GENETIC EPISTEMOLOGY AND THE SOCIOLOGY OF KNOWLEDGE

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A C K N O W L E D G E M E N T S

While it does not do them justice, this work is nevertheless a distillation of the creations of millions of human minds over thousands of years. The struggles and labours of the human species as a whole and those of specific individuals are readily and gratefully acknowledged.

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Ph D Dissertation
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DISSERTATION ABSTRACT

This study originates in certain shortcomings in the sociology of knowledge and in sociological theory generally. Among such shortcomings are: an unnecessarily restricted conception of knowledge, the neglect of contemporary findings in biology and psychology, and the oversocialized conception of humankind and knowledge. The study aims to correct certain of these shortcomings through (1) redefining knowledge and (2) developing part of a comprehensive theory of knowledge which unites the biology of knowledge, the psychology of knowledge and the sociology of knowledge.

Piaget's genetic epistemology and Popper's and Lorenz's evolutionary epistemology provide much of the material which inspired this study and which is developed in it. It is argued that the sociology of knowledge has not yet seriously encountered these disciplines and would benefit from such an encounter. Ethology, developmental psychology, cybernetics, and anthropology are other sources of information used. Knowledge is defined as assimilated information. It is argued that knowledge is assimilated in three basic contexts: that of the species, the individual organism, and the collectivity. These yield, respectively, innate knowledge, learnt knowledge, and social knowledge. Knowledge, thus, is viewed as evolving phylogenetically, ontogenetically, and sociogenetically.

Various theses are proposed and arguments and facts supporting them presented in the course of developing the

theory of knowledge. The following are among the theses proposed: Life is a knowledge process. Human knowledge and knowledge processes can be illuminated by studying the intellectual development of animals and children. Human knowledge and reality are biologically, psychologically, and sociologically constructed. All humans are born with an innate learning schema. This schema is responsible for human life and culture. It plays an important part in determining the pattern and content of culture. Truth is, in part, biologically determined. Society depends on many forms of non-social knowledge. The understanding of culture requires an understanding of the varieties and forms of non-social knowledge which make culture possible.

The study constitutes a contribution to knowledge in various ways. Rather than considering the relationship between biology and behaviour as is customary, this study considers the relationship between biology and knowledge. Certain new concepts are introduced and a theory of knowledge is outlined which integrates the biology of knowledge, the psychology of knowledge and the sociology of knowledge. The study demonstrates that humankind's biological nature plays a vital role in socialization and in the production of culture. It thus serves to correct oversocialized views of humankind. The study reveals that reality is phylogenetically, ontogenetically and sociogenetically constructed; it is the result of the evolution and operation of biological, psychological and sociological factors.

C O N T E N T S

CHAPTER ONE

THE ORIGIN AND PURPOSE OF THIS STUDY

> ... underlying the veneer of cultural differences there is a primordial humanity that must be accounted for as well as respected.
>
> Robert Murphy (1972:v)

Introduction

This study originates in certain problems I encountered in trying to develop a sociological theory of religious knowledge. My reading led me to the realization that there were certain shortcomings in the sociology of knowledge and in sociological theory generally that seriously hindered the formulation of a naturalistic theory of religious knowledge, such as the one I was aiming at. The general deprecation of the search for "origins" was one such matter. Another was conceptual. Various definitions of knowledge are employed by sociologists of knowledge, some of these, following logical positivism, render the phrase "religious knowledge" self contradicting. Other definitions, such as that proposed by Berger and Luckmann (1967), are imprecise because only certain religious "beliefs" -- those that "pass" for knowledge in society -- qualify as religious "knowledge". Other shortcomings stem from such things as the neglect of biology and psychology, a seriously flawed theory of socialization and learning, and a seemingly unbridgeable gap between the micro and macro approaches in the sociology of knowledge. These and other shortcomings indicated that in order to write the kind of sociology of religious knowledge I wished to write, it would first be necessary to investigate and hopefully correct certain of these shortcomings.

The overphilosophized conception of knowledge

Since philosophy is the parent of the sciences, it is to philosophy that one must turn if one is to understand something of the peculiar nature of the actual subject matter of the sociology of knowledge as widely practised. As one soon discovers, the sociology of knowledge is not concerned with all that operates as knowledge in society. Rather, it concerns itself with an unnecessarily restricted range of knowledge and in this way actually hinders the proper understanding of the relationship between knowledge and society. Philosophy is partly responsible for this state of affairs.

It can be said of philosophy that as a result initially of ignorance and more lately of neglect of the biological, psychological and sociological aspects of knowledge it has produced and for a long time been hamstrung by an overphilosophized conception of knowledge. Probably the most overphilosophized conception of all is the Platonic one which views knowledge as something beyond human existence, society and history. According to Stark (1971:328) this conception maintains that, "Truths are not found and fashioned by human societies, but subsist, forever unchangeable, in a supernatural realm of their own. They are, as it were, laid up in heaven, and to lay hold on truth here below means to participate in the truths that lie above." Narrow as this conception is, it has been given an even narrower focus in most philosophy. In the main, only a relatively small number of the things which have served, or which serve, as justified, or justifiable, true belief in the lives of individuals, in society or in history have received the attention of philosophers.

It was dissatisfaction within philosophy with its overphilosophized conception of knowledge which gave rise to the sociology of knowledge. It is possible to appreciate the somewhat peculiar development and subject matter of the sociology of knowledge if one bears in mind, as Berger and Luckmann (1967:15-16) suggest, that the study emerged at a particular time in a particular place and academic context. The time was 1920, the place was Germany and the context was philosophy. (Appreciating these details is itself an

exercise in the sociology of knowledge.) What arose in this context was a tradition of thought with deep roots in German philosophy and early theoretical sociology. It marked an important stage in the philosophical discovery of the profound influence which society has on knowledge. The discovery of this influence dates back to the ancient Greeks (at least). That is, to such sociological insights as that arrived at by Zenophones who, in the sixth century BC cynically remarked that if horses and cattle could sculpt they would represent their Gods in bovine and equestrian forms. Despite the early discovery of the impact of society on knowledge, however, it was only in the nineteenth century AD that philosophy began to reorientate itself in order to accommodate the massive significance of the social factor in thought and knowledge. So significant did this factor appear to scholars such as Wilhelm Jerusalem, Max Scheler and Karl Mannheim that they helped establish and nurture a discipline whose central task was to investigate it. Of the early sociology theorists it is Marx who has remained most central to the sociology of knowledge. He, together with Scheler and Mannheim are still the key figures of the subject. Others who have had an influence are Max Weber and such French thinkers as Emile Durkheim, Gustav Le Bon and Lucien Levy-Bruhl. The thought of Americans such as John Dewey, Charles Horton Cooley, William James, George Herbert Mead and Florian Znaniecki have also had some influence but in the main their thought has remained peripheral and poorly integrated. Of all these writers, as Abercrombie (1980:1) has stated, it is undoubtedly Mannheim who has been and remains the most central figure.

