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Mutation, Mind and Epistemology:

**An Examination of the Concept of Territoriality in Humans
As an Informational and Evolutionary Phenomenon.**

**A Thesis submitted in partial
fulfillment of the requirements
for the degree of Master of Arts
(Geography) from Carleton University**

**Gordon H. Rogers
August 26, 1992**

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Mutation, Mind and Epistemology

**An Examination of the Concept of Territoriality in Humans
as an Informational and Evolutionary Phenomenon**

submitted by Gordon H. Rogers, B.Comm.
in partial fulfilment of the requirements for
the degree of Master of Arts

Thesis Supervisor

Chair, Department of Geography

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ABSTRACT

This thesis examines the hypothesis that territoriality in human beings is an evolutionary phenomenon, representative of the combined interactions of a number of informational transfer mechanisms. Contrary to the views of many human geographers, the author argues that the phenomenon of territoriality in humans differs only in degree from the phenomenon in all other organisms and aggregations thereof; that it is natural in the sense that it occurs at all levels of life and perception and is not strictly a construct of human intelligence. The author puts forward the argument that much of the literature on territoriality in humans is concentrating on the perceived symptoms of the phenomenon from a narrowly defined, anthropocentric perspective based on outdated ontological and epistemological concepts.

The author concludes that such narrow perspectives have been a limiting and distorting burden on geographical research. He argues that a change in perception of humans and humanity, along with all other entities or phenomena, from externally instructed units with an independent environment linked to a privileged observer, to autonomous units with an environment whose features are inseparable from the history of coupling with those units, and thus no privileged

perspective, is warranted in light of current developments in evolutionary and information theory.

Key words: territoriality, evolution, consciousness, cognition, homeostasis, autopoiesis, energy, information, mind, mutation, epistemology, ontology.

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Mutation, Mind and Epistemology :

An Examination of the concept of Territoriality in Humans as an Informational and Evolutionary Phenomenon.

"Woven into and over the formal political and administrative units which compartmentalize the earth's surface are less easily defined and more dynamic geographical units outlining the spheres or 'fields' of human interaction in space..... Thus without formal boundaries, space becomes organized and structured into focal points, core areas, networks of interaction, domains, spheres of influence, hinterlands, buffer zones, no man's lands, cultural homelands, regions, neighbourhoods, gang turfs and ghettos." (Soja 1971)

"In the last century and a half the most prodigious event perhaps ever recorded by history since the threshold of reflection, has been taking place in our minds: the definitive access of consciousness to a scale of new dimensions; and in consequence the birth of an entirely renewed universe, without any change of line or feature by the simple transformation of its intimate substance.....What makes and classifies a 'modern' man...is having become capable of seeing in terms not of space and time alone, but also of duration, or - it comes to the same thing - of biological space-time; and above all having become incapable of seeing anything otherwise - anything - not even himself." (Tielhard de Chardin 1959)

INTRODUCTION:

The fundamental objective of this thesis is to explore new paths and to suggest a framework of concepts which may link political and human geography more effectively with recent methodological and philosophical developments not only in geography, but also in the other social sciences and in the so-called 'hard sciences'.

One of the particular goals will be the analysis of some of the current theories of territoriality in the geopolitics of mankind, as discussed by Edward Soja, Robert Sack, and David Harvey, relative to the concepts of territoriality as a part of the broader concept of the 'Phenomenon of Man', as outlined in the writings of Pierre Teilard de Chardin, with comparative references to a range of current theorists in the fields of sociology, biology, physics, and information theory. It is not my intent to quarrel particularly with any one or any group of theories on the nature of territoriality in humans. I hope, rather, to present a particular view of the origins of the phenomenon which may allow geographers to move beyond what I perceive as a rather narrow anthropocentric perspective of territoriality in particular but also of other socio-communicative actions of our species.

As illustrated by the opening quotation, Soja believes that there is an inherent geographical order to human society; a spatial anatomy of human behaviour and organization which has regular and discernable characteristics. This view is shared by most social and historical geographers. Soja asks the rhetorical question: "Is territoriality in man (the existence of which is usually not challenged) instinctual (genetic, pre-coded) and essentially ineradicable except through major evolutionary change? Or is it experiential, or culturally-derived, and therefore susceptible to suppression, substitution, or elimination through childhood socialization and culture change?" He then observes in partial answer:

Animal territoriality is related to human territoriality primarily by analogy rather than by homology. There are likely to be some interesting similarities in form and function, but the motivations may differ markedly and whatever similarities exist are probably not directly traceable to a common development or evolutionary origin.¹

Robert Sack suggests that the study of human territoriality lies squarely within two geographical traditions: social geography and historical geography - historical geography tending toward particularistic approaches and social geography toward generalizing approaches. He suggests that his middle ground is in fact human geography, between the traditions of social and historical analysis.

¹ Soja, (1971) The Political Organization of Space, p. 31.

Territoriality, according to Sack, is an historically sensitive use of space, especially since it is socially constructed and depends on who is controlling whom and why. Sack maintains that it is the key geographical component to understanding how society and space are interconnected.

Territoriality, according to Sack, is a strategy to establish different degrees of access to people, things, and relationships. Both boundaries and the means by which they are communicated are changeable and territories can occur in degree. Sack writes:

considering territoriality as a strategy for differential access, side steps the fruitless issue of whether human territoriality is in any sense biologically rooted.²

Sack suggests that by making territoriality a strategy, territoriality is placed entirely within the context of human motivations and goals.³

The Phenomenon of Man⁴ is Teilhard de Chardin's culminating effort to formulate a unified outlook upon all reality, a Weltanschauung, encompassing at once his experience as a working paleontologist and his profession as a Roman Catholic priest. Basic to this unification theory is the

² See Sack (1986) Human Territoriality: Its theory and history, note 10 p. 21.

³ Ibid.

⁴ Teilhard de Chardin, Pierre, The Phenomenon of Man (1955) Collins edition, 1959.

belief that man in his totality, including not only the physical but mental and spiritual attributes, is a phenomenon which is subject to study like any other natural phenomenon. Such a study must, however, be made from an evolutionary point of view, according to Tielhard, for all of reality is a process of development (an evolution) in several great phases: first, the physicochemical phase, of which the physical universe, including the great array of chemical elements and compounds, stars, planets and galaxies are the major results; second, the phase of biological evolution, which, starting from simple beginnings in the most complex products of physicochemical evolution, resulted in the origin of life and its diversification into three kingdoms, forty to fifty phyla and literally millions of species or individual kinds of life; and third, a psychosocial phase, made possible by one of the most recent products of biological evolution, the human species. Each phase of evolution depends upon and includes the preceding phases, and so the phenomenon of man, according to Tielhard de Chardin, encompasses the whole of evolution and of what we commonly refer to as "nature."

As the title of this thesis attests, one of the primary challenges in setting forth a cogent argument on one side or the other of such a fundamental question, is the setting out of a clear cosmological, ontological and epistemological presuppositional hierarchy within which to mount the

argument. Central to any such hierarchy is the question of the role of metaphysics in what has been described by Kaftos and Nadeau as "the hidden ontology of classical epistemology".⁵ Descartes' "cognito ergo sum", which recognizes thought as the self-evident fact proving our existence, requires revision in light of current scientific evidence. The proper sequence is more likely to be, "I am, therefore I think;" thus recognizing existence as the enabling condition of thought.

We look through a peephole at nature, and interpret the whole in terms of what little we have been able to see.. But we, too, are part of the whole and we, like the universe, are more than the sum of the observations made of us. We are confronted not with the universe, which is likely to remain an eternal riddle, but with whatever model of the universe we can build within the mind. Every thinking creature in the universe shares this predicament; for all, the ultimate subject of inquiry is not the outer universe but the nature of its dance with the mind.⁶

American astronomer Timothy Ferris uses the image of an hourglass or tree to denote the relationship between the mind and the universe. The nexus of these two domains - the throat of the hourglass or trunk of the tree - is an active, dynamic region where energy flows in both directions. Sense data are conveyed to the brain from the wider universe, but the eye and the rest of the brain system, rather than

⁵ Kaftos & Nadeau, The Conscious Universe (1990), pp. 3-4.

⁶ Ludwig Boltzman as quoted in Ferris (1992), p. 15.

passively recording images, actively select and manipulate them.

Ferris suggests that many philosophers and social scientists go astray by assuming that traffic at the neck of the hourglass goes in one direction only.

Thus realists assert that the universe is just as we perceive it (yet the very text you are now perusing is a black vacuum, with storms of neutrinos howling through it) while idealists say that it's all just thought (yet a falling rock you never saw or thought of can strike you dead).⁷

Most physical scientists hold that metaphysics has nothing to do with pure science, but the result of the recent 'Aspect Experiments' confirming the predictions of Bells Theorem⁸ and the phenomenon of non-locality⁹ as a new fact of nature allows us to infer, although not to prove, that the universe can be viewed as a conscious system.

Science, in the view of most of its practitioners, is first of all a rational enterprise, committed to obtaining knowledge about the actual character of physical reality. It is a tautology that a commitment to metaphysical and epistemological realism is necessary for the pursuit and meaningful analysis of scientific experimentation. The universe is presumed real independently of human observers

⁷ Ibid., p. 201.

⁸ Kaftos & Nadeau (1990), Chapter 3, pp. 61-74.

⁹ Ibid., chapter 3, pp. 72-73 & notes 8 & 9 p. 203.

or any acts of observation - this presupposition is normally deemed to be metaphysical realism. Epistemological realism on the other hand, requires strict adherence to and regard for the rules and procedures for conducting science.

In the case of quantum physics, where one confronts some very challenging epistemological problems, a commitment to epistemological realism requires the acceptance of the proposition that any phenomenon can be presumed a "real" phenomenon only when it is an "observed phenomenon" and that no physical theory can be presumed valid unless its predictions are subject to proof in repeatable scientific experiments under controlled conditions. The new epistemology of quantum theory suggests that fundamental oppositions disclosing the profound truths of nature are complementary, and those constructs have consistently brought us closer to a vision of nature which belies both classical ontological dualism and the bias that ultimate truths are transcendent and pre-existing.

The epistemological situation we are obliged to confront in a quantum mechanical universe, in which non-locality must be viewed as a fundamental fact of nature, provides a new basis for understanding the ability of the human brain to construct symbol systems, or symbolic representations of reality. Borrowing heavily from Kaftos & Nadeau's analysis

of the Copenhagen Interpretation¹⁰, I will suggest that complementarity¹¹ is the most fundamental dynamic in our conscious constructions of reality in both ordinary and mathematical language systems. Since complementarity has been a primary feature in every physical theory advanced since relativity, and since complementarity can also be shown to be an emergent property or dynamic in the life of the evolving universe at increasingly larger scales and times, then future advances in the physical theory of cosmology, or in the study of the origins and evolution of the entire universe will also feature complementary constructs.

There has been and continues to be, a major debate within academic circles on the role of cultural change in the development of a *Weltanschauung* or comprehensive world view of science. Does science in effect direct cultural evolution or vice versa? Two of the major protagonists in this debate have been Kuhn¹² and Hanson.¹³ Kuhn's position in brief and supported by many social scientists, is that scientific revolutions are those non-cumulative development episodes in which an older paradigm is replaced in whole or in part by an incompatible new one. Hanson, basing his theory on his understanding of the role of linguistically-based elements

¹⁰ Ibid., pp. 36-37.

¹¹ Ibid., chapters 4 & 7.

¹² Ibid., p. 6 and note 11, p. 201.

¹³ Ibid., note 11, p. 201.

in physical theory, puts forward the argument that there is no intersubjective language used by scientists that leads to an objective account of phenomena, because there are linguistically-based elements in all theories, that disallow the notion that a theory can be neutral. According to Hanson, theories are not discovered based on inductive generalizations from data but rather by retrospectively inferring probable hypotheses from conceptually organized data.

If one accepts that the questions an observer asks influence what he/she has the right to say about what he/she observes, one is led to consider that we live in a participatory universe, one where the knowable behaviour of subatomic systems depends on the methods we employ to study them. Ferris proposes that both quantum and classical physical theory can be subsumed into the broader paradigm of Information Theory. Information Theory accepts that our knowledge of nature always devolves from a partnership between the observer and the observed; it therefore banishes from science all questions about what things 'really' are, and focuses instead on the observational data themselves, restricting models of the universe to what is in fact knowable. All else is regarded as beyond the province of science.

This is not the espousal of 'quantum solipsism', the assertion that nothing exists except when it is observed. One assumes that there are things out there (metaphysical realism), but one rejects as presumptuous any scientific attempt to declare once and for all what they are (epistemological realism). The concept of 'things' is itself derived from observational data; therefore data are more fundamental than things. What we tend to call facts about nature are inductions from the data, and it is in this spirit that I will invoke Wittgenstein's aphorism¹⁴ that the observable universe is made of facts, not things.

The idea of a close association between reality and some permanent elements has dominated Western thought for at least the last 2000 years. Today, as illustrated by the preceding paragraphs, there is a fundamental change in some of these attitudes. The problems of time, of evolution and of complexification are central to the issue. Ilya Prigogine, in support of the overall theories of Tielhard de Chardin, suggests that the role of time leads to an increased unity between the various sciences. Time does not oppose us to the universe; perhaps more so, it expresses our participation in an evolving universe.¹⁵

¹⁴ Ibid., pp. 92-93.

¹⁵ See King, Thomas et al (1983), p. 87

Bachelard looks at the space of imagination - 'poetic space'. Space that has been seized upon by the imagination cannot remain indifferent space subject to the measures and estimates of the surveyor any more than it can be exclusively represented as the 'affective space' of psychologists. As Bachelard notes:

We think we know ourselves in time, when all we know is a sequence of fixations in the space of the being's stability. Memories are motionless, and the more securely they are fixed in space, the sounder they are.... Space contains compressed time.¹⁶

Jurgen Habermas conceives of social evolution as a bidimensional learning process (cognitive/technical and moral/practical), the stages of which can be described structurally and ordered in a developmental logic. In one sense it is only socialized individuals who learn, according to Habermas, but the learning ability of individuals provides a "resource" that can be drawn upon in the formation of new social structures. The results of the learning process find their way into the cultural tradition; they comprise a kind of cognitive potential that can be drawn upon in social movements when the unsolvable system of problems require a transformation of the basic forms of social integration.¹⁷

¹⁶ Bachelard as quoted in Harvey (1990), p. 217.

¹⁷ Habermas, Jurgen, Communication and the Evolution of Society (1979), p. xxii.

