both through direct perception of the informational structure of the environment and 'indirection'. (Havelock, 1963) The 'education system' of the oral cultures which evolved through the long period of the previous type II era was characterized by conversation and by participation in the arts, particularly those of music and dance. The relation between marketi and learning is quite clear. Once it was advertized that a product was available at a particular location, news of its availability would be

transmitted through the social structure by media appropriate to that structure. The life of a product in a placid clustered field would be dependent on its perceived meaningfulness in relation to the structure of the field. Should it not satisfy the established criteria for meeting needs, its life would be short. Similarly, should the medium chosen for its advertizing not fit perceptions of meaningful communication, the information so conveyed is likely to be disregarded or rejected. As strategy is a necessary dimension of survival in this environment, products and media will be judged not on the basis of their immediately presenting attractiveness but on their long term utility in enriching the affordances of the environment. Life was meaningful learning, embedded in and accutely attuned to a K universe, with a minimum of fragmented, specialized institutions or functions.

The key to type II is ecologically given; in it we know we are a 'part of'. The participative learnings of the old type II cultures were intensely practical, concerned with how one conducts adequately one's responsibilities to the whole; but they were joyful. The paradox is that understanding and wisdom were existent, but they were given in the overall scheme of things. What needed to be passed on was 'knowing about', with respect and love for the whole. Should we once again attain wisdom it will be similarly incorporated into our knowings and practices. Wisdom becomes a focus only when it is ostensibly lacking. Thus, its emphasis in a type IV.

Our understandings gained within the type III need not be lost, but they and further advances in 'scientific' knowings must be reintegrated within an awareness of the systemic nature of all things. Nor need we become illiterate, but the value of literacy will be subordinate to the more

basic forms of conversation and the arts. Stability is the promise of such enjoyment cultures (Tomkins, personal communication) and it is therefore doubtful if television will be voluntarily chosen as a medium appropriate to such a culture. As econiche it will be less attractive than the real world of people associating, in tune with themselves and their planet. Even its minimal function described above as sedative is subject to controversy when one envisages a world where searching is a natural activity, rather than an exhaustive exercise of weary, literate and dissociated people.

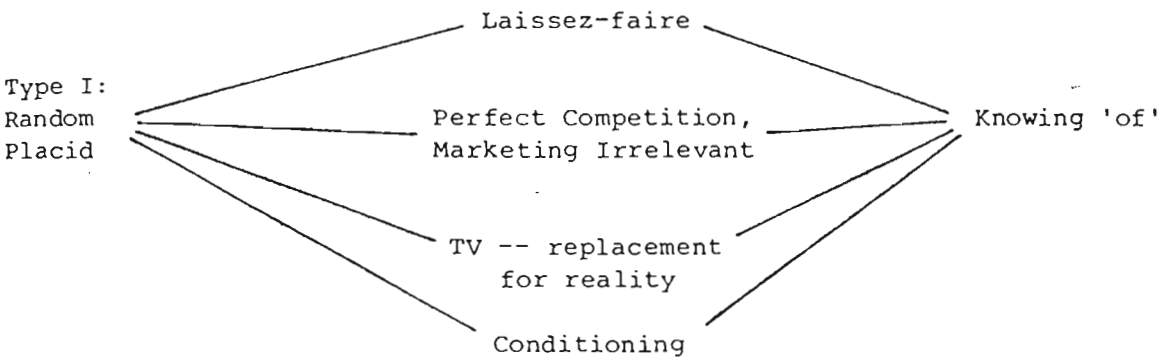
There is a question as to the future of the new CRT technologies in the sphere of productive activity in a type II field. It is most probable that as research continues into the effects of this technological family that new cost-benefit ratios will be perceived, and certainly that usage in terms of shift hours, etc., will be carefully considered (see Chapter 14). Self-managing groups as the dominant organizational structure will take care of much of this concern.

In a type II where the emphasis is upon meaningful learning, there is also a question as to how much of the massive banks of 'information' already existent will actually be found useful. As with marketing and the technology itself, the information explosion is a product of the type III. And it is well to remember Von Foerster's point that information is only informative when perceived (Von Foerster, 1969). We have come to equate the vehicles for information such as books and computers with the information itself. Also, as much of this informtion is abstracted, indeed many times removed from ecological reality, it is quite probable that as Glaser concluded in his analysis of type II marketing, that much of it will be found to be simply irrelevant. In other words, a large

part of the rationale for new technologies, such as teletext, will vanish into thin air.

There remains little doubt that the placid clustered environment is that to which we are adapted. If television or CRT technology generally, cannot produce knowing 'about', it will not be an adaptation in this field. Looked at from many angles, this would appear to be the most probable conclusion.

4. Yo = Type I, a Random, Placid Field



As Terreberry noted in 1968, "there is some question, of course, as to whether man actually has the capacity to cope with the turbulence that he has introduced into the environment". (p 610) Should we not, the choices are limited.

We do not deal here with the type V vortical environment and its associated stalemated systems (Baburoğlu, 1982) for the simple reason that should one eventuate on a large scale from the current type IV, there would be little point in considering the role of a communications medium. The survival tactic in a vortex is to behave like an inanimate object, 'play possum'. There is no strategy, purposefulness or

communication in such an environment which is purely environment (L22) (Emery, 1977, p 12).