Since the sociology of knowledge emerged out of philosophy it was inevitable that it inherited the overphilosophized conceptions of knowledge of its parent discipline. It was not inevitable that it would remain tied to this conception. Unfortunately, it has. On the positive side, the sociology of knowledge has, at least, achieved some measure of "socialization" of this narrow and elitist conception and its influence has spread to cultural studies and the history of ideas in general so that paths are open

for it to fulfill its proper mandate.

The sociology of knowledge

The central and traditional argument of the sociology of knowledge is that cultural phenomena, which naturally includes knowledge, are interconnected with social phenomena. It propagates the doctrine, in the words of Grunwald (1970: 187) of the "connectedness of knowledge and social being", or, as Mannheim (1952:237) expresses it, "the sociology of knowledge seeks to analyse the relationship between knowledge and existence". The exact nature of the relationship between knowledge and social phenomena is a matter of considerable dispute despite its centrality to the sociology of knowledge. The polar positions are occupied by Max Scheler on the one hand and certain Marxists on the other. Scheler held the view that thought determined social structure (Stark 1971:34) while some Marxists, though not Marx himself, see the relationship between social structure and knowledge as deterministic and largely uni-directional. For the later group, social factors, especially economic factors, are largely responsible for the development and the content of human thought. Their arguments hark back to Marx's famous formula, "It is not the consciousness of men that determines their existence, but, on the contrary, their social existence which determines their consciousness." (Marx 1904:12.)

The bulk of writers on the sociology of knowledge, however, both Marxist and non-Marxist, view the relationship more in terms of a dialectical process. Among the non-Marxist's just referred to are Max Weber and his followers, who prefer to view the relationship between knowledge and social factors as a reciprocal interactive process. According to Gerth and Mills (1970:62), "Weber refused to conceive of ideas as being 'mere' reflections of social interests." His studies led him to the view that the constituents of reality, material and ideational, were to some extent autonomous. Weber took pains to show that ideas have a profound effect on the course of history and the structure of society. He did this in order to counter the arguments of those, like the Marxists referred to, who saw

the correspondence between ideas and social factors as overly deterministic and neatly isomorphic. In cases where material interests, social formations, and ideas happened to coincide, Weber chose to speak of "elective affinities" (Weber 1970:284-285). The idea of elective affinities reveals his predilection for a non-deterministic view of the relationship between social structure and knowledge and at the same time avoids the difficulties which lead Marxist theorists to speak of "false consciousness" in cases in which there occurs a disjuncture between ideas and social structure. The notion of "elective affinities" as it is used in dealing with the issue of social determinism asserts, according to Stark (1971:328), "that societies and social movements do not create their own philosophical traditions, but select them from a range of pre-existent and independent 'ideas'".

It is by now axiomatic in the sociology of knowledge that those things which pass for knowledge in society do not remain the same. And, what is more significant, the criteria according to which truth and falsity are socially determined do not remain constant. As Mannheim (1952:259) states:

> The concept truth has not remained constant through time, but has been involved in the process of historical change ... The very principles, in the light of which knowledge is to be criticized, are themselves found to be socially and historically conditioned. Hence, their application appears to be limited to given periods and the particular type of knowledge then present.

According to the dominant view in the sociology of knowledge, no proposition concerning social reality is true in the absolute sense of the word. There are thus those like Mannheim (1972) who prefer to regard all notions of social reality as "ideological" since truth or knowledge of such matters is impossible. The role of social factors in determining the "truth" of propositions about natural and physical phenomena have in recent years been extensively debated (see, for example, Kuhn 1970; Lakatos and Musgrave 1970; Sklair 1973; Barnes 1977). These and earlier debates convincingly propagate the view that knowledge is a

collective human enterprise. Knowledge is socially determined; what passes for knowledge is, in the final analysis, what humans permit to pass for knowledge. This applies as much to the knowledge of the natural and physical as to the knowledge of humankind, society and history.

Berger and Luckmann, two important exponents of the phenomenological variant of the sociology of knowledge define knowledge as "everything that passes for 'knowledge' in society" (1967:26). Knowledge, they write implies the "certainty" that the objects known "are real and that they possess specific characteristics" (1967:13). Berger and Luckmann see their conceptualization as falling somewhere between that of the man in the street and that of the philosopher. If we hold in mind the epistemological position of the positivist on the one hand and the solopsistic one of the man in the street on the other, we can appreciate the sentiment behind this conceptualization. The philosopher's conception omits too much which genuinely passes for and operates as knowledge in society while the idiosyncratic nature of the facts and truths of the man in the street, if taken seriously, would produce a conception of knowledge which would have to include even the deluded musings of a madman. For Berger and Luckmann, and for sociologists of knowledge generally, for anything to pass for knowledge in society it must enjoy a modicum of collective support. But exactly how extensive this collective support must be, and who or what can be used to arbitrate as to what exactly qualifies as knowledge in any instance is a question which Berger and Luckmann avoid dealing with. They are primarily concerned with how human knowledge, as they understand the term, is developed, transmitted and maintained in social situations (Berger and Luckmann 1967:15).

Unlike Berger and Luckmann, however, a number of sociologists of knowledge have dealt with this question. Stark (1971:316), as one example, defined knowledge as thought which is judged to be realistic, fact-determined, and truthful in terms of the societal axiological system. In other words, the ideas encountered in a group, society or historical period may be classified as knowledge or not in

terms of the axiological system operative in that group, society or historical period. According to Stark and others who adopt this approach, each group, society or historical period has its own axiological system by means of which it is able to distinguish knowledge from that which is not knowledge. The axiological system may be defined as a complex evaluative and interpretative schema developed by society in the course of time and used, amongst other things, for ascribing an epistemological status to ideas to which this is applicable. The axiological system constitutes a social A PRIORI and is the "value system", as Stark (1971: 107) sees it, "of the society in which the historian, the seeker after human knowledge, lives". The axiological system, so to speak, lives in the collective consciousness and is always prior and external to the individual. Those who wish to determine what constitutes knowledge in their own or any other society can only do so through the appropriate axiological system. This implies, for historical and foreign societies, that the investigator has to construct or re-construct the societal axiological system before he can state whether a particular idea or set of ideas qualifies as knowledge in that society. Insofar as the world is viewed objectively through the relevant societal axiological system it is possible to speak of truth, that is, knowledge. Each society and each age has, as a consequence of this approach, its own truths no matter how inconsistent and contradictory these may appear when viewed cross-culturally and trans-historically. As paradigms shift, as axiological systems undergo change, different truths become manifest and correspond to reality. Stark (1971:323) sums up this approach with the words, "Whatever operates or functions as the truth within a certain social order at a given time, that <u>is</u> the truth."