Habermas suggests that the application of evolutionary theories to the present makes sense only in the framework of a discursive formation of the will, that is, in a practical argumentation dealing with reasons why specific actors in specific situations ought to choose specific strategies of action over others.¹⁸

Generally perceived as positivistic, technocentric, and rationalistic, universal modernism has been identified by Harvey with the belief in linear progress, absolute truths, the rational planning of ideal social orders, and the standardization of knowledge and production. Harvey maintains that post-modernism, by way of contrast, privileges heterogeneity and difference as liberative forces in the re-definition of cultural discourse. Fragmentation, indeterminacy, and intense distrust of all universal or totalizing discourses are the hallmark of postmodernist thought. The rediscovery of pragmatism in philosophy, the shift of ideas about the philosophy of science wrought by Kuhn and Feyerabend, Foucault's emphasis upon discontinuity and difference in history and his privileging of 'polymorphous correlations in place of simple or complex causality', new developments in mathematics emphasizing indeterminacy (catastrophe and chaos theory, fractal geometry), the re-emergence of concern in ethics, politics and anthropology for the validity and dignity of 'the

¹⁸ Ibid., p. xxiii and note 18.

other, 'all indicates a widespread and profound shift in the 'structure of feeling'.¹⁹

Post-modernism, according to Harvey, signals the death of metanarratives whose secretly terroristic function was to ground and legitimate the illusion of a 'universal' human history. We are now in the process of waking from the nightmare of modernity, with its manipulative reason and fetish of the totality, into the laid-back pluralism of the post-modern, that heterogeneous range of life-styles and language games which has renounced the nostalgic urge to totalize and legitimate itself.

Science and philosophy must jettison their grandiose metaphysical claims and view themselves more modestly as just another set of narratives.²⁰

From this perspective, I will argue that the examination of human territoriality as simply one of the many facets of the "Phenomenon of Man" can be most usefully accomplished by 'jettisoning' the ontological status of humanity along with the epistemological status of 'non-relational' and 'instinctive' evolution which have so burdened the sociological and geographical literature on this subject. If I am successful in this thesis, the reader should come away with an understanding of my perspective, not as Biology or Physics applied to Social Science, or as a technological

¹⁹ Harvey, David, The Condition of Postmodernity (1990).

²⁰ Eagleton as quoted in Harvey (1990), p. 9.

explanation of human socio-cultural practices; but rather as the view that the humanities, and human territoriality in particular, are a vastly complex and variable, interrelated manifestation of what are, relatively speaking, quite simple natural phenomena; applicable in essence to all organisms. The central theme, that all entities are informational and evolutionary in the Darwinian sense of natural selection, should not be seen to suggest that all human activity is automaton, or pre-ordained and therefore predictable - quite the contrary!

CHAPTER ONE

HUMAN TERRITORIALITY:

In this chapter I hope to summarize in brief the descriptions of the origins of the phenomenon of territoriality in humans as outlined in the writings of Soja and Sack, with observations from the writings of Harvey and Habermas. It is my intent to isolate the essential question addressed by this thesis. Is the phenomenon of territoriality in humans felt to be of evolutionary origin by the authors surveyed? If not, what are the essential differences in perception and what origins do they ascribe to the phenomenon?

Man is generally accepted in the literature to be a territorial animal and territoriality affects human behaviour at all scales of social activity. Most of what has been written about human territoriality derives from two sources: ethology and socio-cultural and psychological studies of personal space and small group ecology. Both of these sources concentrate at the level of the individual and, as a result there has been proportionately less attention given to the more macro-spatial forms of human territoriality. Ethological interpretations of human

territoriality according to Soja,¹ tend to have pervasive biological overtones and have become the center of widespread controversy over the degree to which human behaviour can be inferred directly from the behaviour of animals.

Soja maintains that territoriality in humans is a behavioral phenomenon associated with the organization of space into spheres of influence or clearly demarcated territories which are made distinctive and considered at least partially exclusive by their occupants or definers. The confinement of certain activities in particular areas and the exclusion of certain categories of individuals from the space of the territorial individual or group are central to this concept of space or territory as a container.

Somers, as discussed in Soja,² discusses territoriality in conjunction with another mode of human and animal organization called dominance behaviour. He views territoriality and dominance as interdependent and complementary. He points out that it is generally accepted in modern biology that the primary driving force behind evolutionary change is natural selection. Virtually all persistent anatomical, physiological and behavioural characteristics - including social organization - are

¹ Soja (1971), p. 20.

² Ibid., p. 21.

therefore likely to be adaptive in that they promote the survival of the species. Evolutionary processes, however, according to Somers, tend to favour (at least in vertebrates) competitive or aggressive behaviour at the individual level. Since this kind of behaviour could be expected to disrupt social life and group cooperation, there must be some mechanism which can sustain group formation in vertebrates through the control of intra-specific aggression. The two which appear most widespread in vertebrate social groups are dominance behaviour and territoriality. In a very rough way, the dominance hierarchy compartmentalizes animal society vertically in its social organization, while territoriality compartmentalizes the society in terms of the space it occupies. Boundary creation and maintenance stabilize social relationships by reducing intra-group conflict and reinforcing established behavioral norms.

Soja suggests that while there are undoubtedly many implications for human behaviour in the evolutionary perspective of ethology, in the search for causes of certain types of human behaviour, the role of built-in biological determinants must be weighed carefully against the more powerful influence of symbolic learning, culture and environment. He suggests that cultural development and differentiation in man has provided a range of adaptive opportunities unmatched in animals.

He further states that while there may well be territorial instinct in man, as there appears to be in most vertebrate animals, territorial behaviour in man, particularly at the larger group level, is probably more directly rooted in early human social and cultural evolution than it is in some primitive and ineradicable genetic "imperative" traceable to man's animal origins.³

Somers discusses how the impact of the new conditions associated with man's move from the forest - the advent of carnivorous habits, the use of weapons, intensive competition between groups for resources and protection - stimulated important social and cultural readjustments to limit intra-specific aggression and to further promote group solidarity. Despite their undifferentiated nature, evolving primitive political systems at all times served to control competition, conflict and cooperation - functions which in animal societies were provided by a primarily 'biologically-based territoriality' and dominance hierarchy but which in human society came increasingly to revolve around culturally-based and symbolically-expressed modes of socio-political organization.

At the same time he points out, however, a totally new form of territoriality developed, larger in scale and

³ Ibid., p. 29.

symbolically or socially expressed, which became institutionalized as part of the political system. As human society began to increase significantly in scale and complexity territoriality reasserted itself as a powerful behavioural and organizational phenomenon. But this was a cultural and symbolic territoriality, not 'the primitive territoriality of the primates and other animals.' In part, this symbolic macro-territoriality encompassed the array of attitudes toward land, space, and territory which existed at the individual or small group level along with the potentially integrative functions it served. But it also developed new dimensions as a regulatory mechanism for the society as a whole - as a focus for group identity and membership, as an expression of social and economic organization, as a basis for the exploitation of the environment, and as a means of shaping and channeling human spatial interaction.

What we cannot accept is the implication that the territoriality that underlies state formation has any but superficial resemblance to the kind of territoriality that seems quite definitely to be much more ancient than the cultural recognition of kinship.⁴

Thus, although cultural territoriality fundamentally begins with the origins of the cultured primate, man, it achieves a central prominence in society only with the emergence of the state. And it probably attains its fullest flowering as an organizational basis for society in the formally structured, rigidly

⁴ Ibid., p. 30.

compartmentalized and fiercely defended nation-state system of the present day.⁵

The basic differences between man and animal, according to Soja, are most likely greatest at the larger group or societal level. He maintains that in no other animal species except man is the adult male so completely dependent upon others for his survival. It is no surprise, therefore, that he also feels that nearly all the characteristics which distinguish man from the other animals - culture, the degree of dependence upon symbolic learning, knowledge of history and tradition, the development of specialized forms of intra-specific communications, including language - are all attuned to the maintenance of men in integrated groups.

In terms of studying societal territoriality in man, it is probably more fruitful, according to Soja, to examine human territoriality at the individual or personal level rather than seeking direct relationships with either individual or group territoriality in animals. This does not rule out, apparently, what he calls 'the fascinating questions of shared biological factors' in individual human and animal territoriality, but it primarily cautions against hasty biological interpretations of human group territoriality in the absence of strong scientific evidence one way or the other.

⁵ Ibid.

Robert Sack⁶ examines human territoriality in the context of human motivation and suggests its true significance is as a human strategy to affect, influence and control.

Territoriality, according to Sack, is best not thought of as biologically motivated but rather as socially or geographically rooted. Its use depends on who is influencing and controlling whom and on the geographical contexts of place, space and time. Territoriality is intimately related to how people use the land, how they organize themselves in space, and how they give meaning to place. Clearly these relationships change, and the best means of studying them, according to Sack, is to reveal their changing character over time.

Sack suggests that his theory of human territoriality is an interrelated group of characteristics which can be used to explain or make sense of behaviour. It is designed to disclose potential reasons for using territoriality.

Territoriality, according to Sack, can shed light on the rise of civilization and on critical facets of modernity.

In Sack's words, territoriality is:

the attempt by an individual or group to affect, influence, or control people, phenomena and relationships, by delimiting and asserting control over a geographic area.⁷

⁶ See Sack (1986) and Sack (1980), Conceptions of Space in Social Thought.

⁷ Sack (1986), p. 19.

Territoriality must involve a form of classification by area and it must also include a form of communication. It must involve an attempt at enforcing control over access to the area and to the things within it, or to things outside of it by restraining those within the boundaries.

The logic of Sack's territoriality rests on the fact that the advantages of using it must be linked with one or more of these interconnected relationships. Because they are essential facets of territoriality the three must also be the basis of the significance of territoriality.

Sack is quite disturbed by the fact that most of the literature on territoriality is about animal behaviour and does not concern us unless social scientists have borrowed from it in discussing human territoriality. He suggests that previous literature on the subject is deficient, among other reasons, because it fails to distinguish the term territoriality from the term spatial. Because these studies do not define territoriality as a particular kind of behaviour in space, they miss the opportunity of offering a systematic analysis of territoriality. Any insights they present are difficult to attribute to territoriality in particular, and difficult to generalize about. Sack seems

particularly offended by those which use the term figuratively to refer to 'cognitive territories'!⁸

He suggests that the linking of territoriality to particular needs occurs primarily in studies which suppose that humans and animals use territoriality for the same essential biological reasons, i.e., as a means of obtaining food, mates and controlling population size. He states that focussing on these narrow effects may make territoriality in humans appear to be something like an instinct rather than a strategy that can be turned on and off.

My observation of the central conundrum posed by both Soja and Sack is that they both suffer from an excess of the hidden metaphysics of classical and modernist thinking. They seem to accept that certain functions of territoriality in humans are likely of biological origin but they find the prospect less than pleasing. They seem determined to enunciate human social and cultural development or evolution as a separate and distinct phenomenon from other forms of 'instinctual', 'primitive' or 'biological' evolution. Given the metaphysical and ontological framework within which they operate, such distinctions are perhaps understandable, but I will argue that these distinctions are based on ontological biases and epistemological distortions that serve more to cloud than to clarify the issue.

⁸ Ibid., p. 23, note 15.

Both Harvey and Habermas examine at some length the question of cultural and social evolution, particularly with reference to the role of space and time and space-time in the perception and definition of the phenomenon. Their works serve, in my opinion, as a most effective link between the rather narrow, anthropocentric, and symptomatic work of Soja and Sack and the more theoretical and perhaps open-minded work of Tielhard de Chardin (1965), Kaftos and Nadeau (1990), Margulis (1981) and Lovelock (1979), Maturana and Varela (1980).

Picking up on Sack's observations noted above, of the role of space and time as geographical concepts essential to the understanding of territoriality in humans, Harvey suggests that the history of the understanding of time, space and time-space in physics has, in fact, been marked by strong epistemological breaks and reconstructions. The conclusion he draws, and which is shared by most physical theorists, is simply that neither time nor space can be assigned objective meanings independently of material processes and that it is only through investigation of the latter that we can properly ground our concepts of the former.⁹

The objectivity of time and space is given in each case by the material practices of social reproduction, and to the

⁹ Harvey (1989), p. 202.

degree that these latter vary geographically and historically, so we find that social time and social space are differently constructed. Each distinctive mode of production or social formation will, in short, embody a distinctive bundle of time and space practices and concepts. How we represent space and time in theory matters, because it affects how we and others interpret and then act with respect to the world.

Social theories, according to Harvey, typically privilege time over space in their formulations. They broadly assume either the existence of some pre-existing spatial order within which temporal processes operate, or that spatial barriers have been so reduced as to render space a contingent rather than a fundamental aspect to human action. Aesthetic theory, on the other hand, is deeply concerned with the spatialization of time. The reduction of space to a contingent category is implied in the concept of progress itself. Since modernity is about experience of progress through modernization, writings on that theme have tended to emphasize temporality, the process of becoming, a favourite Tielhardian concept, rather than being in space and time.¹⁰

Harvey discusses the concept of 'habitus' - a durably installed generative principle of regulated improvisations which produces practices which in turn tend to reproduce the

¹⁰ Ibid., p. 205.

objective conditions which produced the generative principle of habitus in the first place. The circular and cumulative causation is obvious, he suggests:

Because the habitus is an endless capacity to engender products - thoughts, perceptions, expressions, actions, - whose limits are set by the historically and socially constituted conditions of its production, the conditioning and conditional freedom it secures is as remote from a creation of unpredictable novelty as it is from a simple mechanical reproduction of the initial conditionings.¹¹

Jurgen Habermas points out that in the course of history not only the elements but the boundaries and the goal states of societies undergo change; consequently their identity becomes blurred.¹² A given modification might be regarded either as a learning process and regeneration of the original system or a process of dissolution and transformation into a new system. There is apparently no way to determine which description is correct independently of the interpretations of members of the system.

In all evolutionarily successful civilizations, according to Habermas, there was a noteworthy structural change of world view - the change from a mythological-cosmogenic world view to a rationalized world view in the form of cosmological ethics and a move toward the search for highly abstract

¹¹ Bourdieu, (1977), p. 95, as quoted in Harvey (1989).

¹² See Habermas (1979), p. xvi.

principles of social organization.¹³ By principles of organization he understood innovations that become possible through developmental-logically reconstructible stages of learning, and which institutionalize new levels of societal learning.