On the other hand, should the type IV field become so uncertain and painful that those within will intensify their moves to dissociate themselves from it, the field could approximate a type I. A high degree of relevant uncertainty combined with the passivity of dissociation may well approach the theoretically limiting conditions for random placidity. While it is extreme "there has been wide recognition of the need to postulate it as a theoretical limit . . . (It) may frequently occur as the relevant environment for some secondary aspect of an organization and is also quite likely to occur in humanly designed environments for the reason that such simplified environments offer maximum probability of predicting and controlling human behaviour." (Emery in Emery & Trist, 1972, p 42) Examples commonly cited are concentration camps and conditioning experiments. Here we argue that television as econiche, approaches or simulates the nature of a type I field and is an appropriate econiche when the field <u>is</u> approaching a type I.

In type I there is a random distribution of goals and noxiants such that the system cannot know what will turn up next, when or from where. (Emery, F. 1977, p 5) There is no strategy therefore which is better than the best tactic and "in the absence of differences in relative value -- the nearest goal object being the best -- system behaviour . . . does not involve choice." (Emery & Trist, 1972, p 42) "It seems most unlikely that any living systems evolved from such environments" (Emery, F. 1977, p 6) and the appropriate organizatonal structure is laissez-faire. In laissez-faire, control is located entirely within the individual and the here-and-now; it is an absence of persisting

organization and represents random process. It is the organizational expression of dissociaton as both personal and cultural state. (Emery & Emery, 1976, p 109-114)

In economic terms, the type I approximates the classical market (Emery & Trist, 1972, p 42) and perfect competition (Glaser, 1983, p 15). The marketing system is entirely irrelevant for survival or adaptation. Total randomness renders advertising ineffective (Glaser, as above, p 20-21). Obviously, television would not perform adaptively in a type I as a marketing medium.

> "The classical learning situation most closely corresponding to the placid, random environment is that devised by Pavlov and his followers. In this situation sound-proofing, restrictive harness for the animal, etc., are used to create a blank unvarying environment and the animal is exposed to random encounters (that is, random for the animal) with some goal objects and some other specific stimuli which are unrelated to the goal objects, except for co-occurrence in space and time . . . It would be difficult to devise a better reproduction of a random, placid environment. The learning 'behaviour' observed is conditioning not trial-and-error. Strictly speaking there is no behaviour involved as there is no element of goal-seeking, the system is just conditioned." (Emery & Trist, 1972, p 44-5)

Evidence surveyed by Emery & Trist showed however,that higher order systems will strive to utilize any elements of non-randomness to create more order and permit themselves to perform closer to their level (1972, p 45). Similarly, Konorski (1962) established that even within the conditioned reflex in dogs there is no simple neural schema. "The animal does not utilize all the information supplied by the conditioned stimuli, but it definitely selects certain ones, neglecting the other ones." Similarly he showed that "information and its utilization are inseparable constituting, as a matter of fact, one single process." (quoted by Von Foerster, 1969)

Brewer (1974) has argued for what he calls a conservative interpretation, namely "that the bulk of conditioning in the human learning literature is due to the operation of the higher mental processes, as assumed in cognitive theory, but that there is some minimal evidence for automatic, unconscious processes . . ." But given the correlation of increasing experimental sophistication and support for cognitive interpretations "a more natural and internally consistent interpretation . . . is that all the results of the traditional conditioning literature are due to the operation of higher mental processes . . . and that there is not and never has been any convincing evidence for unconscious automatic mechanisms in the conditioning of adult human beings." (p 27) Brewer's position was criticized by Dulany (1974) on the grounds that it showed only that such a cognitive position is equally plausible to behaviourism rather than less, as has been previously held (p 44). But the critical point here is that we may create environments where higher order systems will accept some degradation of their learning to simple conditioning, simply to survive. (Emery & Trist, 1972, p 45) Concentration camps are the case in point. (Des Pres, 1976)

The following statement makes a direct link between the extreme rigidity built into conditioning experiments and watching television: we cannot be deceived into seeing a flat image as three dimensional reality unless the head is still and one eye is positioned at the station-point of the picture plane. We may however have an illustion of reality given a "suspension of disbelief". (Gibson, 1966, p 232-3) We discussed the positioning phenomenon prior to viewing, in 1975 with the conclusion that the ritual leaves little need for searching or accommodating eye movement (Emery & Emery, 1976, p 75). As discussed in chapter 1 both attention and vigilance are necessary for adaptive knowing, but the televiewing

phe nomenon of near motionlessness and concentrated or focused attention, can now be appraised as a voluntary exercise in conditioning. If further support is found for our postulate of perceptuomotor maladaption we will have a neural substrate for the occurrence of suspension of disbelief.

Randomness by definition precludes knowing 'about', i.e. knowing in any real or complete sense.