Within the sociology of knowledge there exists a split between those who accept both axiomatically harmonious cognitive thought as well as axiomatically harmonious evaluative thought as knowledge, and those who accept only axiomatically harmonious cognitive thought as knowledge. This latter group is thus concerned in separating "knowledge"

and "belief" (in the more traditional sense of these words) whereas the former conflate these two concepts, erecting in their steads the dichotomy "knowledge" and "ideology". According to Hamilton (1974:VIII), positivism has played an important role in the development of the approach within the sociology of knowledge and sociology generally which separates "knowledge" and "belief". This "approach assumes," as Hamilton (1974:VIII) expresses it, "that a complete distinction can be made between that which is to count as valid knowledge (according to the empiricist model), on the one hand, and that which is to be counted as value judgements, normative statements, or simply beliefs, on the other."

The sociology of knowledge, since it argues that the ideas of every individual in society are to some extent distorted by their social position, creates by this fundamental insight a further obstacle in the path to the attainment of its own objective. For if no-one is able to truthfully judge what qualifies for knowledge in society, a sociology of knowledge is not possible but only a sociology of belief or ideology. This obstacle has been dealt with in various ways. Some scholars do actually accept the obstacle as insurmountable and are thus content to regard their activity as the sociology of belief or the sociology of ideology. Others, like many Marxists, regard a particular class of individuals and their enlightened spokesmen as competent to determine what qualifies as knowledge and what does not. This class is usually the proletariat and the spokesmen those intellectuals who identify and align themselves with the proletariat. The reason for this is that only through adopting in imagination the social relations and the perspective of the proletariat can an undistorted view of social reality be achieved.

Mannheim (1972), while accepting the thesis that every individual's perspective on social reality is socially and situationally determined and would thus distort their view of the whole, argued nevertheless in favour of the capacity of certain individuals to rise above their limiting and socially given positions. As Mannheim argues, a cadre of free floating intellectuals by adopting a detached but

extremely enlightened perspective is able to synthesize "ideological" perspectives, and via this process achieve objective knowledge. (See also Simonds 1978.)

Arguing from within a different theoretical framework to that of Mannheim, Goldmann (1969) nevertheless presents a similar point of view on this issue. Goldmann feels that it is possible for some individuals to transcend the influences of their class and even go beyond the boundaries of the classes existing in their time. These individuals achieve knowledge through their eclecticism and ability to synthesize the partial truths which the limited perspective of each class possesses at any time. In this way they produce new and more extensive elements of understanding and come as close to the production of knowledge as is humanly possible.

Max Scheler employed two almost contradictory conceptions of knowledge. The first reflecting his religious tendencies, was Platonic in that it posited an absolute and deistic realm of truth. The second, focusing on the mundane world, and reflecting his philosophical and sociological tendencies, identified the thought of the educated elite as knowledge. Naturally, the latter being grounded in this world was regarded by him as inferior, partial, variable, and a limited image of the truths of the transcendent realm beyond (see Stark 1971; Hamilton 1974; Remmling 1973; Scheler 1980). Scheler's 'terrestial' conception of knowledge as the thought of the educated elite locates him within the above group of thinkers. Taken together, the claims of these thinkers have, as Stark (1971:318) suggests, "... a rather aristocratic complexion: truth is not for all, but only for some, not for the weak, but only for the strong -- according to Nietzche for the superman, according to Pareto for the super-scientist". And, we might add in summary, according to Mannheim and Goldmann, knowledge is only for the free-floating intellectual; according to the Marxists it is only for the spokesmen of the proletariat; and according to Scheler it is only for the educated elite.

The foregoing resume is intended to convey some impression of the major concerns and ideas found in traditional sociology of knowledge. It also, hopefully,

conveys an impression of what is neglected or distorted as a result of the theories developed in this field. It is to such shortcomings that we now turn.

Some shortcomings of the sociology of knowledge

In the infancy of the discipline he helped establish, Max Scheler (1874-1928) urged that the sociology of knowledge develop and maintain an intimate link with developmental psychology. This was necessary if the sociology of knowledge was to provide any understanding of how it was that knowledge evolved from "brutes to man, from child to adult, from primitive to civilized man, from stage to stage within mature cultures" (Scheler 1980:33). He also urged that the sociology of knowledge take account of biological discoveries and insights because, as he argued, "an instinct:drive theory of man is a necessary presupposition for the sociology of real factors" (Scheler 1980:35). Among the other tasks which Scheler set the sociology of knowledge was that of concerning itself with a broad rather than a narrow conception of knowledge. According to him, "The sociology of knowledge has as its subject matter the sociology of truth and also the sociology of social phantasms and superstition and socially conditioned errors and forms of deception" (Scheler 1980:75).

Despite the vast canvas which Scheler bequeathed sociologists of knowledge, they have selected to paint only one part of its surface, reworking this over and over. The part so concentrated on, it must be conceded, was the most central part, that concerned with the social nature of human knowledge. But so fixated has the discipline become on a few issues that, as Abercrombie (1980:1) notes, it is still largely dominated by a loosely organized set of principles largely derived from Karl Mannheim's works of the 1920s and 1930s. According to Abercrombie, theoretical debates have tended not to go beyond programmatic statements about the relationship of society and knowledge, too much attention has been devoted to the manner in which the sociological account of knowledge challenges the validity of some or all truth claims. Empirical studies conducted under the rubric of the sociology of knowledge have not significantly influenced the

nature or direction of theoretical reasoning in the discipline. The discipline has not kept track and assimilated significant developments taking place in related fields.

As regards the parts of Scheler's bequest to the sociology of knowledge noted above, these have been even more neglected than the aspects highlighted by Abercrombie. Close links with developmental psychology have not been established, let alone maintained or developed. The biological dimensions of knowledge have received little attention. What passes for knowledge in the discipline is very restricted indeed. The attempt by Berger and Luckmann (1967:26) to extend this to "everything that passes for knowledge in society" has not been widely taken up. The attention given by ethnomethodologists and phenomenologists to common-sense and taken-for-granted knowledge has, as yet, had little influence on the conventional sociology of knowledge.