Habermas suggests that it is the personality system that is the bearer of the ontogenetic learning process; and in a certain way, only social subjects can learn. But social systems, by drawing on the learning capacities of social subjects, can form new structures in order to solve steering problems that threaten their continued existence. To this extent the evolutionary learning process of societies is dependent on the competences of the individuals that belong to them. The latter in turn acquire their competences not as isolated monads but by growing into the symbolic structures of their life-worlds.¹⁴ In chapter three below, I will be discussing this concept from the perspective of information theory, and in the conclusion I will compare Habermas' ideas of the learning capacities of social systems with Maynard Smith's concepts of evolutionarily stable strategies, otherwise known as ESS.

We can, according to Habermas, attempt to interpret social evolution, taking as our guide those problems and needs that

¹³ Ibid., p. 152.

¹⁴ Ibid., p. 155 for details.

are first brought about by evolutionary advances (changes?). At every stage of development the social-evolutionary learning process itself generates new resources, which mean new dimensions of scarcity and thus new historical needs, and thus new territorial imperatives, according to Sack's interpretation.¹⁵

Habermas points out that with the transition to the sociocultural form of life, that is, with the introduction of the family structure, there arose the problem of demarcating society from external nature. In neolithic societies, harmonizing society with the natural environment became thematic. Power over nature came into consciousness as scarce resource. The experience of powerlessness in relation to the contingencies of external nature had to be interpreted away in myth and magic. With the introduction of a collective political order, there arose the problem of self-regulation of the social system. In developed civilizations, the achievement of order by the state became a central need. Legal security came to consciousness as a scarce resource. The experience of social repression and arbitrariness had to be balanced with legitimations of domination.

In the modern age, with the autonomization of the economy (and complementarization of the state) there arose the

¹⁵ See Sack's definitions above p. 21.

problem of a self-regulated exchange of the social system with external nature. In industrial capitalism, society consciously placed itself under the imperatives of economic growth and increasing wealth. Value came into consciousness as a scarce commodity. Finally, if post-modernist societies, as they are today envisioned, should be characterized by a primacy of the scientific and educational systems, one can speculate about the emergence of the problem of a self-regulated exchange of society with internal nature. Again a scarce resource would become thematic - not the supply of power, security or value, but the supply of motivation and meaning. With each evolutionarily new problem situation, e.g., a new socio-cultural or territorial organization, there arise new scarcities; scarcities of technically feasible power, politically established security, economically produced value and culturally supplied meanings. If this schema is plausible, it follows that the logical space of evolutionarily new problem domains is exhausted with the reflexive turn of motive formation and the structural scarcity of meaning; the end of the first run-through could mean a return, at a new level, to problems of demarcation - namely, to the discovery of internal limits which the socialization process runs up against - and to the outbreak of new contingencies at these limits of social individuation.¹⁶

¹⁶ Habermas (1979), p. 165.

From the above paragraphs, it is apparent that the concept of human territoriality as a method by which individuals or groups can affect, influence or control people, phenomena and relationships (Sack) and territoriality as containing space (Soja) is closely linked to concepts of human social and cultural evolution. There seems to be broad consensus in the literature that while ancient 'instinctual' evolutionary linkages may exist to pre-historic man, the advent of symbolic and language based socio-cultural organization has separated man from the rest of the organic world. While the term evolution is used freely in the description of socio-cultural change and development, it is apparent and indeed often stated that the phenomena under discussion are ontologically separate from so-called 'natural phenomena' and therefore subject to a separate epistemology. Evolution, as the term is used by Soja and Sack, and possibly by Harvey and Habermas, when applied to territorial phenomena in humans, is very different indeed from the definition of the term by writers such as Tielhard de Chardin (1965), Bateson (1979), Lovelock (1979) and Margulis (1981). While the nature of the difference is not spelled out in detail, it seems to revolve around the advent of consciousness in humanity and the ontological status of humanity so engendered. Emphasis in the literature on the role of boundary creation and maintenance, the role of communication, cultural development and differentiation in providing man with 'adaptive opportunities unmatched in

animals' suggests, in my opinion, the need for further analysis of the ontological and epistemological foundation of such arguments.

CHAPTER TWO

TEILHARD DE CHARDIN:

The apparent restriction of the phenomenon of consciousness to the higher forms of life has long served science as an excuse for eliminating it from its models of the universe. A queer exception, an aberrant function, an epiphenomenon - thought was classed under one or another of these heads in order to get rid of it... consciousness, in order to be integrated into a world-system, necessitates consideration of the existence of a new aspect or dimension in the stuff of the universe..... Since the stuff of the universe has an inner aspect at one point itself, there is necessarily a double aspect to its structure, that is to say in every region of space and time..co-extensive with their Without, there is a Within to things.¹

Any analysis of the literature covered by this thesis presents challenges in the area of reconciliation of multiple conflicting presuppositional hierarchies. Teilhard de Chardin, in particular, as a Christian priest, and a paleontologist, presents a perspective on biology and on evolution which has been controversial, to say the least, within both scientific and theological circles. This thesis does not endorse Teilhard's theistic and orthogenetic views of evolution but attempts to look beyond them to what I perceive as very fundamental observations on life and intelligence and on the "unity of knowledge". What I find particularly intriguing is the direction in which his

¹ Teilhard de Chardin as quoted in Devreux (1989), p. 137.

theories on complexification and psychosocial evolution point when considered from a naturalistic cosmological point of view and a less anthropocentric ontological perspective.

Teilhard de Chardin thought of evolution in its three great phases, outlined in my introduction, as an ever continuing process, never as a completed, static fact.² Accordingly, he preferred words which suggested process, transition, becoming: cosmogenesis rather than cosmology; evolution rather than creation; hominization rather than the origin of man; and noogenesis for the continuing development of mind and all of its consequences.

Teilhard saw the grand sweep of evolution, from the origin of matter up through hominization and beyond, as fundamentally one continuous process of increasing complexity, but a process characterized by critical points on opposite sides of which a change of state occurs. He believed that any process continued over a wide range, would include such critical points and thresholds. So impressed was he by the production of ever greater levels of complexity by evolution that he proposed a law of complexification, by which he meant simply that the production of ever greater levels of complexity is a necessary characteristic of evolution. Thus one such critical threshold lies between the most complex of the non-

² See Teilhard de Chardin (1965) The Phenomenon of Man.

living molecules and the simplest of the living organisms, while another separates the human species from the other primates.

The concept of complexity is now being refined by information theorists. While there are something like a hundred billion cells in an average mammal, and hundreds of millions of atoms in each cell, complexity is not just in quantity. The actual number of atoms contained in complex units is of minor importance compared with the number and quality of links established between the atoms. It is the interlinking, the connections between parts that denote complexity, and the greater the complexity, the greater the consciousness that occurs 'within' the form, 'the more living they are'.³

Modern Chaos theory is also demonstrating that the greater the complexity and apparent unpredictability within a system, the greater the availability of information. Robert Shaw maintains that chaotic and near chaotic systems bridge the gap between macro-scales and micro-scales and between phase states of matter.⁴ These bridges between phase states are, in my opinion, similar to Teilhards 'thresholds'.

Chaos, which I prefer to think of as the **Cosmic Clutch**, is according to Shaw, Mandelbrott, and Lorenz, the creation of

³ Teilhard as discussed in Devreux (1989), p. 138.

⁴ Shaw as quoted in Gleick (1987), p. 260.

information.⁵ As a system becomes chaotic (complex), it generates a steady stream of information.

A basic Teilhardian principle, discussed by Dodson (1984) in some detail, is that every evolutionary movement has its roots in the past, its present reality and its projection into the future.⁶ Teilhard called this the principle of coherence or scientific symmetry. Paraphrased, I take it to mean that evolution is a continuum in which nothing arises de novo.⁷ We humans are acutely aware of our consciousness, and many aspects of the behaviour of other mammals and birds are most readily interpreted in terms of a comparable consciousness. The consciousness of cold blooded vertebrates may be less acute, and among most of the invertebrates it is quite equivocal. Finally, the most primitive organisms, such as bacteria, show no signs of consciousness, although other evidence of life and communication is clear. In the viruses, even life is debatable, while in the inorganic world we currently see no evidence of anything of the sort. Drawing on the principle of coherence, however, with everything having its roots in the past (an earlier stage of evolution), Teilhard postulated that a forerunner of

⁵ See Shaw, Robert (1981) Strange Attractors, Chaotic Behaviour, and Information Theory; Mandelbrott, Benoit (1977) The Fractal Geometry of Nature; and Lorenz, Edward (1983) Irregularity: A Fundamental Property of the Atmosphere for a more detailed discussion of this topic.

⁶ See Dodson (1984) The Phenomenon of Man Revisited.

⁷ See McLuhan and Powers (1989) for a discussion of the concept of the Tetrad as a manifestation of the human thinking process.

consciousness must be present not only in the simplest organisms but even in the atomic particles of inanimate matter.

It is commonplace to observe that evolution has run counter to the direction of entropy.⁸ The classical view of entropy is that the amount of available energy is gradually dissipated and order is replaced by disorder. Classical physicists anticipate that in a remote future this will result in the death of heat - a uniformly cold, lifeless and disordered universe. The contradiction between the ideas of entropy and of complexification is quite evident. Teilhard tried to resolve this problem by postulating two kinds of energy, which he called tangential energy and radial energy. Tangential energy is characteristic of the 'without' of matter; it is the energy of ordinary experiments in physics and chemistry; and it is fully subject to the second law of thermodynamics. Radial energy is the energy of the 'within' of matter; it increases with the increasing complexity of matter (that is, a given mass of protein has more radial energy than an equal mass of sodium chloride, and the same mass of living cells has more radial energy than does the protein) and as such, radial energy is at least potentially independent of entropy.⁹

⁸ See Drexler (1986), p. 157.

⁹ See discussion below on information theory and chaos relative to entropy.

Because evolution is a process, Teilhard believed that it could not be understood or evaluated solely in terms of its origin but that its direction must also be taken into account. It was, and is, much debated whether evolution has an inherent direction. He believed that it did, with complexification playing a key role. Once the threshold of life was crossed, it began the diversification which resulted in the astonishing abundance and variety of life in the world today. Teilhard took account primarily of the animal kingdom. He was impressed by the evolution of greater levels of complexity which resulted in two principle climaxes to animal evolution, one in insects, the other in the vertebrates, and most especially in the mammals and man. In both, complexification is shown especially in the organization of the nervous system, but this system has evolved along radically different lines in the two groups. In the insects, the nervous system has specialized for automatic, instinctive responses to the ordinary problems of insect life. In the vertebrate, the nervous system has specialized in processing information to permit variable responses. In both, the elaboration of the nervous system is diagnostic for high levels of radial energy, and Teilhard regarded the progressive elaboration of nervous systems as the clearest indication that evolution does have a direction. In the case of insects, however, the type of specialization forms a dead end, while the vertebrate type of nervous organization is open-ended, permitting much

further complexification, with an attendant increase in radial energy.

In the order Primates, Teilhard postulated that the rising level of radial energy approached and then crossed over a major critical threshold: on one side of that threshold was typical mammalian life, highly conscious, knowing much, but, in spite of flashes suggestive of the highest human faculties, incapable of reflection or of abstract thought; on the other side of that critical threshold was - and is - man, a typical mammal and primate in most respects, yet not only knowing, but knowing that he knows, capable of reflection and abstraction, capable of compassion, and capable of a new kind of evolution, psychosocial evolution, which is no longer dependent upon the slow, genetic mechanisms of biological evolution. Thus the crossing of the critical threshold in the increase in radial energy produced a change of state - resulting in a new type of life; life dominated by thought, human life.¹⁰

Teilhard de Chardin believed that the earth was evolving an extra sphere, a layer of consciousness which he called the **noosphere** (from **noos**, the Greek word for 'mind'). He saw the development of the material universe as an outer phenomenon accompanied by an inner counter-part - a 'within of things'.

¹⁰ See discussion of time consciousness and theories of Panikkar on human social evolution discussed in conclusion below.

As human beings, we could see ourselves outwardly as biological organisms, but we also knew that 'within' us consciousness was at work.

Teilhard felt that the 'juvenile earth' possessed a 'quantum of consciousness' which it had passed on through evolution to the biosphere. The process had gone on until the appearance of self-reflective consciousness in humans, whereupon the thrust of evolution had turned back on itself; consciousness became conscious of itself. There was only one entity on Earth, and that was life itself. Mind and matter were two energies within evolution, and together they formed life. Life compels us increasingly to view it as an underlying current, in the flow of which matter tends to order itself upon itself with the emergence of consciousness.

CHAPTER THREE

MUTATION: LIFE AND EVOLUTION

In this chapter I will review a range of opinion on the nature of life, and the theories of evolution. My intent, obviously, is not to present an exhaustive analysis of this huge subject but to trace in a coherent fashion some of the various threads of logic and discourse which, in my opinion, lead to the ecological view of the 'new biology' and which reinforce many of the basic concepts of Teilhard de Chardin. It is my hope that this chapter will lead logically into a discussion of the role of consciousness in our understanding of evolution and information transfer in human socio-cultural development.

Haldane observed that in an evolutionary line rising from simplicity to complexity, then often falling back to an apparently primitive condition before its end, we perceive an artistic unity similar to that of a fugue, or the life work of a painter of great and versatile genius.¹ Possibly such artistic work gives us as good an insight into the nature of the reality around us as any other human activity.

¹ Haldane, J.B.S. (1932) The Causes of Evolution.

As he says: "To me at least, the beauty of evolution is far more striking than its purpose..."²

John Maynard Smith, echoing Dodson, points out that we are reasonably confident about the definition of life in large objects but we are less so with objects as small and relatively simple as viruses and bacteria.³ He suggests that the difficulty arises because of the inadequacy of our sense organs rather than of our concepts. If we had eyes which magnified like an electron microscope, we would probably recognize a bacterium as alive.

He suggests that there are two relevant properties of living objects: 1) Although the forms of living organisms remain constant, the atoms and molecules of which they are composed are constantly changing; in other words, they have a 'metabolism'. 2) The parts of organisms have 'functions'; that is to say the parts contribute to the survival and reproduction of the whole. Thus your legs are for walking with, your heart is for pumping blood and the feathery seed heads of dandelions help to disperse the seed. The major part of biology is concerned with these two properties of organisms: biochemistry and physiology with the former, genetics and evolution theory with the latter.

² Ibid.

³ Smith, John Maynard (1986) Chapter 1, 'The Definition of Life' from The Problems of Biology.