> "If the world consisted of an unstructured chaos then no knowledge would be possible. Even if the world consisted of a plurality of uncorrelated events, the exigencies of life (assuming it were possible) would be totally arbitrary, thus precluding adaptation by any living creature. For knowledge to be possible, then, we must assume that such structure is preserved to some significant extent by the knowledge-gathering process of organisms." (Shaw & McIntyre, 1974, p 326).

As Emery points out (1977, p 6) one may know of the laws of probability but even an experienced dice player can get wiped out by the natural operation of these laws themselves. We may say that randomness is conducive only to knowing 'of'. Familiarity with such abstractions, which are commonly interpreted as concrete realities (Lady Luck) provides no control over them in the same sense in which the subject of conditioning experiment has no control over the presentation of 'stimuli', goals or noxiants.

We have already hypothesized that television will be found to provide only knowing 'of'. In the mode of its viewing it approximates conditioning; changing channels is only a pseudo-control. In the rapid unpredictable change of its content, it mimics a type I field. Postman noted that if he had, out of the blue, interspersed his talk and article with ads for a diverse range of products, public service announcements,

etc., his various audiences would conclude that he had gone mad. (Postman, 1983) But on television we have become conditioned to acc randomness. As econiche therefore, television presents a version of reality which is far from the systematically organized, or non-random world, in which we live and to which we are in terms of evolution and ecology, adapted.

There obviously is an organizing principle to television and it is well known to professional marketers (chapter 8). But it is divorced from the obligation to present or represent a coherent or undistorted reality. (chapter 7) At this level, but in terms of news and general content rather than advertising, we will also find evidence that television not only happens to present the world as a random, unpredictable and therefore unknowable and dangerous place to visit, but takes this further to a deliberate selection of content which reinforces this perceptio In the service of its own system principle the industry will have moved from being a-learning to anti-learning as it actively discourages participation in anything but its own econiche.

As it would appear that we do not normally function randomly and that even in cases of extreme disturbance there is still an obviously systemic response, the type I environment and its approximation by television, is maladaptive because it denies the principle of Cognitive Symmetry. (Shaw & McIntyre, 1974, p 343) There is no persistent symmetry between the psychological states of the person and the informational states of the environment or econiche. It would therefore appear difficult to educate and re-educate attention under such circumstances.

If television is shown to produce only knowing 'of', capable of capture only by means of recognition, and the type I field is only a theoretical limit, not a possible reality, we must conclude that this technology is an adaptation only to an illusion, or is an illusory and delusory adaptation. It is an aberration born of our consciousness and ability to imagine. But while we may accept at times, a range of coenetic states as replacement for the real thing, we must expect that the abuse of such an ability will take its toll. Living in a totally imaginary world is commonly called madness. For heavy viewers we expect to find a pattern of seriously distorted perceptions of ecological reality or the extended social field of directive correlations. In the paradigm employed here, this is sufficient to establish maladaption because there is no concept of health or madness residing within the skin or the head. Dissociation and laissez-faire, featuring breakdown in community and responsibility also confer a strange sense of time freedom, which can be viewed as an aberrant or runaway variant of consciousness as time-binding. Heavy viewers in the language of the previous paradigm should show signs of psychological 'stress' or distress.

In Summary:

Table 5.1

Causal Texture, CRT Technology & Adaptation

Type		Adaptivity	CRT Technology*
I	random, placid	maladaptive	+
II	clustered, placid	adaptive	-
III	disturbed, reactive	maladaptive	+-
IV	turbulent	elements of both	+-
V	vortical	maladaptive	meaningless

* A positive sign indicates that this technology is appropriate in the field designated. A negative sign indicates that it has little appropriate function within that environment.

The various causal texturings inherently afford (mal)adaptation. Only a type II is postulated as fully adaptive although the type IV carries a promise for wisdom and a return to an associating culture. Our brief exploration of the fit between CRT technology, predominantly in terms of television, and environments, has led us to expect that evidence of its effects in the marketing and education systems will identify it with types I, III and IV to differing degrees. The main weight of the hypothesis lies in the type of knowings which television can deliver or produce, but we have also derived a subset of expectations from the overall models. These will be explored through various data. From many perspectives there should emerge a profile of a technology at odds with our most distinctive adaptations and able to contribute little by way of associative reconstruction.

7. Individual differences in sensitivity to the medium as measured by an open systems definition of personality, account for the range of responsiveness, liking and disliking, and also the range of neurophysiological states.

8. By becoming a substitute for reality, television both reduces the opportunity for, and inhibits the learning and development of basic skills, particularly those of associating; spoken language, conversing and expanding the panorama of significant group ties. Television is therefore dissociative.

9. Heavy viewers will show diminished competence in, and motivation towards associating, with accompanying signs of stress and distress.

10. Heavy viewing cultures will be characterized by dissociation with overtones of other maladaptions and distorted perceptions of reality.

- at the short-term level of directive correlation:

11. CRT technology is maladaptive in that it induces a set of neurophysiological system states, all of which by definition cannot satisfy the focal condition of adaptation.

12. The range of effects of VDU's will parallel those of television and confirm that it is the CRT which induces the maladaption.

We have also argued in Chapter 4 that associated with sustained televiewing will be found decreased levels of norepinephrine, and release of endorphins. These hypotheses are not however, tested in this work.