Though individuals are the originators and bearers of knowledge, the sociology of knowledge tells us little regarding the relationship between individuals and knowledge. The so-called micro-sociology of knowledge is a largely undeveloped field. Looking to sociology in general, socialization theory should be able to make a contribution here, but, unfortunately, the socialization theory available is largely unsatisfactory. Socialization theory overemphasizes the role of society in the individual's acquisition of knowledge. Such theory also has little to say regarding the origin of knowledge. Socialization is generally presented as a one-sided process involving a static body of knowledge. Because the sociology of knowledge focuses primarily on the relationship between social structure and knowledge it tends to emphasize the differences in knowledge between one group and another. In fact, in terms of its central thesis, people in different situations must have different knowledge. While this thesis has great merit and validity, it serves to obscure that knowledge which is widely, if not universally shared, the knowledge which is predominantly biologically and psychologically determined, rather than sociologically. This widely shared common knowledge, is, as this study will attempt to demonstrate, of sociological importance and

deserves to be part of the sociology of knowledge.

The problem of subject matter

The Shorter Oxford English Dictionary lists eleven separate meanings of the word "knowledge". Given the arbitrary nature of language it would be absurd to expect the sociology of knowledge to deal with everything represented by this word. It would be absurd since some of these meanings may refer to objects, processes or states which are of no concern to sociology or which refer to contradictory or different orders of phenomena. (One could not expect the zoology of bats, for example, to include the study of the mammalian order or CHEIROPTERA, the study of wooden implements used in ball games, and the study of winking.) Though it is the case that the word "knowledge" does refer to different orders of phenomena it is a fortunate accident of English that at least some of these orders stand in such a relation to each other and to sociology that it is possible, and in fact theoretically advantageous, to treat them together in a comprehensive sociology of knowledge.

It is one of the disappointments in the sociology of knowledge that if this field is approached with a general understanding of the everyday usage of the word "knowledge" that one soon discovers that the bulk of the sociology of knowledge is devoted to a narrow range of specific categories of knowledge and that many others are seriously if not totally neglected even though a case can be made for their being social categories of knowledge. The dominant conceptualization implies that the sociology of knowledge is simply another title for the sociology of science. This conceptualization identifies knowledge with the most advanced and 'objectively valid' theoretical thought as this exists in all the sciences: physical, natural and social. Such an approach defines as out of court such socially and hence sociologically important varieties of knowledge as religious knowledge, artistic knowledge, magical knowledge, and the knowledge "how". By identifying knowledge with science and advanced theoretical thought, the sociology of knowledge was led, until recently, to seriously neglect the pre-scientific

common-sense knowledge of the ordinary citizen. A form of knowledge which is probably more fundamental to the understanding of society than any other form because it is a prime determiner of the day-to-day activities of all members of society. What is more, and as will be emphasized in this study, the pre-scientific common-sense knowledge of children and ordinary people is the birth-place and sustainer of the highest forms of theoretical and scientific knowledge. The proper understanding of the latter presupposes the understanding of the former. The sociology of knowledge, like much of philosophy, overlooks the personal nature of all knowledge and hence espouses a faulty epistemology (see Polanyi 1969).

The major reason for the narrow and peculiar focus of the sociology of knowledge stems from the fact, noted above, that it inherited the conceptualization of its subject matter from German philosophy. The title "sociology of knowledge" and the major orientation of the discipline were taken from the German WISSENSSOZIOLOGIE. Because the words "WISSEN" and "knowledge" do not cover the same range and dimensions of meanings, the title "Sociology of knowledge" is paradoxically both an accurate and an inaccurate description of the discipline as it exists. The first is the case if it is viewed from the perspective of philosophy. The second is the case if it is viewed in terms of broader sociological conceptions. Because they regard it as an inaccurate description, some sociologists have proposed alternatives such as "Sociology of cognition", "Sociology of thought", "Gnosiosociology", "Sociology of ideas" and "Sociology of culture" (see Simonds 1978:24). While I share the latter group's view that the so-called "Sociology of knowledge" should concern itself with more than the philosopher's idea of knowledge, I nevertheless feel that the title "Sociology of knowledge" should be maintained. The "Sociology of knowledge" should concern itself with what exists as knowledge in society. It should be concerned with everything that people can be said to know. The many forms of knowledge which exist, when viewed in their interrelationships, point the way towards a more comprehensive and satisfactory theory of

knowledge in which the sociology of knowledge would occupy a central position. It is this idea which partly motivated this study. Re-defining "knowledge" can serve not only to get the sociology of knowledge out of the rut it has been in since Mannheim's major contributions, it can also serve to link the sociology of knowledge with the biology and psychology of knowledge and in this way correct its oversocialized conception of knowledge.

The oversocialized conception of knowledge

It is understandable and inevitable that different disciplines studying aspects of the same phenomena will tend to stress the aspects studied while neglecting the others. However, if they are not to distort our understanding of the phenomena in question, it is necessary for them to show where the work of related disciplines fits in and how their own discoveries and theories dovetail with those of the related disciplines. Despite this necessity, few sociologists have done this. The cursory treatment of sociology's relation to the other social and natural sciences and the brief references (if any) to the biological nature of man in most textbooks is one indicator of the tendency to oversocialize social phenomena.

In his article, "The oversocialized conception of man in modern sociology" (which suggested the terms oversocialized and overphilosophized), Wrong (1961) provides a good example of the error of oversocialization in sociological theory. In response to the wellknown Hobbesian question of how humans become tractable to social controls, the twofold answer of conventional American sociology has been that they "internalize" social norms and seek favourable self-images by conforming to the "expectations" of others. Wrong points out that such a model of man denies the very possibility of man being anything but a thoroughly socialized being. It thus, in answering the Hobbesian question, actually turns it into a non-question. Such sociology produces the image of people as social puppets or dupes. How then can their conformity or social order be viewed as problematic?

Wrong cites the Freudian view of man as an example of a

more satisfactory view. For Freud man was a social though never a fully socialized creature. It is just such qualifications that one misses in oversocialized social thought. As a word of advice to sociologists seeking to correct oversocialized views of man, Wrong (1961:19) suggests that they "... must start with the recognition that in the beginning there is the body".

Among others who have criticized the oversocialized views in sociology is Bidney (1970:120) who refers to the "sociologistic fallacy" which is committed by theories that regard society as the ultimate ontological entity SUI GENERIS and use it to explain all social and cultural phenomena. As he states (p 135),

> Culture and society ... are regarded by superorganicists as if they were superpsychic entities that follow independent laws of their own and require no reference to the psychobiological nature of the individuals who participate in them. In this way a superorganic fatalism is substituted for the equally objectionable organic fatalism which they oppose.

Oversocialized as much of mainstream sociology may be, it is probably in the sociology of knowledge where this error has been most widely and consistently perpetrated. How more oversocialized can an argument be than the Durkheimian argument that the categories of thought are the product of social factors or the Marxian argument that it is not the consciousness of men that determines their being, but, on the contrary, it is their social being that determines their consciousness? (See Durkheim and Mauss 1965; Marx 1904, 1973.)