Smith proposes that life should be defined by the possession of those properties which are needed to ensure evolution by natural selection. That is, entities with the properties of multiplication, variation, and heredity are alive and entities lacking one or more of those properties are not. Thus we have two distinct pictures of living organisms. One is of a population of entities which, because they possess a hereditary mechanism, will evolve adaptations for survival. The other is of a complex structure which is maintained by the energy flowing through it. Perhaps the hardest part of biology is to see how the two pictures fit together; functional and causal. They are not alternatives and mutually exclusive; both can be true, and they can illuminate one another. They are complementarities.

There are at least three ways to explain the structure of an evolved population of molecular replicators, whether test tube RNA, viral genes, human genes, or even Dawkins' memes⁴ or Teilhard's psychosocial entities. The first kind of explanation is a blow by blow account of their histories: how specific mutations occurred and how they spread. The second explanatory approach resorts to a somewhat misleading word: Purpose. In detail, the molecules simply change haphazardly and replicate selectively. Yet stepping back from the process, one could describe the outcome by imagining that the surviving molecules have changed to

⁴ Dawkins, Richard, (1978) The Selfish Gene, pp. 202 - 214.

"achieve the goal" of replication. The language of purpose makes useful shorthand but the appearance of purpose need not result from the action of a mind. The third explanation says that order emerges through variation and selection of replicators. A molecule folds in a particular way because it resembles ancestors that multiplied more successfully and left descendants including itself.

Evolution attributes patterns of success to the elimination of unsuccessful changes. It thus explains a positive as the result of a double negative - an explanation of a sort that seems slightly difficult to grasp. Worse, it explains something visible - successful, purposeful entities - in terms of something invisible - unsuccessful entities that have vanished. Because only successful organisms have littered the landscape with their remains and those of their descendants, the malformed failures of the past have not left many fossils.

The human mind, as noted above, tends to focus on the visible as comprehensible, seeking positive causes for positive results, an ordering force behind orderly results. Yet through reflection we can see that this great principle of natural selection has changed our past and will shape our future: evolution proceeds by the variation and selection of replicators.

The first replicators on earth evolved abilities beyond those possible for RNA molecules in test tubes. By the time they reached the bacterial stage, they had developed the 'modern' system of using DNA, RNA and ribosomes to construct protein. Mutations then changed not only the replicating DNA itself, but protein machines and the living structures they build and shape. Teams of genes shaped ever more elaborate and complex cells, then guided the cellular cooperation that formed complex organisms. Variation and selection favoured teams of genes that shaped beasts with protective skins and hungry mouths, animated by nerve and muscle, guided by eye and brain (analogue receptors). As Dawkins puts it, genes built ever more elaborate survival machines to aid in their own replication.⁵

Central to the debate between adherents of the new biology and classical biology is the question of optimality. In fact whether at the genotype or the phenotype level, the classical approach is to consider separate traits which supposedly undergo progressive betterment in their fitness. But biologists today are well aware that genes (or cistrones) are as intricately interrelated as are body organs, and cannot be dealt with separately. The genotype and the phenotype are mutually interdependent: one specifies molecular species, the other specifies which of the molecular species gets expressed.

⁵ Ibid., pp. 48-70.

The reliance on optimal adaptation is not the only way to understand organic evolution, and its alternatives are quite natural. We need to move out from the classical framework to see that natural selection was never intended as a trait-by-trait optimization. It states, rather, minimal conditions which will be satisfied under the condition of differential reproduction among the members of a population; what is not forbidden is allowed - not what is not allowed is forbidden.

It is not a matter of survival of the fittest, it is a matter of survival of the fit. It is not the optimization of adaptation, but the conservation of adaptation that is central: a path of structural change of a lineage congruent with its environmental changes. This view of evolution centered on the conservation of adaptation as a minimal condition, Varela calls natural drift. In moving from an adaptationist view to an understanding of evolution as natural drift, we have also moved from a logic of correspondence to a logic of coherence.⁶

According to the recent works of Humberto Maturana, living systems if they are to be explainable, must be treated as structure determined systems, defined by certain

⁶ Varela, Francisco (1987) Essay 'Laying Down a Path Walking', p. 55 Gaia: A Way of Knowing.

organizations.⁷ The interactions they undergo will only trigger changes in them; they will not specify what happens to them. To a structure determined system, nothing can happen which is not determined by it - by how it is made, its structure. For a system to change its dynamics of state, for it to change what it does, even though it maintains its identity and we still call it the same name, means that its structure must change. The medium or environment selects the path of structural transformation that a living organism undergoes during its life phase. Two organisms ideally equal in the initial state, but in different media, will undergo different sequences of interaction. None of us is here by accident, according to Maturana; all of us are here as a result of our particular histories of interactions in our media.

Adequate conduct is conduct which is congruent with the circumstances in which it is realized.⁸ The life history of every organism is a history of structural change in coherence with the history of structural changes of the medium in which it exists, as realized through the continual mutual selection of the respective structural changes. The congruence between the organism and its medium is, hence, always the result of its history. Every cell is itself the result of a long history, which implies millions of years, a

⁷ Maturana, Humberto (1987) Essay 'Everything is Said', p.

⁶⁵ Gaia: A Way of Knowing.

⁸ Ibid., p. 69.

history of successive, successful reproductions. Not only are we here now as the result of our personal histories, but we are here now as a result of the history of our ancestors. In a way, we are all of the same age, and all our cells have the same age - millions of years - if we see not only our own ontogenies but also phylogenies, the history which is responsible for the structural changes that have led to our particular kind of coherence.

P.W. Atkins observes, that chemical reactions are transformations by misadventure.⁹ Atoms are only loosely structured into molecules, and explorations of rearrangements resulting in reactions are commonplace. That is the reason why consciousness had already emerged from the inanimate matter of original creation. If atoms had been as strongly bound as nuclei, the initial primitive form of matter would have been locked into permanence, and the universe would have died before it awoke.

The emergence of consciousness, according to Atkins, like the unfolding of a leaf, relies upon restraint. Richness, the richness of the perceived world and the richness of the imagined worlds of literature and art - the human spirit - is the consequence of controlled, not precipitate collapse. Energy itself holds the key to its own degradation.

⁹ Atkins, P.W. (1981) The Creation, p. 1 in Dixon (1989).

Molecules have the opportunity to react when they meet, but they actually do so only if their atoms are loose enough to wander into new arrangements and to expose themselves to opportunities for misadventure. While frail, molecules are not floppy.

Chaos¹⁰, at least at the molecular level, both drives and restrains the world, according to Atkins. Collapse into chaos motivates change, for all natural events are outcomes of the tendency to dispersal. Chaos also stabilizes form, because the chance is only small that molecules are favoured with enough energy for them to explore possible alternative arrangements. If everything, both structure and change, is the outcome of chance orchestrations of chaos, there must be chains linking the superficial to the deep. Evolution is reaction by seduction. Complex molecules can acquire even greater complexity in stages instead of attempting a single grand passion.

Atkins suggests that the whole course of evolution can be regarded as a geared and cooperative dissipation of energy. Every stage of evolution, including the steps that gave rise to complex molecules out of simpler ones, to people out of slime, and the processes involved when species are confronted with competition, proceeds by dissipation. Every

¹⁰ See Gleick (1987) for full discussion of development of Chaos theory.

change in the complexion of the cells and their interconnections is at heart brought about by a natural disposition to chaos. That this motiveless, purposeless, mindless activity emerges into the world as motive and purpose, and constitutes a mind, is wholly due to the complexity of its organization. As symphonies are ultimately coordinated motions of atoms, so consciousness emerges from chaos.

So long as we can restore our cells by hunting for high quality, undispersed energy in the outside world, transferring some of it to our cells, then so long can our complexity be sustained. A bleak if honest view is that living is therefore a struggle, driven not by purpose but by dispersal, to discard low quality energy into the surroundings and to absorb high-quality energy from them. In a sense, we corrupt the outside world in order to have an inner life. The chain of consumption, men eating cows, cows eating grass, grass eating mountains and living off the sun, is what has grown up through evolution as an interlocked mechanism of dispersal. There is no need to look for a purpose behind it all, according to Atkins: "energy has just gone on spreading, and the spreading happened to generate elephants and enthralling opinions."¹¹

¹¹ Atkins (1981).

One of the key foundations of the classical ontological status of humanity and one of the more perplexing problems in classical biology is the size and complexity of human brains and the supposedly unique self reflective consciousness or intellect thus possible in our species. Nature does not normally tolerate needless extravagance in the organisms: superfluous capacity is trimmed back by evolution, new capacity added only as and when it is needed. We do not expect to find animals possessed of abilities which far exceed the calls that natural living makes on them.

The mind is a far more subtle engine of imitation than any mere protein machine or assembler. Voice, writing and drawing can transmit designs from mind to mind before they take form as hardware. The ideas behind methods of design are more subtle yet: more abstract than hardware, they replicate and function exclusively in the world of consciousness, minds and symbol systems. Teilhard de Chardin and Dawkins both argue that a relatively new form of evolutionary phenomenon which Teilhard called psychosocial entities and Dawkins called memes, is functioning in parallel with the two more widely accepted forms of evolutionary phenomena, the physico-chemical and organic. Where genes have evolved over generations, and eons, mental replicators now evolve over days and decades. Like genes, ideas split, combine and take multiple forms. Genes can be

transcribed from DNA to RNA and back again; ideas can be translated from language to language and symbol set to symbol set. While science has not yet fully described the neural patterns that embody ideas in brains, most authors accept that ideas mutate, replicate and compete. Ideas evolve.

Memes replicate because people both learn and teach. They vary because people create the new and misunderstand the old. They are selected, in part, because people don't believe or repeat everything they hear. As test tube RNA molecules compete for scarce resources, so memes must compete for human attention and effort. Since memes shape behaviour, their success or failure is a deadly serious matter.

Since ancient times, mental models and patterns of behaviour have passed from parent to child. Meme patterns that aid survival and reproduction have tended to spread. Year by year people varied their actions with varying results. Year by year, some died while others found new tricks of survival and passed them on. Genes built brains skilled at imitation because patterns imitated were, on the whole, of value - their bearers after all had survived to spread them.

In the literature on animal intelligence, there has not been until recently a great deal written on the biological function of intellect; how it contributes to biological

fitness. Why does a given animal or organism in its natural environment need demonstrated cognitive skills? What is the use of 'conditional oddity discrimination' to a monkey in the field? What advantage is there to an anthropoid ape in being able to recognise its own reflection in a mirror? While it might be odd for a biologist to make it his task to explain why horses can't learn mathematics, it should not be odd for him to ask why people can.

Humphrey observes that it is tempting to adopt a broad definition of intelligence which makes it self-evidently functional.¹² Alice Heim's definition of intelligence in man, "the ability to grasp the essentials of a situation and respond appropriately" is a case in point.¹³ Substitute adaptively for appropriately and the problem of the biological function on intellect is (tautologically) solved.

When intelligence is defined as the ability to do this or that, who can dare question the biological advantage of being able? When reference is made to 'understanding' or 'skill at problem solving', the terms themselves seem to quiver with adaptiveness. Every organism's world is, after all, full of things to be understood and problems to be solved.

¹⁴

Humphrey maintains that an animal displays intelligence when it modifies its behaviour on the basis of valid inference

¹² See Humphrey (1984), chapter 2, 'The Social Functions of Intellect', p. 118 in Dixon (1989).

¹³ Ibid., p. 119.

¹⁴ Ibid.

from evidence. The term valid is meant to imply only that the inference is logically sound; it leaves open the question of how the animal benefits in consequence. He puts forward the hypothesis that the main role of creative intellect lies in practical invention. Invention here means acts of intelligent discovery by which an animal comes up with new ways of doing things. Thus it includes not only the fabrication of new tools or artifacts, or putting of existing objects to new uses, but also the discovery of new behavioural strategies such as territoriality, new ways of using the resources of one's own body, or what Smith has called an evolutionarily stable strategy.¹⁵

The chief role of creative intellect, according to Humphrey, is to hold society together. The life of social animals is highly problematical. In a complex society, such as those we know exist among higher primates, there are benefits to be gained for each individual member both from preserving the overall structure of the group and at the same time from exploiting and outmaneuvering others within it. Thus social primates are required by the very nature of the system they create and maintain to be calculating beings; they must be able to calculate the likely behaviour of others, to calculate the balance of advantage and loss - and all this in a context where the evidence on which their calculations are based is ephemeral, ambiguous and liable to change, not

¹⁵ See Dawkins (1978), pp. 74 -93.

least as a consequence of their own actions. The game of social plot and counter-plot cannot be played merely on the basis of accumulated knowledge, any more than can the game of chess. Thus over and above cognitive skills which are required merely to perceive the current state of play, the social gamesperson, like the chess player, must be capable of a special sort of forward planning. It asks for a level of intelligence which is likely unparalleled in any other sphere of living.

What makes society complex in the first place? There have probably been selective pressures of two rather different kinds, one from without and one from within society. Humphrey suggests that one of the chief functions of society is to act, as it were, as a polytechnic school for the teaching of subsistence technology.¹⁶ The social system serves the purpose in two ways: 1) by allowing a period of prolonged dependence during which young animals spared the need to fend for themselves are free to experiment and explore; and 2) by bringing the young into contact with older, more experienced members of the community from whom they can learn by imitation and perhaps, in some cases, from more formal lessons, thus setting the stage within the collegiate community for considerable political strife. It is no accident that humans, who of all primates show the

¹⁶ Humphrey (1984), p. 127.

longest period of dependence¹⁷, and who have evolved the most complex kinship and territorial structures and the widest overlap of generations within society, should be more 'intelligent' than chimpanzees, and chimpanzees for the same reasons more 'intelligent' than monkeys.¹⁸

Once a society has reached a certain level of complexity, then new internal pressures must arise which act to increase its complexity still further. For, in a society of the kind outlined, an animal's intellectual 'adversaries' are members of his or her own breeding community. If intellectual prowess is correlated with social success, and if social success means high biological fitness, then any heritable trait which increases the ability of the individual to outwit his fellows will soon spread through the gene pool, and in these circumstances there can be no 'going back'. An evolutionary ratchet will have been set up, acting as a self winding watch to increase the general 'intellectual' standing of the species. In principle, the process might be expected to continue until either the physiological mainspring of intelligence is full wound or else 'intelligence' itself becomes a burden. The latter seems most likely to be the limiting factor: there must surely come a point where the time required to resolve a social 'argument' becomes insupportable!

¹⁷ Humphrey cites a dependency period of nearly thirty years for Bushmen in Africa, p. 127.

¹⁸ Ibid., p 127.