Even writers as disparate as Mannheim and Berger and Luckmann, though they made concerted attempts to avoid an oversocialized view of knowledge did not quite succeed. Mannheim is accused by some of his critics of arguing that knowledge is socially determined and thus devaluing knowledge. (This accusation is strongly denied by Simonds 1978.) The very title of Berger and Luckmann's (1967) book, "The social construction of reality", can be read as an oversocialized statement. Fortunately, the contents of this

book go a long way towards exonerating them from such a charge. Berger and Luckmann have achieved this by means of their electicism which combines important insights gleaned from various disciplines into a successful synthesis. Using Schutzian phenomenology as their point of departure and main conceptual font, they have combined ideas of sociologists of knowledge such as Marx, Weber, Durkheim, Mannheim and Scheler with the social psychology of Mead, Cooley, James and Simmel. Also woven into this work, albeit less successfully, are ideas from ethologists, such as Von Uexkull and Portmann, and anthropologists such as Plessner, Gehlen, Malinowski, Levy-Bruhl and Kluckholn. There are also references to the genetic epistemology of Piaget and to the ethnomethodology of Goffman. This work is not exegetical, as so many recent sociological works tend to be, nor is it synthesis for the sake of synthesis. It is, as the authors state, an exercise in systematic theoretical reasoning aimed at a redefinition of the nature and scope of the sociology of knowledge which they intend should move this subject from the periphery to the centre of sociological theory (Berger and Luckmann 1967:29).

By helping to draw attention to the work of Alfred Schutz and by providing an alternative conceptualization of knowledge to the more common oversocialized one, Berger and Luckmann have helped in the development of a sounder sociology of knowledge. They have, however, not entirely escaped the oversocialized charge. Though they pay some attention to biological and psychological factors as these relate to "reality" and "knowledge" they fail to take into account the fact that these factors are reflected in the social world and in culture and thus in "reality" and "knowledge". It is consequently an overstatement to say, as they do (p 67), "While it is possible to say that man has a nature, it is more significant to say that man constructs his own nature, or more simply, that man produces himself." Out of what does man produce himself and by what means? In their discussions of society as objective reality and as subjective reality, Berger and Luckmann fall into the oversocialized mould of thought referred to by Wrong above. Such "consensus

model" concepts as "institutionalization", "legitimation", "roles", "norms", and "socialization", are used in a way that betrays some of their own references to man's plasticity and creativeness and to the fundamental problematic and multifaceted nature of human existence and knowledge. Hamilton (1974:139) rightly criticizes them for their Durkheimian viewpoint which cuts right across the Marxian 'anthropology' they claim to accept

> For to posit that man is free to reproduce his social and natural conditions in limitless fashion, and then to limit that reproduction in terms of a system of external and internal constraints -- institutionalization, legitimation and socialization -- presents a contradiction that can only fatuously be called "dialectical".

Mead's (1972) work on the genesis of the "self" has gradually filtered into parts of the sociology of knowledge. As important a contribution as this is generally judged to be, it is not without its weaknesses. The virtually closed system of explanation which Mead offers of personality, self and social activity is a further example of an oversocialized conception. One illustration of this is his claim that significant gestures are gestures which have the same effect on the individual making them as they do on the individual to whom they are addressed (Mead 1972:158). Both Mead's notion of the "generalized other" and a "unified self" do not stand up well in relation to the fragmented nature of contemporary life nor the fundamental dialectical and creative nature of life and knowledge. It is the dynamic role accorded the "I" that partially saves his theory. The "I" is responsible for everything that cannot be explained by socialization, but, writes Kolb (in Coulter 1979:109),

> Where creative conduct is concerned, the explanatory power of the "I" concept is transparently restricted; indeed, with this notion Mead effectively explains away creative conduct which, in his scheme, is quite residual and is handled in a residual and vague way.

One characteristic of oversocialized thought is its neglect and even blindness to ideas and data which might help to curb such a tendency. It is one of the perennial calls in

recent sociology that more attention be paid to related disciplines. Van den Berghe (1978:18) has urged that sociologists "strive for a realistic conception of human nature, realistic in the sense that it is consistent with observable behaviour not with what we hope our behaviour might be". One of the roots of sociological ignorance he notes is "our reluctance to take human biology seriously" (p 15). An important reason for sociology to strive towards a more accurate view of human nature is that current views are incorporated into official thinking and social programmes. The use of inadequate models of man, as Gordon (1979:5) states, "... is to build on sand and invite the unanticipated consequences of purposive social action -- a recipe for failure". He argues that unless sociologists are willing to accept the extreme version of cultural determinism, closer links must be forged with psychology and the role of biology and genetic factors in social phenomena explored. Even the question of language, which, thanks to Sapir and Whorf, has so easily encouraged oversocialized views, needs to be reconsidered. In this connection, Flavell (in Mischel 1971: 122) has written, "increasing attention will have to be paid in the future to the possible biological-organic as contrasted with environmental contributions to, and constraints on, human cognitive development ... My own suspicion is that the role of language in thinking is generally overestimated." The work of Furth (1966) with deaf children possessing little language who are nevertheless capable of solving complex operational problems is cited as an example of work which might lead to a more accurate appreciation of the role of language in thinking.

Socialization theory generally, because it views individuals as socialized by society rather than as active self socializers and the socializers of their supposed socializers, may be accused of operating in terms of a "bucket theory of mind" (Popper 1973:63). The usual approach fails to deal with the fact that social knowledge has to be assimilated by individuals in terms of existing cognitive structures. What is assimilated always bears the stamp of individual and society. Socialization theory distorts and

oversimplifies the complex relationship between socially available knowledge and the knowledge acquired by individuals. The oversocialized notion of socialization is mirrored in psychology by its overpsychologized notions of learning. Both could benefit from a closer look at biology and the dialectics of knowledge acquisition.

The neglect of biology

Of the mainstream of sociological thought's sins of omission, none is probably greater than its neglect of biology. Indeed, much sociology seems to be in cahoot with the wife of the Bishop of Worcester who is reported to have exclaimed, "Descended from monkeys? My dear, let us hope that it isn't true! But if it is true, let us hope that it doesn't become widely known!" (quoted in Barash 1979:xiii). The sociology of knowledge, though a chief sinner in this regard, nonetheless helps in appreciating the reasons for this neglect. The neglect of biology is both the manifestation of an older and diffuse set of factors and a more recent and direct set.