While 'normal science' in Kuhn's sense of the term, has little if any room for social thinking, 'revolutionary science' may more often than we realize derive its inspiration from a vision of a socially transacting universe. Humphrey maintains that the ideology of classical science has had a huge but in many ways narrowing influence on ideas about the nature of 'intelligent' behaviour. In so far as an idealized view of scientific method has been the dominant influence on recent human intellectual history, biologists, according to Humphrey, should be the first to dismiss much of recent history as bunk.

Habermas reviews how the anthropological theories of evolution of the late nineteenth century (Morgan, Tylor) were driven back, in our century by the culture-relativistic views of the functionalist school; only authors like V.G. Childe (1946) and L. White (1949) held on to the concept of general stages of development.¹⁹ Under the influence of the dominant cultural anthropology (Kroeber, Malinowski, Mead), developmental-theoretic views were - as the multilinear evolutionism of J.H. Steward (1955) shows - represented only in a very cautious form and accommodated to cultural ecology. More recently, however, the success of the theory of biological evolution has again given rise to the renewal of social-scientific evolutionism. Social evolution no

¹⁹ Habermas, Jürgen (1976), pp. 169-170.

longer appears only vaguely as a continuation of organic evolution; instead, neoevolutionists (Parsons (1966), Luhmann (1974), Lenski (1973)) start with the idea that social evolution can be explained in accord with the well analyzed and well tested model of natural evolution. The heuristic usefulness of the biological model is not an issue for Habermas; he is, however, doubtful whether it points the way to a generalized theory of evolution valid for both natural and cultural development.²⁰

Habermas suggests that the biological model relies on the concept of the self-maintenance of self-regulating systems that demarcate themselves from hypercomplex environments. Between the environment and the system there is a complexity gap; the boundary-maintaining system is faced with the task of developing as much self-complexity as is needed to enable it adequately to reduce the complexity of the environment. The bearers of natural evolution are the species, each of which is represented by a specific genetic makeup capable of reproducing itself. Species reproduce themselves in the form of populations that stabilize themselves in their ecological surroundings. These in turn are composed of individual organisms that interact among themselves and with the environment. The evolutionary learning process applies immediately to the genetic makeup. Through the process of mutation, which Habermas feels can be understood as an error

²⁰ Ibid., p. 170.

in transmission of genetic information, divergent phenotypes are produced; under the selection pressure of the environment these are selected for by the process of double negatives outlined above, making possible the stabilization of a population dependent on the conditions of its environment.

According to Habermas, the heuristic value of the biological model consists in its directing our attention to the evolutionary learning mechanism.²¹ At the basis of cultural tradition there is evidently a variety-generating mechanism that corresponds vaguely to mutation. Natural evolution is not affected by those individual learning processes of individual organisms that extend and modify genetically programmed behaviour, for the behavioural modification is limited to the life-cycle of the individual and not fed back into the next round of reproduction of the genetic makeup. By contrast, he maintains, at the socio-cultural stage of development, learning processes are socially organized from the start, so that the results of learning can be handed down. Thus cultural tradition provides a medium through which variety-generating innovations can operate after the mechanism of natural evolution has come to rest. Most evolutionary biologists would maintain, of course, that natural evolution never 'comes to rest' and that Habermas is displaying a classic case of temporal tunnel vision in

²¹ Ibid., p. 171.

defense of his hidden metaphysical bias. Dawkins and Teilhard de Chardin would point also to the congruent role of psychosocial evolution or memic evolution.

Bateson assumes that epistemology and theories of mind and theories of evolution are very close to being the same thing.²² Epistemology, according to Bateson, is a somewhat more general term which covers both the theories of evolution and the theories of mind. Evolution and cognition are really flip sides of the same conceptual coin. The mind/body problem or the mind/matter problem, essentially avoided in classical biology, was the focus of Bateson's later work. The central question in Bateson's last work was, if we separate off, for the sake of enquiry, the world of mental process from the world of cause and matter, what will the world of mental process look like?²³

Information, according to Bateson, is precisely not "stuff", a thing. The entire language of materialism, good as it may be for the description of relations between material things, reflecting back upon the things, is useless as a way of describing the relations between things to reflect forward upon their organization. He acknowledges no things as there are no things in thought. There are no pigs, no trees, no people; there are only ideas of pigs, trees and people. In

²² Bateson, Gregory (1980), taped lecture 'Men are Grass' to Lindisfarne Conference.

²³ Bateson, Gregory (1979), Mind and Nature.

the mental world there is no location, only yes and no, ideas of ideas, news of messages and the news is news essentially of differences, or differences between differences.

Men die.

Socrates is a man.

Socrates will die. (Barbara syllogism)

Grass dies.

Men die.

Men are grass. (Affirming the consequent syllogism).²⁴

Bateson suggests that the above syllogisms are apt metaphors for the fundamental question addressed by this thesis, the question of the ontological status of humanity. The logical basis of this ontological status, which I will discuss in more detail below, rests on the developed concepts of classes and subjects. Most educated people would affirm the first syllogism and deny the logical validity of the second. Bateson points out, however, that while the first syllogism identifies Socrates as a member of a class and neatly places him in the class of those who die, the second syllogism is concerned with the equation of predicates; dies - dies, that which dies is equal to that other thing that dies.

²⁴ Bateson, Gregory (1980), Lindesfarne Lecture.

He points out that if it be so that the 'grass syllogism' does not require subjects and if it be so that the 'Socrates syllogism' does, then it will also be true that the 'Socrates syllogism' could not have been much use in a biological world until the invention of language and the separation of subjects and predicates. There were and are, however, shared predicates between horse and man which today we call homology. It seems therefore that metaphor is more than poetry, it is neither good nor bad logic, but the logic upon which the biological world is built. Metaphor according to Bateson, is the main characteristic and organizing glue of this world of mental process.

CHAPTER FOUR

MIND: CONSCIOUSNESS AND INFORMATIONAL ENTITIES

In understanding our own evolutionary history, the intervening variables that constitute the largest single factors contributing to our perceived human evolutionary success are language and culture.¹ The rapid increase of the size of the hominid brain relative to body weight, or the so-called encephalization quotient discussed in some detail above, was the fortunate pre-adaptive condition that allowed language and culture to evolve and in turn influence the degree of complexity of that same brain function.²

The enlarged brain of homo sapiens sapiens, coupled with our possibly more sophisticated language system, appears to have manifested its power largely in terms of more elaborate social organizations. Just as we cannot even begin to assess the complexities of social organization in hunter-gatherer and agricultural societies today in terms of their crude lithic, wood and bone implements, so we cannot assess the social organization of prehistoric homo sapiens sapiens on that basis. But that organization was clearly based on a

¹ Kaftos and Nadeau (1990), p. 97.

² See discussion of Humphrey's work in chapter three, pp. 52-55 of this thesis.

growing capacity for language which allowed daily existence to be increasingly choreographed in terms of rules of kinship, ranks, roles, taboos and obligations as outlined above. Language, as the basis for symbolic thinking, and the deepening of long-term memory to store vast amounts of information was the penultimate product of 'sapientization'.³

Symbolic language, which in the initial stages freed humans from the grip of pre-adaptive responses and allowed us to better coordinate our activities in the interest of survival, eventually made us free in a much more radical sense - it allowed us to create and re-create our own reality which was externalized into and perpetuated by an increasingly elaborate material and immaterial culture. Teilhard de Chardin called this process psycho-social evolution. While this new reality resident (perhaps) in the cerebral cortex had some survival value, the bulk of our conscious creations must be classed as non-survivalistic in that they do not appear to be a consequence of the struggle for survival on the subsistence level. This observation is in accord with Varela's views on optimality and the conservation of adaptation outlined in the previous chapter.

There is no evidence that genetic inheritance provides a template for a specific range of human behaviors, or that it

³ Ibid., pp. 94-96.

predetermines the character of any aspect of human reality.⁴ A human child during the first six weeks of life cries with an immobile tongue and a fixed supralaryngeal area at the back of the pharynx. What is innate in a normal human infant is the capacity to acquire language, including a tendency to space phonemes at specific intervals, to prefer the taste of sugar, and to be visually attracted to eyes, a smiling face, and bull's eye designs.⁵ Toward the end of the sixth week the tongue is freed and the child begins to utter a range of distinct sounds. At the end of three months the babblings have no special pattern, but at six months the child begins to arrange certain sounds in sequence, accentuating some and repressing others as he/she patterns responses after auditory stimuli in the environment. A child born deaf will show a gradual atrophy of the babbling behaviour due to lack of auditory reinforcement. The developmental programming makes it possible at about age one for the child to utter holophrastic, or one-word, sentences and to put words into full sentences by about eighteen months. From this point onward the inheritance of language and culture is absorbed or learned, and the raw stuff of homo sapiens sapiens becomes the repository of the imaginative acts and experience of forebears who helped to fashion his/her reality.

⁴ Ibid., p. 98.

⁵ Ibid., see note 11.

The point of the above analysis is that the raw uncultivated stuff of our evolutionary (biological/organic) history does not in itself produce an organism suited for survival or one that is even distinctly human. The qualities which we recognize as distinctly human are all functions of human consciousness which begins to develop fully only after children have passed through the initial stages of linguistic development. At this point an inheritance built upon but quite different from innate genetic determinants and predispositions takes over, and the emergent human being enters a reality bounded but not dictated by its large neurophysiological capacities. As the anthropologist Clifford Geertz describes the process:

Culture, rather than being added on to a virtually finished animal, was a central ingredient in the production of the animal itself..... The perfection of tools, the adoption of organized hunting and gathering practices, the beginnings of the true family organization, the discovery of fire, and most critically, the increasing reliance upon systems of significant symbols (language, art, myth, ritual) for orientation, communication, and self-control all created a new environment.... By submitting himself to governance by symbolically mediated programs...man determined, if unwittingly, his own biological destiny. He literally created himself.⁶

In my opinion, it is this 'critical threshold' which Teilhard de Chardin refers to as the cross-over from the level of typical mammalian consciousness to human consciousness, or what he refers to as 'noogenesis', that is

⁶ Geertz as quoted in Kaftos and Nadeau (1990), p. 98.

the central point of debate in this thesis. Clearly Habermas, Harvey, Sack and Soja believe that this is the point where 'biological' evolution ceases and 'cultural' evolution, with all the ontological and epistemological connotations entailed in that distinction, begins. Bateson (1979), Dawkins (1978), Lovelock (1979), Maturana and Varela (1980), Kaftos and Nadeau (1990) clearly lean toward a more holistic view.

While the differences between mutation processes and social learning "leap to the eye", according to Habermas, he suggests that the combination of the conceptual repertoire of systems theory and evolution theory is undoubtedly advantageous in investigating structural changes that expand the steering capacity of a society.

Something is organic if it has the ability to process information and to act accordingly. We have little choice but to acknowledge that photons, which are energy do appear to process information and to act accordingly and therefore they seem to be organic. Since we are also organic, there is a possibility that by studying photons (and other energy quanta) we may learn something about us.

Zukav, at least in the above quotation, appears to operate from a similar logical perspective to Bateson in his 'syllogism of grass'. Most of the proponents of systems and

⁷ See Zukav, (1980), p. 88.

information theory operate within a similar logical framework.

A system can be defined as an organized collection of inter-related elements characterized by a boundary and functional unity. The concept of system emphasizes the reality of complex relational networks and permits the analysis of mutual causal processes involving large numbers of interacting entities.⁸ The concept of an organization, the elements of which are themselves small organizations, is neither unfamiliar nor new. One illustration is current cell theory, discussed by Margulis, according to which most of the animals and plants are made up of endosymbiotic units which have many if not all the attributes of independent living organisms.⁹ Dawkins' treatment of the living organism as being merely a plenum wherein other living organisms, the genes, have their life is but another step in the same direction. Strictly speaking such physically conjoint colonies as these pose no question of organization which is philosophically deeper than those which arise at a lower level of individuality.

It is very different, however, with humans and the social animals. The degree of integration of the life of the community may very well approach the level shown in the

⁸ See Dechert (1966), p. 11.

⁹ Lynn Margulis, (1981), Symbiosis and Cell Evolution.

conduct of a single individual, yet the individual will probably have a fixed nervous system with permanent topographical relationships between the elements and permanent connections, while the community consists of individuals with shifting relations in space and time and no permanent unbreakable physical connections.

With humanity, information and the communication of it embraces among many other things the whole intricacy of language, literature and the arts. Whatever the means of communication any group may have, it is possible to define and to measure the amount of information available to the group and to distinguish it from the amount of information available to the individual. No information available to the individual is also available to the group unless it modifies the behaviour of one individual to another, nor is even that behaviour of group significance unless it is distinguishable by other individuals from other forms of behaviour. The question as to whether a certain piece of information is of group or of purely private availability depends on whether it results in the individual assuming a form of activity which can be recognized by other individuals as being distinct in the sense that it will in turn affect their activity.¹⁰

¹⁰ Wiener (1961).

In information theory the boundaries of groups or communities extend only so far as there extends an effectual transmission of information. A group may have more group information or less group information than its members. A group of non-social animals, temporarily assembled, presumably contains very little group information, even though its members may possess a great deal of information individually. On the other hand, the human organism contains vastly more information, in all probability, than does one of its cells. There is thus no necessary relationship in either direction between the amount of group or tribal or community information and the amount of information available to the individual.

The idea of an active field of information that unfolds in the various structures and processes of nature and of matter that has endless levels of subtlety suggests that the whole order of nature may well be more complex than has ever been supposed. James Lovelock, the co-author the Gaia hypothesis, has defined memory in a cybernetic system as the capacity to store, recall and compare information in order to self-correct and self-direct the system.¹¹ Memory is the self-referencing capacity of a system - its identity. One of the ways in which memory arises is by interaction with another system. The simplest cybernetic circuit can be said to have memory of a dynamic kind - not based on static

¹¹ Lovelock as quoted in Devreux (1989), p. 155.

storage but upon the travel of information around the circuit. This concept of the dynamics of identity development across cognitive boundaries, or systems, informs, in my opinion, Harvey's concept of habitus (discussed on page 26 above) and Habermas' observations on the role of personality systems in the ontogenic learning process. This concept should serve as an epistemological bridge between the humanist and naturalist world view. David Bohm proposes that elementary particles do not actually have a wave/particle nature but instead are particles with considerable internal complexity.¹² In addition to the normal electromagnetic force that acts on the elementary particle as a result of the electrical charge, Bohm postulates a new quantum potential. The quantum potential acts like a guide wave and carries information about the environment of the quantum particle, thus informing the particle and effecting its motion. Since the information in the potential is very detailed, the resulting trajectory is so extremely complex that it appears chaotic or indeterministic. In this way, the indeterminism of quantum events is accounted for by the complex nature of the quantum potential. Since quantum potential does not decrease with distance, it is in general not possible to analyze a quantum system and its environment into separate parts; rather the system must be treated as a whole which is guided and formed by active information in the quantum potential. Bohm's

¹² As quoted in Peat (1988), p.168.

causal interpretation suggests that matter has orders that are closer to those of mind than to simple mechanical order. Information is given an active, formative role so that an individual elementary particle is linked through the quantum potential to the entire universe.

The physical world, it seems, is not a structure built out of independently existing analyzable entities, but rather a web of relationships between elements whose meanings arise wholly from their relationships to the whole. The philosophical implication of quantum mechanics seems to be that all of the things in our universe, including us, that appear to exist independently, are actually parts of one all-encompassing organic pattern, and that no parts of that pattern are ever really separate from it or from each other.

When one thinks of organic systems generating information, one might think of the spontaneous generation of pattern in the world.

At the pinnacle of complicated dynamics are processes of biological evolution, or thought processes.... Intuitively there seems to be a clear sense in which these ultimately complicated systems are generating information. Billions of years ago there were just blobs of protoplasm; now billions of years later here we are. Information has been created and stored in our structure. In the development of one person's mind from childhood, information is clearly not just accumulated but also generated - created from connections that were not there before.¹³

¹³ Packard quoted in Gleick (1987), p. 262.

Habermas maintains that in natural evolution the success of learning processes is measured against the ability of a population to stabilize itself in a given environment; and the reproduction of the species depends in the final analysis, on the individual organism's ability to survive. He states that we can specify in turn unambiguous parameters for the ability of an organism to avoid death but maintains that this is not the case for the ability of a society to avoid death. The physical survival of a number of members sufficient for reproduction is, of course, a necessary condition for a society's maintaining its identity - but it is not its sufficient condition.

The identity of a society, according to Habermas, is normatively determined and depends on cultural values; on the other hand, these values can change as the result of a learning process. There is no clearly specifiable goal-function against which the ultrastability of societies could be measured. Habermas suggests that any evolutionary assessment of the highest values (system target goals) leaves us forever in a hopeless circle of self referential definitions of social life. For this reason, he argues, the relation between socialized individuals and their society is not the same instrumental relationship as that between exemplar and species at infra-human stages of development.

Species reproduce themselves when sufficient numbers of exemplars avoid death; societies reproduce themselves when they avoid passing on too many errors. If the survival ability of organisms is a test case for the learning process of the species, then the corresponding test cases for societies lie in the dimension of the production and utilization of technically and practically useful knowledge.¹⁴

Once again I would argue that Habermas' epistemological bias is such that, however inadvertently, he is using different standards and definitions for what he considers to be two separate ontological realities. The definition of death in any organism is problematic at best, and any attempt to definitively specify parameters for the avoidance of death either in physical organisms or cultural aggregations is a daunting if not fruitless task. His comments on the level at which evolutionary change takes place - at the gene, individual or population level - are discussed below by Varela.

Habermas points out that a reliable evolutionary classification of complexity is only possible if we know the inner logic of a series of morphological changes or of an expansion of reaction potential. The role played by the central nervous system in phylogenetic comparison is

¹⁴ See Habermas (1976), p. 173.

prototypical here; we have to know the general structure and logic of development of the nervous system if we want to classify different species according to the state of development of the system. In social evolution as well, we shall not be able to classify social formations according to their state of development until we know the general structures and developmental logic of the social learning process. Corresponding to the central nervous system here are the basic cognitive structures in which technical and moral-practical knowledge are produced.¹⁵ As a systems specialist with a background in biology, I would tend to agree with this observation and indeed with much of Habermas' overall analysis. I would, however, probably define the structure and developmental logic of the social learning process as inclusive of a considerably broader range of entities.

Ilya Prigogine,¹⁶ in the study of the extremities of the informational continuum, examines how matter in far-from-equilibrium conditions acquires basically new properties leading to the possibility of communication over macroscopic times and distances, the possibility of "perceiving" small effects leading to a pattern selection and, finally, the possibility of memory corresponding again to temporal successions of bifurcations. He observes how non-equilibrium

¹⁵ *Ibid.*, pp. 174-175.

¹⁶ See King et al (1983).

systems permit matter to "feel", much more in detail, the various fields in which they are embedded, be they gravitational, electric or magnetic (informational) and now that certainly has to be one of the roads which matter had to follow in order to come to the highly adaptive systems which are the living systems we know.

Prigogine points out that this phenomenon is probably going to play a more important role in the questions of the evolution of life in its pre-biological stages and social diversification. Evolution in a non trivial sense requires the continued interaction between the microscopic and macroscopic level. This aspect is obvious, he suggests, on the ecological and sociological levels where individuals and macroscopic features (such as institutions) are engaged in a complex dialectical process. Thermodynamic macroscopic concepts, as well as the idea of evolution, of an anisotropy of time, appear on all levels: from the level of elementary particles up to the level of cosmology.¹⁷

Prigogine suggests that emphasis on time has brought in unifying elements which connect science and culture more closely together, as Teilhard de Chardin predicted. In science, it is already certain that none of the three basic levels (elementary particles, molecular and biochemical, and the cosmological) can be considered in isolation. Each

¹⁷ See Kaftos and Nadeau (1990), chapter 3.

depends on the two others. It is perhaps remarkable that Teilhard's position appears today much less isolated than it was at the time of his writing.

In a beautiful article on the energy of the universe, Freeman Dyson has written:

It is conceivable however that life may have a larger role to play than we have yet imagined. Life may succeed against all the odds in molding the universe to its own purpose. and the design of the inanimate universe may not be as detached from the potentialities of life and intelligence as scientists of the twentieth century have tended to propose.¹⁸

As a physicist, Dyson cannot help suspecting that there is a logical connection between the two ways in which mind appears in the universe. He feels that our awareness of our brains has something to do with the process which we call observation in atomic physics. That is to say, our consciousness is not just a passive epiphenomenon carried along by the chemical events in our brains, but is an active agent forcing the molecular complexes to make choices between one quantum state and another. In other words, mind is already inherent in every electron, and as stated in my opening hypothesis, the processes of human consciousness differ only in degree but not in kind from the processes of

¹⁸ Dyson, Freeman "Energy in the Universe" Scientific American 225 (1971) 50-59.

choice between quantum states which we call 'chance' when they (the choices) are made by electrons.

Jaques Monod (1971) would call such sentiments 'animist', fit only for believers in spirits.¹⁹ 'Animism' according to Monod, establishes a covenant between nature and man, a profound alliance outside of which seems to stretch only terrifying solitude. According to Monod, this is nonsense, and man knows at last that he is alone in the universe's unfeeling immensity, out of which he emerged only by chance.

Dyson argues that while it is true that we emerged by chance, the idea of chance is itself only a cover for our ignorance. The more we examine modern physics and biology, the more many people are coming to the belief that the universe must have known we were coming. The architecture of the universe, according to Dyson, is consistent with the hypothesis that 'mind' plays an essential role in its functioning. The challenge as I see it is to move beyond the traditional mysticism of religion and define mind in terms of the informational transfer mechanisms of which it is comprised.

On the level of subatomic physics, the observer is inextricably involved in the definition of the objects and

¹⁹ See Ilya Prigogine and Isabelle Stengers, Order Out of Chaos (1984).

phenomena which he/she observes. On the level of direct human experience, we are aware of our own minds, and we find it convenient to believe that other human beings and animals have minds not altogether unlike our own. Now we have found a third level. The peculiar harmony between the structure of the universe and the needs of life and intelligence is a third manifestation of the importance of mind in the scheme of things.

We have evidence that mind is important on three levels. We have no evidence for any deeper unifying hypothesis that would tie these three levels together. As individuals, some may entertain the hypothesis, as Teilhard de Chardin did, that there exists a universal mind or world soul which underlies the manifestation of mind that we observe. If one takes this hypothesis seriously one fits, perhaps, Monod's definition of an animist.²⁰

²⁰ See Dyson, Freeman (1979) "The Argument from Design" Disturbing the Universe.

CHAPTER FIVE

EPISTEMOLOGY: COMPLEMENTARITY AND NON-LOCALITY:

As Wallace points out, a coherent basis for geographical inquiry is shown to lie in a recognition of the complexity and ambiguity of human nature and hence of the fact that most well-established theoretical frameworks capture a valid but only partial dimension of human behaviour in space.¹ In this chapter, I will attempt to lay out the presuppositional logic on which this thesis is based. I will review the ontological and epistemological problems inherent in quantum physics, and by extension in modern biology, and discuss the implications of non-locality and the concept of complementarity on our understanding of reality not only in the natural sciences but also the social sciences.

Perhaps the most fundamental aspect of western intellectual tradition, which is pervasive throughout the history of western thought, is ontological dualism. The concept of Being as continuous, immutable, and having a prior or separate existence from the world of change dates from Parmenides. The same qualities were associated with the God

¹ Wallace, Iain (1987) The Global Economic System, manuscript chapter (unpublished): Carleton University.

of Judeo-Christian tradition, and were considerably amplified by the role played in theology by Platonic and Neoplatonic philosophy. Since the architects of classical physics and biology were all inheritors of a cultural tradition in which ontological dualism was a primary article of faith, the idealization of the mathematical ideal as a source of communion with God, which dates from Pythagoras, provided an ontological or metaphysical foundation for the emerging natural sciences.

The basic presuppositions of this ontology can be defined as: 1) The physical world is made up of inert and changeless matter, and matter changes only in terms of location in space.

2) Matter mirrors physical theory in that its behaviour is inherently mathematical, and thus physical reality is essentially quantitative rather than qualitative.

3) Matter, as the unchanging unit of physical reality, can be exhaustively understood by mechanics, or by the applied mathematics of motion.

4) The mind of the observer is separate from the observed system of matter, and the ontological bridge between the two is scientific law and theory.²

Of equal importance in the development of both the natural sciences and social sciences is the wide consensus both

² See Kaftos and Nadeau (1990), p. 75.

within theistic and naturalistic cosmologies of the ontological status of human beings as quite distinct from all other non human entities in nature. Whether operating from a theistic or naturalistic ontological perspective, both Soja and Sack clearly demonstrate, as pointed out in my second chapter, that they believe in the ontological status of humans as uniquely complex organisms within a separate natural world of cause and effect relationships. They, along with most humanists, recognise the uniqueness of humanity as stemming from precisely those attributes which distinguish humans from 'simpler', 'subhuman' organisms.

The question of primacy of the individual or the social or informational aggregate is one which has been discussed in some detail in this thesis, particularly with respect to the views of Jurgen Habermas (in terms of human sociology and human social evolution) and Maturana, Varela, Kaitos and Nadeau (in terms of physics, biology and general evolution). The question of the ontological status of groups or aggregations of human beings versus individuals in society or organisms or elementary particles in the cosmos is central to this thesis.

Although Laplace had largely removed the theological component of ontological dualism by the early nineteenth century, the first major blow to the divine truth implied in mathematics came with the discovery of non-Euclidean

geometry during the same period. Kant and later Wierstrass observed that the objects of nature conform to our knowledge of nature and eventually Einstein adopted the view that mathematics is a pure creation of the human mind.

With the promulgation of atomic theory and quantum mechanical theory, a major debate ensued, lasting more than twenty years, between Neils Bohr and Einstein, among others, as to the true relationship between the mathematical forms in the human mind called physical theory and the physical reality. Without going into detail on the debate, the recent Aspect experiments confirming the concept of non-locality put forward by Bell's Theorem³ confirmed Einstein's worst fears, and physical scientists must now view physical theories not as an ontological bridge between observer and observed system, but rather as subjectively-based human constructs. This new relationship implies, without being able to prove, that consciousness participates in the life of the cosmos in ways that classical physics completely disallowed.⁴

As stated in the introduction, Kaftos and Nadeau maintain that in spite of the fact that physics has been moving inexorably toward a confrontation with what they call 'this hidden metaphysical presupposition' since the nineteen

³ See comments in Introduction and chapter 3, also chapter 3 of Kaftos and Nadeau (1990).

⁴ Ibid., p. 109.

twenties, the belief in the one-to-one correspondence between every element of the physical theory and physical reality has persisted. This has led to what Kafos and Nadeau refer to as 'metaphysical leaps' by a number of internationally known physicists in an attempt to resuscitate or save the traditional ontology of scientific epistemology by positing various alternatives to the Copenhagen Interpretation.⁵ The insurmountable problem in preserving the old ontology in the face of the results of the Aspect experiments has been well summarized by Henry Stapp:

No metaphysics not involving faster-than-light propagation of influences has been proposed that can account for all of the predictions of quantum mechanics, except for the so-called many worlds interpretation, which is objectionable on other grounds. Since quantum physicists are generally reluctant to accept the idea that there are faster-than-light influences, they are left with no metaphysics to promulgate.⁶

As outlined in my introduction, Bohr's version of the Copenhagen Interpretation argues strongly that quantum epistemology reveals that fundamental oppositions disclosing profound truths of nature are complementary, and those constructs have consistently brought us closer to a vision of nature which belies both classical ontological dualism and the bias that ultimate truths are transcendent and pre-existing.

⁵ Ibid., chapter 4.

⁶ Stapp as quoted in Kafos and Nadeau (1990), p. 112.

The usual textbook definition of complementarity suggests that it applies to "apparently" incompatible constructs, like wave and particle, or variables, such as position and momentum. Since one of the paired constructs or variables cannot define the situation in the quantum world in the absence of the other, both are required for a complete view of the actual physical situation. Thus a description of nature requires that the paired constructs or variables be viewed as complementary, meaning that both constitute a complete view of the situation while only one can be applied in a given situation. Such a definition usually concludes that the Copenhagen Interpretation assumes that entities in the quantum world, like electrons or photons, do not have definite properties apart from our observation of them.⁷

Clifford Hooker suggests, however, and Kaftos and Nadeau agree, that such a definition arises only by taking Bohr's description out of context.⁸ They argue that Bohr viewed classical mechanics as a subset of quantum physics, not the other way around. Quantum mechanics, according to Bohr, is the complete description, and the measuring instruments in quantum mechanical experiments obey this description. Although we can safely ignore quantum mechanical effects when dealing with macro-level phenomena, for the reason that

⁷ Ibid., p. 78.