As regards the former, sociology and the sociology of knowledge are latter day developments of a line of thought which has in the past strongly repressed the body and which still has an influence in this regard. Most Westerners have experience of the repression of the body in one way or another. This repression is deeply embedded in the fabric of Western culture since it is in large part the product of the West's particular theological and philosophical traditions. "The dominant ethos of Christianity has been one of repression of the body," asserts Benthall (1976:70). Platonic philosophy and Christianity not only separated body and soul but sanctified the soul and profaned the body. The denial of the body also has roots in the Greek and Roman disdain for manual labour. An attitude which, reinforced by Christianity and idealistic philosophy helps account for the prevailing antipathy towards manual labour in modern capitalist societies. To work with one's hands or to enjoy one's body are denigrated by the deeper values of Western society. It is possible to view the oversocialized conception

of man as an outgrowth of earlier theological conceptions. In the oversocialized conception, the human body and individuality are devalued, as is the biological connection between man and beast, and society takes the place of God as the author of man's destiny and being (see Bauman 1976:32). (It is not possible to speak of an overtheologized conception of man because if God exists and He is responsible for all that is and happens, as some religions claim, then it could not be a distortion or exaggeration to say that man is totally determined by Him.)

Illuminating as the older and diffuse factors are, it is the more recent and direct factors which are the most important for understanding the current position of biology in relation to the social sciences. It is ironical that sociology is still struggling with partial views of man because, after all, modern sociology originated as a protest against the partial views of man propagated by such doctrines as utilitarianism, classical economics, social Darwinism and vulgar Marxism (Wrong 1961:190). It may be that a "proper model of man" is a positivistic phantom and that each age will produce its particular model. While this is no doubt true to some extent, I still believe that, to the extent that the scientific enterprise is a worthwhile one, it is possible to improve on current views of man which, though they may be closer to the mark than those of the past, may still be judged wanting. It is, in particular, the biological dimension that has not yet been adequately assimilated into our contemporary view of man and we are here concerned with the factors responsible for this before proceeding to attempt to remedy it.

One of the major reasons for the neglect of biology in modern sociology is, paradoxically, the considerable impact which nineteenth century biology had on, the then, embryonic science of society. Darwin's evolutionary theory and his vision of the unity of life processes influenced all the founding fathers of sociology. Unfortunately, neither the biology nor the sociology of the last century was sufficiently mature for the latter to truly benefit from the former. What resulted from this premature cross-fertilization were the

monstrosities of social Darwinism and the organic view of society. These ideas found fertile ground in the imaginations of the ruling elites of the time. The biosociology of the turn of the century was used to legitimate racism, imperialism, sexism and LAISSEZ FAIRE capitalism. As Allen (1978:260) comments, "Historically, powerful countries or ruling groups within them have drawn support for the maintenance or extension of their power from these products of the scientific community." By way of example she cites John D Rockefeller's words, "The growth of a large business is merely a survival of the fittest ... It is merely the working out of a law of nature and a law of God." She notes too that such theories provided an important basis for the enactment of sterilization laws and restrictive immigration laws in the United States between 1910 and 1930. To the extent that ideas are responsible for human brutality and suffering, these ideas were probably part of the tragedies of Nazi Germany, two World Wars, the colonial era, the Great Depression and the oppression of racial minorities. It is thus small wonder that much modern social science seeks to distance itself from the stigma which still adheres to biological reasoning when applied to people and society. It had been German social science which had most emphasized biological factors. The demise of Nazi Germany had the effect of significantly obliterating both the positive and negative influences of biology on social science. This was true in America, and to a lesser extent Britain, in particular. The effect of the above factors was that from the 1930s into the 1970s the dominant current in sociology was one of dogmatic environmentalism, extreme cultural relativism, antireductionism, and anti-evolutionism (Van den Bergh 1978: 34). Social science became characterized in the main by an almost complete oblivion of the organic basis of behaviour.

What developed after the Second World War, especially in America, was a mythology which held that all people were born equal and which believed that human nature and society were infinitely malleable. The poor could be made comfortable. The oppressed could be liberated. No hill could not be climbed. All that was required was the will and the

material resources. And, for three decades, America had these in abundance. In commenting on the adverse response by many social scientists to his "Sociobiology: The new synthesis", Wilson (1978:2) remarks that he was unprepared for a largely ideological response. "It is now clear to me", he writes, "that I was tampering with something fundamental: mythology." Morin (quoted by Holton 1978:82) sees the adverse response to sociobiology in a similar light. It is not a scientific response to evidence but a doctrinal response to heresy. Sociobiology is guilty of three heresies: (1) It denies two essential elements of the Greco-Judaic/Christian tradition: body mind dualism and the special creation of man. (2) It violates Durkheim's injunction that social phenomena be explained in terms of social variables. (3) It has implications that contradict the notion of the perfectability of man. Wilson had supposed that his sociobiology would be received by social scientists in the spirit of the scientific enterprise: as data, theories and hypotheses to be treated with respect and to be evaluated according to accepted scientific criteria. It became obvious in the course of the sociobiology debate that many social scientists are still not ready to admit the shortcomings of their ideas and even less ready to admit the need for a biological input. Their stance is a major impediment to the advancement of scientific knowledge. Van den Berghe (1978:35) regards the neglect of biology in such a serious light that he has urged the social sciences to return to their biological roots lest their claims to scientific status become increasingly tenuous.

It is not simply that the past still weighs heavily on the present that accounts for the largely negative receipt of sociobiology, it is also the fact that vital socio-political and ideological struggles of the present, such as those against racism, sexism, aggression, capitalism and political oppression, see in it arguments which can be used to legitimate the evils against which these struggles are directed. The nefarious uses to which scientific ideas have been put in the recent past gives them adequate cause for alarm. In America it has been primarily members of the

Sociobiology Study Group of Science for the People that have most vehemently condemned sociobiology. In their attacks, however, they have often confused scientific matters with ethics and have committed, what Wilson (1978b:302) calls, the Fallacy of the Political Consequent, which results from the assumption that political ideologies can be matched one-to-one with scientific theories. On the contrary, the same scientific theory can be used to support two or more opposed political ideologies, as, for example, extreme forms of environmentalism are used to support both Marxist and Liberal thought. Environmentalism can also be used to support the most reactionary social doctrines as Chomsky (1975:132) has noted. If we are largely culturally determined then sexism, racism, aggression, exploitation, and so forth can just as easily and morally justifiably be supported as they can be condemned.

Attacks on sociobiology have led to the question posed by David Hull (1978:151), "Should a scientific theory be suppressed because it is dangerous, even though it might be true?" A sticky question indeed. But, as just noted, a scientific theory in itself is not dangerous, it only becomes dangerous in a particular social context and when given a particular reality status in that context. This study proceeds in the spirit that would reply "No!" to the above question. Though the uses to which we put our knowledge may sometimes take us closer to destruction and evil than ever did our ignorance, the hope that knowledge will itself lead to wisdom and the increasing use of knowledge for exclusively noble ends inspires this study. Science has in the past revealed dangerous truths to humanity and humanity has met their challenge, though never wholly satisfactorily. It is to be hoped that in the future it will show even greater maturity and adaptive capacity.

The purpose of this study

This study is intended to make a contribution to sociology and the sociology of knowledge by attending to some of the shortcomings of conventional sociology and sociology of knowledge. It seems to me that since certain of the

shortcomings noted stem from a fixation on a conception of knowledge ill-suited to the nature and purpose of sociological study, certain of the shortcomings of the sociology of knowledge can be overcome through a re-definition of knowledge and the development of a conceptual framework which includes everything that functions as knowledge in the lives of individuals and society. Because many of the shortcomings of sociology and the sociology of knowledge are a result of "oversocialized" concepts and theories it seems to me too that the conception of knowledge proposed and the conceptual framework developed should be such as to facilitate the integration of biological and psychological approaches to knowledge with those of sociology. These ideas underly the first main objective of this study, which is to develop the kind of conceptual framework just referred to.

The second objective of this study is to correct certain oversocialized sociological theories by developing part of what I consider to be a more satisfactory theory of knowledge. It is a thesis of this dissertation that certain key concepts and theories in sociology are indeed oversocialized and thus reality distorting and even false. Along with Van den Berghe, Piaget, Popper, Lorenz, Wilson, Barash and others I feel that the road ahead for sociology should lead to a more serious encounter with biology and developmental psychology. Fortunately, despite contrary attempts, the road to such an encounter has been partially prepared. This has been done not only by sociobiology but, as I try to indicate in the following chapter, by genetic epistemology and evolutionary epistemology in particular. Other fields such as ethology, natural philosophy, and developmental psychology have also helped pave the way towards a closer integration of the sociology of knowledge with the biology and psychology of knowledge. Though a comprehensive theory of knowledge will be outlined, it will not be fully developed in this study. What will be developed in some detail are ideas and data which help to illuminate the relationship between biology and cultural knowledge. This is one of the ways in which this study can help correct aspects of the oversocialized conception of knowledge found in sociology.

In the course of developing the theory just referred to, various theses will be proposed and arguments and facts supporting them presented. The following are among the central theses to be proposed:

(1) Life is a knowledge process. Life and knowledge are inseparable. Every life form is a representation of its knowledge. Adaptation implies the continual use and modification of knowledge.

(2) The intellectual development of humankind can be illuminated by studying the intellectual development of children and animals. Animals and children, as much as adults and scientists are concerned and must be concerned with "that which is the case". Life depends on the successful adjustment to a reality which includes organism and environment in an indivisible unity. All living creatures can be supposed to have some valid knowledge of reality. Human knowledge and human reality are biologically constructed as well as being psychologically and socially constructed.

(3) All organisms capable of learning do so by virtue of an innate learning schema. Human life and culture is made possible by humankind's innate learning schema. This schema plays an important part in determining not only the pattern but also the content of human culture.

(4) The complexity of humankind's innate learning schema implies that, rather than being endowed with less genetic structuration, humans are in fact endowed with more. Cultural life presupposes a greater degree of genetic structuration than does more instinctual life.

(5) All humans share essentially the same innate learning schema. This schema has changed relatively little in historical time. Because of this, individuals in all societies and at all times have been prompted through similar circumstances to produce similar items of cultural knowledge. Humans everywhere make sense of their world in many similar ways and have many items of non-social, social and cultural knowledge in common.

(6) The acquisition of knowledge is a creative act. Humans are constitutionally creative. Socialization implies

the creation of knowledge out of the information made available by society and self-generated information.

CHAPTER TWO

GENETIC EPISTEMOLOGY AND EVOLUTIONARY EPISTEMOLOGY

> All our progress is an unfolding, like the vegetable bud. You have first an instinct, then an opinion, then a knowledge. Trust the instinct to the end, though you can render no reason ... By trusting it to the end, it shall ripen into truth.
>
> Emerson (1887:148)

In this chapter attention will be devoted to two related theories of knowledge -- genetic epistemology and evolutionary epistemology. My purpose in doing this is because Piaget's genetic epistemology and Popper's evolutionary epistemology offer the sociology of knowledge a theoretically sound way of attending to some of its current conceptual and theoretical weaknesses. That is, genetic epistemology and evolutionary epistemology suggest ways in which the biological and psychological dimensions of knowledge can be integrated with the sociological to produce not only a sounder sociology of knowledge but also the beginnings of a more general theory of knowledge. They also suggest ways in which the concept "knowledge" might be broadened so as to embrace the intelligence possessed by life in general. As will be obvious, this study owes much to other subjects concerned with "knowledge" in one way or another as well as those which focus on "behaviour" instead of "knowledge". Space does not permit each relevant subject to be separately discussed.

Genetic epistemology

The name of Jean Piaget is today most generally associated with the study known as "genetic epistemology". This is due in no small measure to his own efforts to promote this study through his writing and the activities of the International Center for Genetic Epistemology at the University of Geneva which he founded in 1955 and of which he was the director until his death last year. But though the name "Piaget" springs automatically to mind at the mention of "genetic epistemology", the phrase is not Piaget's exclusive property nor does he lay any claim to its invention. James Mark Baldwin is credited as having coined the phrase in his work "Thought and Things" published in 1901 (see Kaplan 1971: 63). Among the precursors of the approach now known as Genetic Epistemology, some of whom are acknowledged as such by Piaget himself, are Baldwin, Wundt, Sigwart, Bosanquet, Hobhouse and Cassirer (see Kaplan 1971:63; Russell 1978:1; Piaget 1950:18 and 1957:14). Piaget devoted his life to the study of genetic epistemology. Of the more than fifty books and monographs and hundreds of articles he published during his long and productive life, by far the most deal with this abiding concern.

The phrase "genetic epistemology" is, to the uninitiated, doubly ambiguous. This is so because, firstly, the word "epistemology" as used in the phrase refers to a different kind of theory of knowledge to that common in philosophy, although not so different as to be exclusive or contradictory. Secondly, the term "genetic" is a homonym which, as used by Piaget, is generally intended to mean "origin and development", but its other meaning refers to "gene", the active material of life, and is also often implied by Piaget because of his emphasis on biology in his approach to knowledge. In American and British psychology "genetic epistemology" is commonly referred to as "developmental psychology" but since the latter lacks the rationalistic and philosophical orientations of the former they can hardly be considered as identical pursuits. In recent years, however, these pursuits have shown signs of merging, a development which can only be of mutual benefit.