⁸ Ibid., note 14 and p. 79.

those effects are small enough to be excluded for "practical" purposes, we cannot ignore the implications of quantum mechanics on the macro level for the obvious reason that they are there. Bohr is simply describing a new epistemological situation which we are forced to accept now that we realize that the quantum of action is, like light speed and the gravitational constant, a constant of nature.

The architects of classical physics and biology were translating into mathematical language their visualizable macro-level experience with physical and biological phenomena. We must now view the various macro categories or entities as **abstractions**, or **idealizations** representing properties that are definable or observable only in interaction with other systems.⁹ This is so because our customary points of view and forms of perception evolved as a result of experience at the macro level, and will forever be conditioned and constrained by that experience. All truths reside, ultimately, in our world constructing minds.

The recent biology of Maturana and Varela begins with a fundamental notion of unities. In Varela's Principles of Biological Autonomy,¹⁰ he discusses the failure of conventional biology to recognize that the individual is the

⁹ Bohr quoted in Kaftos and Nadeau (1990), p. 91.

¹⁰ See Thompson (1987), p. 22.

true ontological unity in evolution. We do not observe a species; we construct the idea of species in an imaginary historical space. The creation of a species in a biological description is a performance of natural history that is related to cultural history. In many ways there is an attractive link between the Autopoiesis¹¹ of Maturana and Varela and quantum theory, for both share a more highly sophisticated epistemology. Heisenberg noted that we do not have such a thing as a science of nature; rather we have a science of man's knowledge of nature. We do not live in reality; we live in a series of descriptions of reality. We can more accurately say that natural history is a subset of cultural history and not the other way around. Heisenberg also maintained that the universe is made out of music not matter; and so when the biologist sees processes and participates with them in a performance of descriptions, consciousness is participating with cognition in what Maturana and Varela would call "the realization of the living".¹²

The area of science outside of quantum physics where Bohr made the most consistent effort to apply complementarity in the hope of resolving an otherwise irresolvable opposition was biology. The vitalism-mechanism controversy was central

¹¹ See Maturana and Varela (1980), Autopoiesis and Cognition: The Realization of the Living for complete description of Autopoiesis.

¹² Thompson (1987), p. 22.

to his quest. The distinction between a living organism, which by definition interacts with its environment, and a detailed scientific description of that organism, which must treat the system as isolated or isolatable, remains problematic, although the recent work of Margulis and Prigogene outlined above addresses the problem directly.

The incessant exchange of matter which is inseparably connected with life will even imply the impossibility of regarding an organism as a well-defined system of material particles like the systems considered in any account of the ordinary and physical chemical properties of matter. In fact we are led to conceive the proper biological regularities as representing laws of nature complementary to the account of the properties of inanimate bodies¹³

Bohr's conclusion that living organisms, characterized by their biological regularities, display an active and intimate engagement with their environment that is categorically different from that of inorganic matter is quite valid. Since organic matter and inorganic matter are constructs which cannot be applied simultaneously in the same situation, and since both are required for a complete description of the biological situation, they are, by definition, complementary.

Prigogene's work on far-from-equilibrium systems, outlined in the previous chapter, points to the profound complementarity between reversible and irreversible

¹³ Bohr as quoted in Kaftos and Nadeau, p. 142.

processes. If we assume that order is identical with reversibility, and disorder or chaos with irreversibility, a generalization that seems to make sense in terms of mathematical physics, then order and chaos are complementary constructs in physical reality. In this view we can no longer conceive of order and disorder as if both were seeking complete domination of the physical situation, or as if the two, like the cultural analogues of good and evil, were engaged in cosmic warfare. They appear rather as equally necessary and fundamental aspects of a seamless whole which displace one another as emergent properties in a particular situation. The existence within the equations of classical physics of a chaos so complete that any hope of returning to unrestricted determinism seems utterly impossible, makes perfect sense within the logical framework of complementarity. Any definition of order must also feature disorder as its complementary construct.

The fundamental principle arising from the combined thoughts of the above-quoted authors, and outlined so presciently by Tielhard decades earlier, is that living systems (and all systems are either living or pre-living) express a dynamic in which opposites are basic and opposition essential. The movement from archaic industrial modes of thought into a new planetary culture is characterized by a movement from ideology to an ecology of consciousness. In ideological modes of thought, one believes that the Truth can be

expressed in an ideology, and that ideology can be administered to the masses by an elite. Now in a world that is formed by the shapes of interacting opposites, the fundamental notion is that the Truth cannot be expressed except in relationships of opposites (complementarity); therefore, every ideology is partial and in its purest elaboration it is most incomplete. As Neils Bohr expressed the idea a generation ago: "The opposite of a fact is a falsehood, but the opposite of one profound truth may well be another profound truth."¹⁴

If our cosmological and ontological perspective on the nature of reality defines the perceived appropriateness of the means of acquiring knowledge, then the implications of the ontological status of complementarity on the epistemology of both natural and social science are potentially profound. Each of the systems we attempt to isolate in the study of nature, including human nature, is in some sense a whole in that it represents the whole in the activity of being the part. But no single system, with the exception of the entire universe perhaps, can fully realize the cosmic order of the totality due to the partial and subordinate character of differentiated systems. No part can sustain itself in its own right for the reason that difference is only one complementary aspect of its being - the other aspect requires participation in the sameness of

¹⁴ Bohr as quoted in Kaftos and Hadeau, p. 37.

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cosmic order. All differentiated systems in nature require, in theory and in fact, supplementation by other systems.¹⁵

This thesis does not suggest that the acceptance of complementarity as an ontological foundation in any way diminishes the validity of current epistemological approaches in either the natural or social sciences. What it does suggest is that current epistemological practices lead to limiting methodologies which rather severely constrain the logical domain within which meaningful insights can be achieved. In many ways, these constraints are analogous to the problems encountered in fractal geometry. There must be boundaries between 'figure' and 'ground' for the process of entity perception to occur, but one cannot fully comprehend any given figure without understanding the 'ground' within which it exists, and the more one examines the boundaries, the less precise they become.¹⁶

The presuppositional hierarchy on which this thesis is based therefore is:

- 1) A naturalist cosmology, although I would not rule out the existence of a God; I would simply state that the probability of the existence of a God is exceedingly low.

¹⁵ Ibid., note 13, p. 177.

¹⁶ See McLuhan and Powers (1989) for more detailed discussion of the concept of 'figure' and 'ground.'

2) An ontology of complementarity as opposed to dualism, and a view of the ontological status of humanity and all its cultural manifestations as inextricably interlinked to the whole universe through consciousness.

3) An epistemology approaching my understanding of Habermas' Historical-Hermeneutic and Critical-Emancipatory nature. As Wallace points out, few of us can effectively or practically ask the kind of ultimate questions posed by Habermas about life's purpose and the nature of reality on a daily basis, but there are pragmatic and philosophical reasons for regarding the comprehensive scope of Habermas' theory as a standard against which to judge the adequacy of our understanding of society.¹⁷

¹⁷ Wallace Iain, unpublished manuscript (1987) Carleton University.

CONCLUSION:

In my opening hypothesis, I argued that territoriality in humans is an evolutionary phenomenon in the Darwinian sense of the word and that it is also an informational phenomenon in that it only exists if there has been a transfer of information across boundaries. In chapter one, I developed the argument that Soja and Sack specifically, as geographers writing on human territoriality, seem to operate from an ontological perspective which, based on the possession of distinct consciousness or intellect, sets humanity apart from the rest of the animal world and indeed from the biological environment within which humanity, as a distinct phenomenon, exists. I then outlined the perspective of Teilhard de Chardin of a single entity in the universe called life, which must be understood from an evolutionary point of view and which is composed of two complementary, organic energies. The next three chapters in the thesis have attempted to trace the recent developments in physics, biology and information theory and the impact of these developments on the presuppositional hierarchies of the so-called natural and social sciences, with particular emphasis on the concept of complementarity and the ontological status of humanity as separate and distinct. In this closing chapter, I hope to address specific points of difference

between the perspectives of various authors raised in the earlier chapters and spell out in detail why I feel it important that the evolutionary nature of all cognitive phenomena be understood and recognized ontologically. I will also attempt to outline some of the implications of such recognition on our understanding of human geography in general and human territoriality specifically. As Thompson has observed: "Ideology is to the mind what excrement is to the body: the exhausted remains of once living ideas."¹ Although the above quotation is open to some debate as to the biological accuracy of the implied non-living nature of excrement, the concept is one which I find to be very apt to this discussion of presuppositional hierarchies and the world views derived from them.

A world is not an ideology, nor a scientific institution, nor is it even a system of ideologies; rather, it would seem from the perspective of modern physics and biology to be a structure of conscious relations and symbiotic processes. "Nature" is neither a place nor a state of being; it is a human abstraction that we set up through cultural activities and evolution. We then use this abstraction to justify those very cultural activities as "natural".

Drexler, in a far-ranging discussion on mental evolution, described by Dawkins as memic evolution, points out how

¹ Thompson (1987), p. 209.

parasites have forced organisms to evolve immune systems.² He suggests that parasitic memes have forced minds down a similar path, evolving meme systems that serve as mental immune systems.

The oldest and the simplest mental immune system simply commands "believe the old - reject the new". Something like this system generally kept tribes from abandoning old, tested ways in favor of wild new notions, such as the notion that obeying alleged ghostly orders to destroy all of a tribe's cattle and grain would somehow bring forth a miraculous abundance of food and armies of ancestors to drive out foreigners.³

The body's immune system follows a similar rule: it generally accepts all the cell types present in early life and rejects new types such as potential cancer cells and invading bacteria, as foreign and dangerous. This simple 'reject the new' system once worked well, yet in this era of organ transplantation it can kill. Similarly, in an era when science and technology regularly present facts that are both new and trustworthy, a rigid mental immune system becomes a dangerous handicap. Much of the history of philosophy and science may be seen as a search for better mental immune

² Drexler (1986), Engines of Creation.

³ Ibid., p. 137. Drexler cites the effect of such a belief on the Xhosa people of southern Africa in 1856 when 68000 people died, chiefly of starvation.

systems, for better ways to reject the false, the worthless and the damaging. The best systems respect tradition, yet encourage experiment. They suggest standards for judging memes, helping the mind to distinguish between parasites and tools.

One of the central tenets of this thesis is that principles of evolution provide a way to view change, whether in molecules, organisms, technologies, minds or cultures. The same basic questions keep arising: What are the replicators? How do they vary? What determines their success? How do they defend against invaders?

Habermas⁴ suggests that, above all in biology, an organism is easily demarcated from its environment and the state in which it maintains itself can be characterized in terms of the necessary processes with specifiable tolerances. He suggests that the same cannot be said for social systems. As has been pointed out above, modern evolutionary thinking suggests that most biological species, at the macro level at which we tend to perceive them, are in fact colonies or societies of genes or other self replicating units of life and that evolution occurs at the level of the smallest unit of life, not, except by extension, at the macro level at which we tend to perceive. The central question is - where or at what level of time and space (perceptual size) does

⁴ Habermas (1979), pp 170-177.

the action take place, and how is such action translated or communicated throughout the network of units which comprise the whole (organism or societal unit)?

Habermas has developed, or is developing, what he calls a critical theory of society, a 'theoretically generalized history' or 'general interpretation' which reflectively grasps the formative process of society as a whole, reconstructing the contemporary situation with a view not only to its past but to its anticipated future. Habermas believes strongly that the normative theoretical foundations of critical theory would have to be sought in that distinctive and pervasive medium of life at the human level, language.

What raises us out of nature is the only thing whose nature we can know: language. Through its structure, autonomy and responsibility are posited for us. Our first sentence expresses unequivocally the intention of universal and unconstrained consensus. Autonomy and responsibility together, comprise the only idea we possess a priori in the sense of philosophical tradition⁵

Habermas is attempting to work out a unified framework in which the different dimensions of human development are not only analytically distinguished but in which their interconnections are also systematically taken into account. Beyond this, the empirical mechanisms and boundary conditions of development have to be specified. The general

⁵ Ibid., p. xvii.

outlines of his approach suggest that he adopts a competence-development approach to the foundation of social action theory; the basic task is the rational reconstruction of universal, "species wide", competences and the demonstration that each of them is acquired in an irreversible series of distinct and increasingly complex stages that can be hierarchically ordered in a developmental logic.

Habermas suggests that there are four basic dimensions in which communication can succeed or fail: comprehensibility, truth, rightness, and truthfulness. Each of these specifies not only an aspect of rationality, but a "region of reality" - language, external nature, society, internal nature - in relation to which the subject can become increasingly autonomous. Thus ontogenesis may well be construed as an interdependent process of linguistic, cognitive, interactive and ego (or self) development. The ontogenesis of the ego is not a development separable from the others but a process that runs complementary to them: the ego develops in and through the integration of "internal nature" into the structure of language, thought and action. Any general theory of ego development would have to integrate an account of the interdependent development of cognitive, linguistic,

and interactive development with an account of affective and motivational development.⁶

As with much of Habermas' thinking, I find much to agree with in the above analysis of historical materialism. His recognition of the role of informational transfer across the boundaries of cognitive domains in the role of ego or identity development has a great deal in common with current biological and information theorists, but he still draws an ontological line at the point that "raises us out of nature". From my perspective, this ontological bias severely limits the ultimate value of his analysis, which otherwise serves as a significant bridge between the world views of current evolutionary theorists and most social theorists.

As outlined in my introduction, Teilhard de Chardin believed that man, in his totality, was an evolutionary phenomenon and that the process of evolution of consciousness had reached a major point of transition in humanity with the development of self-consciousness. Habermas suggests that one can find homologous structures of consciousness in the histories of the individual and species. He suggests three domains of comparison: rationality structures in ego development and in the evolution of world views; the development of moral consciousness and the evolution of

⁶ Ibid., Chapter Four, pp. 130-177 for detailed discussion of these concepts.

moral and religious representations. This observation, with which I would agree, leads to some interesting observations by Panikkar on the structure of human time consciousness and the role of humanity in evolution.

If man is essentially self-conscious, Panikkar argues that in order to understand what man is we must take into account all that human beings have understood themselves to be.⁷ The object 'Man' of the study of Man also embraces the subject 'Man' who undertakes the study. But this man is not only I or we, the investigators, it is everybody. Man reveals himself not only in thinking but in doing. The peculiar nature of the human being also consists in the who that thinks and does, besides the what that is thought and done.

Panikkar suggests that this constitutes the fundamental distinction between the so-called 'natural', or physical sciences and philosophical anthropology, or the humanities. The former intend to know the objects, however modified by and dependent on the investigators: the latter seek to understand the subjects, even if incompletely covered by the investigation. When 'science' studies man it wants to know the object man: what man is. When philosophy studies man it wants to understand the subject man: who man is and even who I, a human, am and you are. The epistemological paradigm of the natural sciences is: "S is P." It strives to find the P

⁷ See Panikkar R. "The end of History" in King et al (1983).

fitting to S. The epistemological paradigm of at least some philosophy is: What am I? so that it may also answer "What you are," and be able to formulate "who man is".

Between the cosmic yardstick of a Teilhard de Chardin, comprising hundreds of thousands of years, on the one hand, and the journalistic vision of just days or weeks, the sociological perspective of decades or the historical perspective of some centuries, lies the astrological meter of the earth's rhythm. An individual's needs for food cannot be dealt with on a yearly or even weekly basis; it is a daily concern. Politics cannot bypass or ignore the situation of the generation actually living within the political entity. Historians have a wider span, natural scientists another, and philosophers would tend to further enlarge their perspective and somehow generate theories or opinions which are valid for the human species as such.

Yet there is an intermediate span which has all too often been neglected, according to Panikkar, because it needs different scales and yardsticks. There are problems too small to be measured by physical or biological laws, and too big to be treated in merely sociological categories.

Panikkar suggests that perhaps this should be called the astrological scale. This scale is precisely defined by the magnitude of those phenomena which relate to Man as homo

sapiens and to the solar system within the more comprehensive rhythms of our galactic system.

The problem here is differentiating between humanity as temporal beings, as distinct from humans as historical beings. Panikkar, in agreement with Habermas and Kaftos and Nadeau, suggests that the true yardstick is language. Historical studies have to limit themselves to written documents and prehistorical research concentrates on human tools. Language is perhaps the human metron par excellence. We must examine human consciousness of the last twenty thousand years at least and human memory of the six thousand elapsed historical years.

Panikkar defines three moments of human time consciousness: Pre-historical, Historical, and Post Historical, and he emphasizes that they must not be interpreted as being chronological. They are qualitatively different and yet intertwined, coexisting in one way or another, in the human race and the human person as well. They are neither mutually exclusive nor diametrically opposed, but 'kairologically' related. He defines this term as the qualitative aspect of human time which represents at once the dominance of one mode over the others, according to idiosyncrasies of all sorts, and a certain sequence which accords with the unfolding of individual and especially collective life. Speaking within the historical myth, history must be the

central point of reference - pre-historical, historical, and trans-historical. These three moments not only form a triad in our own individual lives, they are also, according to Panikkar, analogously present in the collective unfolding of human existence, although in any given culture and from a sociological viewpoint one of them may predominate over the others.

The background of prehistorical man is the theocosmos: He finds himself in friendship and confrontation with the numina, the natural and divine forces. His scenario is the divinized cosmos. He lives mainly turned toward the past. He worships his ancestors. The horizon of historical man is history. He finds himself in collaboration and struggle with human society of the past, present and future. His world is the human world. He lives mainly turned toward the future. He worships the God that shall be. The emerging myth of trans-historical Man assumes a more or less conscious theanthropocosmic vision of the universe: He finds himself in varying degrees of harmony and tension, within a cosmotheadric reality in which the forces of the universe - from electromagnetic to divine, from angelic to human - are intertwined. He lives mainly in the present. He is very cautious about worshipping. If at all, he would reverence the intersection of past and future, of the divine and human.

Historical consciousness reached its maturity with the growth of Modern Western Science although its origins are much more ancient. Historical consciousness has overcome the fear of nature. The meaning of life is not to be found in the cosmic cycle but in the human one, in society, which is a human creation. Justice is the supreme principle - which does not mean that it has been achieved. Nor has historical consciousness gained all the hearts and minds of our contemporaries.

If the discovery of script could be said to have been the decisive break between historical and nonhistorical consciousness, the corresponding event which opens up the post-historical period is the discovery or invention of the internal self-destructive power of the atom. So powerful is its nature that it ceased to be what it had purported to be - indestructible. It has ceased to be atomos, indivisible, ultimately simple and in a certain sense, everlasting. The splitting of the atom also exploded historical consciousness. The atom stood for the consistency of things held to be permanent and thus reliable. The atom corresponded to the old idea of substance. If nothing "sub-stands" anything, historical consciousness is at a loss. There is no platform, no beginning from which anything can unfold and upon which can be accumulated being, experience, energies. Elementary particles and their interactions with energy seemed immutable, but this is now put in question. If

the acme of historical consciousness is tied not only to the Judaeo-Christian-Islamic tradition but also to Western dominance over the entire planet, even if the name for such dominance is Science and Technology, this change may well represent the end of the Western period of humanity, according to Panikkar. The grandeur of the idealistic view of history, of a Schelling calling history the "eternal poem of the divine Reason", or Hegel's identification of History with Reason, or Marx's of Man as history, all this comes to an end.⁸

Contemporary technological-paneconomic ideology is intrinsically connected both with historical consciousness and with the specific character such consciousness has taken in the Judaeo-Christian-Islamic-Marxist-Western world. The Western roots of modern Science have been sufficiently studied and this is equally the case with technology, which could only be what it is with the collaboration of the present economic system of the West. The entire predominant system today presupposes not only a certain epistemology and anthropology linked with the emerging new cosmology, but ultimately a whole ontology.

As both symptoms of the crisis of historical civilization and attempts to find a way out, there are today all over the world, movements for Peace, Non-violence, Return to the

⁸ Ibid., see notes 1,2,3, p. 104.

Earth, Environmentalism, Disarmament etc. Most of these point to a trans-historical consciousness in Panikkar's view. We are perhaps witnessing the passage from Monotheism to Trinity. From the monotheistic worldview to a Trinitarian vision. It is the overcoming of dualism by a non dualistic view of reality; a middle path between the 'Scylla of Dualism' and the 'Charybdis of Monism' - the sacredness of the secular - the sense that being and time are inextricably connected. Time is experienced as a constitutive dimension of being; there is no atemporal being. Sacred secularity is an expression meaning that this very secularity is inserted in a reality that is not exhausted by its temporality. Being is temporal but it is more and other than this.

Cosmotheandricism is the experience of the equally irreducible character of the divine, the human and the cosmic (freedom, consciousness and matter), so that reality - being one - cannot be reduced to a single principle.⁹

Panikkar maintains that if we take pluralism not as a political strategy but as a word representing the ultimate structure of reality, we shall have to overcome the assumption of a single human pattern of intelligibility. It may be that there is only one scheme of intelligibility, but we cannot postulate it a priori. It may also be that there is a peculiar awareness of dimensions of reality which

⁹ Ibid., pp 110-112.

simply does not fit into current categories of intelligibility.

Soja and Sack, and to a lesser degree Harvey, describe the modern world-system in terms of territorially based nation-states.¹⁰ They see boundaries as defining containers of culture and identity and they emphasize the role of boundaries in controlling access to scarce resources both from within and without. The theories of Teilhard de Chardin on the Unity of Knowledge, however, substantiated by the range of biologists, physicists, chemists, and sociologists whose current theories, as discussed in this thesis, appear to support Teilhard's basic theory, present us with the world as an evolving, organic senscient network whose internal organs are bounded by permeable membranes, and in the life of a membrane, negation can be a form of emphasis.

Culture, whether at the level of molecules or civilizations, structures itself around differences that generate organs and organizations; it organizes itself by energizing differences. Create a condition of sameness, and immediately differentiation among the same will develop, whether we are talking about speakers of a language or members of a single religion or political party.

¹⁰ See Harvey (1989) and chapter 1 of this thesis.

The conscious purpose of a society, expressed in its socio-economic policies, has very little knowledge of its biological life within an environment. A society does not know what it is doing, or, in other words, its political interpretation of life is less than its full existence in an ecology. All that is left over when the conscious interpretation of activity is subtracted constitutes the virtual existence of the organism embedded in the environment. This unconscious transformational activity at the membrane between the organism and the environment, McLuhan's "resonating interval,"¹¹ was, for Gregory Bateson,¹² the expression of a kind of Mind. The nervous system in Bateson's descriptions only reports on its products and not its processes; similarly, society only reports on its industrial and cultural products and not on the condition of its ecological processes.

The new language of biology and evolution is not atomistic and hard but speaks rather of "connectionism", of neural nets, distributive lattices, and a metadynamic in which the global behaviour of a system shows learning and emergent properties and new cognitive domains. If one imagines oneself to be an object in a container, then one will invest one's identity in containers, be they cars, houses, banks or

¹¹ See McLuhan and Powers (1989).

¹² See chapter 3 of this thesis for discussion of Bateson, also Bateson (1972) Steps to an Ecology of Mind, pp. 440-448.

nation-states. One will also see most relationships which touch one's boundaries as threatening infringements on that identity. If, on the other hand, one sees oneself as a process, a cloud in the sky or an algal mat in the sea, then other clouds or waves that share the dynamic of one's emergence will not be seen as threats.

A planet, a brain, and a cell cannot be fully described as objects in Euclidian space, be they continents in a biosphere or genes within a molecule: rather, they have to be re-envisioned as dynamic processes emanating their own phase space. The endosymbionts of Lynn Margulis (1981) share a constructive process and not simply a containing space. Their space in the cell is a state-space, or phase-space, and the multiple dimensions of the phenomenon tell us that it is the dynamic that is critical, and not simply the space. The organ of this dynamic is a membrane, a chemical language, and not a wall.

As Thompson (1991) observes, as we begin to appreciate the complex membrane dynamics of cultural ecologies, we shall perhaps begin to move away from the concept of the state as container or a piece of turf to the idea of the noetic polity, a symbiotic process in which groups constellate cognitive domains that encourage us to wonder about the pattern that connects the economy to the ecology, the

universe to the university.¹³ Neither the planet nor the organism, the macrocosm nor the microcosm, are contained things, but constructive processes. They are flows of time: rivers directed by the banks they sculpt to bring forth an evolutionary landscape. Biologists are looking at the origins of our planetary atmosphere above us in the air, the origins of cellular life below us in the sea, and the origins of the neural networks within the brain, and beginning to tell us that the old world view of objects in containing space, or organisms in constraining niches, simply will not tell us what we need to know about where we are now in time and space.

Thompson suggests that this problem of the little and the large is not simply a metaphor, but a way of perceiving the architecture of the world. It is certainly the essential political problem of this moment in history and concepts of "territorial sovereignty" from the past will not help us to resolve what are more complex metabolic processes of identity for cultural organelles within a global, electronic, noetic polity.¹⁴

If one accepts this vision of symbiosis and cell evolution, then one can re-imagine the Middle East and all of Europe, as the Palestinians, Lithuanians, Basques and the Armenians

¹³ Thompson (1991), p. 257.

¹⁴ Ibid., p. 259.

take on a new dynamic in a new phase-space. The little requires the large, but sometimes this means that as things become smaller, the old large is no longer large enough. If you are a chloroplast, you require light; if you are a Lithuanian, you require not the large Soviet Union but the larger envelopment of European civilization.

In the giantism that characterizes vanishing forms, from dinosaurs to totem poles or sailing ships, the gigantic nation-state, with its identity based upon turf, is on its way out. The center and periphery structures of empire, American or Russian, are unable to hold territorial identities in the chaos dynamics of a planetary flow of electronic information. Post-industrial capitalism, in shifting from British industrial centralism to electronic polycentralism in Massachusetts, California and Japan, became much more expressive of dynamical states of "self-organization from noise". Both the centralizing empire and the industrial nation-state are dissolving; the endosymbiotics for the planetary cell are not the territorial state but the organelles that produce identity, the cultural biome.

I closed my introduction to this thesis with a quotation from Eagleton,¹⁵ suggesting that post-modernism requires the jettisoning by science and philosophy of their grandiose

¹⁵ See p. 13 of introduction.

metaphysical claims. The arguments presented in the previous chapters have, I hope, outlined why these 'grandiose metaphysical claims' have been a limiting and distorting burden on both science and sociology. I have attempted in the process to lay out logical arguments as to why we must change our point of view of humans and humanity, along with all other entities or phenomena, from externally instructed units with an independent environment linked to a privileged observer, to autonomous units with an environment whose features are inseparable from the history of coupling with those units, and thus with no privileged perspective - cognitive mechanisms by which unities can endow a world with a sense through their structure and history of interactions.

I have argued that to achieve this, two crucial changes in emphasis are required. The first is putting emphasis on the way autonomous units operate. Autonomy means here that the unit described (be it a cell, a nervous system, an organism, or a human socio-economic or territorial grouping) is studied from the perspective of the way in which it stands out from a background through its internal inter-connectedness.

The second change is putting the emphasis on the way autonomous units transform. Transformation means that natural drift becomes possible due to the plasticity of the

unit's structure.¹⁶ In this drift, adaptation is an invariant. Natural drift applies to phylogenic evolution as well as to learning, depending on the unit being considered (a brain in one case; a population in the other).

Biology, I suggest, is the source of most metaphors in current thinking, and such metaphors as Bateson's syllogism of grass¹⁷ express the possibility of a world view beyond the split between us and it, where knowledge and its world are as inseparable as the inseparability between perception and action.

In territoriality theory, De Certeau treats social spaces as quite open to human creativity and action.¹⁸ Walking, he suggests defines a 'space of enunciation'. Footsteps in a city, he suggests, by their swarming paths give their shape to spaces. They weave places together, and so create a city through daily activities and movements. He points out that footsteps are not localized, rather that they spatialize. This concept of nodes of activity linked by inter-nodal pathways or cross boundary communication has been dealt with at some depth by Soja, Sack, Harvey and (locally) by David Knight (1982) but I propose that their presuppositional hierarchy has limited their perceptions with respect to the

¹⁶ See Varela (1987), "Laying Down a Path" in Thompson (1987), p. 50.

¹⁷ See p. 59, chapter 3 of this thesis.

¹⁸ De Certeau as outlined in Harvey (1989). p. 213.

complementary role of humanity and its environment: "What we do is what we know, and ours is but one of many possible worlds." ¹⁹

Wanderer, the road is your
footsteps, nothing else;
wanderer, there is no pain,
you lay down a path in
walking.
In walking you lay down a
path
and when turning around
you see the road you'll
never step on again.
Wanderer, path there is none,
only tracks on ocean foam.²⁰

¹⁹ Varella, Francisco (1987).

²⁰ Antonio Machada as quoted in Varella (1987).

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