Though Piaget makes occasional references to other kinds of knowledge, he sees the task of epistemology to be the explication of analytic and scientific knowledge. The central problem of this explication is, for Piaget, the emergence of "novel" forms and items of knowledge as a function and as the embodiment of its development (Piaget 1970:77). He writes of this study, "Genetic epistemology attempts to explain knowledge and in particular scientific knowledge, on the basis of its history, its sociogenesis, and especially the psychological origins of the notions and operations upon which it is based" (Piaget 1970:1). Piaget has taken pains to point out that legitimate epistemological concerns exist outside of those which philosophers take as constituting epistemology. And, what is more, that the narrow epistemological concerns of philosophers cannot be separated sharply from the epistemic concerns of biology, psychology and sociology.

For Piaget, the "verified true belief" with which philosophers most often concern themselves is not a fixed object nor, indeed, are the criteria employed to delineate this object. All knowledge is in a state of flux and has evolved, even what is now regarded as axiomatic. "Scientific thought, then, is not momentary; it is not a static instance; it is a process" (Piaget 1970:2). Because of this, the philosophical claim that there exists on the one hand the study of the genesis of knowledge and on the other the study of existing knowledge, is untenable. In addition, as Piaget asserts, all epistemology entails factual as well as formal problems. The implication of all this is that philosophical questions are inextricably bound to biological, psychological and sociological ones. "The first principle of genetic epistemology, then is this -- to take psychology seriously" (Piaget 1970:9). To this can be added, "as well as biology and sociology", to which Piaget would no doubt agree. It is reasoning along the above lines which has led Piaget to doubt the correctness of the radical distinction many philosophers make between "analytic" and "synthetic" truths. But here, as Kaplan (1971:75) points out, Piaget is in good company even in philosophical circles since he shares this misgiving with

the likes of Quine (1951), White (1950), Rudner (1949) and Waismann (1949/51). "In epistemology", writes Piaget (1970: 12), "both logic and psychology should be taken into account, since it is important to deal with both the formal aspects and the empirical aspects of human knowledge."

> The problem posed by genetic epistemology ... is accounting for the transition from knowledge judged to be inferior to knowledge judged to be superior and the nature of these transitions is a factual question to be explained in terms of historical, psychological or even biological factors.

(Piaget 1970:13).

Piaget (1970:13) states that the fundamental hypothesis of genetic epistemology is that there is a parallelism between the progress made in the logical and rational organization of knowledge and the corresponding formative psychological processes. To demonstrate this isomorphism one could, according to Piaget consider the evolution of the human brain in relation to the evolution of human knowledge, but this is a difficult if not impossible undertaking. Hence, in terms of the biological principle that, in some ways, ontogeny recapitulates phylogeny, Piaget (1972:11) turned to the study of the ontogenesis of knowledge rather than its phylogenesis. In particular, he concentrated on studying the development of logico-mathematical and scientific knowledge in children. For Piaget, developmental psychology -- part of his genetic epistemology -- is the embryology of human knowledge and intelligence in general (Boden 1979:13). The intellectual development of children is, for Piaget, a fundamental part of the general intellectual development of humanity. If children did not <u>construct</u> for themselves the basic knowledge required to continue the scientific enterprise such an enterprise could not be continued. This enterprise embraces children as well as Nobel prize winners. Everyone is, to some extent, engaged and must be engaged in the pursuit of "that which is the case". By thus bridging the gap between child psychology and epistemology, "Piaget liberates analytic epistemology from the narrower constraints of formalism, and from the dogmas of analytic self-sufficiency" (Wartofsky 1971:139).

As a result of his ingenious studies, Piaget was led to the discovery that the development of knowledge in normal children passes through distinct stages and that this occurs invariably and trans-culturally. The basic impetus and structures of cognitive development are, for Piaget, provided by genetically inherited tendencies and structures as these operate and develop. These inherited tendencies and structures, which include what Piaget calls 'innate knowledge', are the result of, and remain subject to, phylogenetic development.

The developmental stages Piaget established are themselves illustrative of the basic isomorphism between the development of knowledge and physical development. Though the demarcation of ontogenesis into developmental stages is to some extent an arbitrary undertaking, there do nevertheless appear to be more distinctive cognitive changes in the early weeks, months and years of life than in the later years. Piaget's stage theory is grounded in this fact and his discovery that the younger child passes through more qualitatively different cognitive stages than does the older child parallels in a most suggestive way the types and qualities of physical changes which are known to constitute the child's morphogenesis.

In discussing the ontogenesis of logico-mathematical and scientific knowledge, Piaget came to distinguish sensory-motor knowledge, pre-operational knowledge, concrete operational knowledge and formal operational knowledge. Embodied in these knowledge categories, which correspond to the major stages of cognitive development he identified, is his more general categorization of knowledge: innate knowledge, the knowledge structured by hereditary programming; acquired knowledge, the knowledge acquired from physical experience; logico-mathematical knowledge, the knowledge abstracted, formalized and equilibrated from acquired knowledge but which, in its development, achieves independence from experience (see Piaget 1971:266).

Innate knowledge, acquired knowledge and logico-mathematical knowledge will all receive further attention later in this study. Hence, in this brief general overview,

we can pass to Piaget's theory of the processes by which knowledge develops. This theory, as Piaget recognizes, can be applied to understanding both the phylogenesis and the ontogenesis of knowledge. But it is even more general than this because it can also be used to account for social epistemogenesis, as is to be indicated. According to Piaget, knowledge develops in the species or in the individual (or the society) as a result of three very general and united processes, accommodation/assimilation and equilibration. (These processes are more fully dealt with later.) Knowledge is for Piaget something which results from activity on the part of an organism, it is constructed and reconstructed on the basis, at each moment of construction, of existing knowledge and knowledge structures (Piaget 1968:77).

Piaget's treatment of the social

It is no simple matter to comment on Piaget's treatment of the social aspects of human intelligence. Though he did devote some attention to these aspects, it is nevertheless true, as Hamlyn (1971:18) notes, that in his work there is "... a considerable underestimation of the social". Piaget's treatment of the social is not only slight, but it is also ambiguous and contradictory. During his long and distinguished academic career, Piaget held a number of joint psychology/sociology posts and even held the post of professor of sociology at the University of Geneva from 1939 to 1951 (Gruber and Voneche 1977:xiii). These appointments were made, it can be supposed, partly on the basis of the attention he paid to the social factors in the genesis of human intelligence in his early works.

At the beginning of his adult life, Piaget clearly recognized the basic dialectic between the psychological and sociological aspects of life. In a philosophical novel published in 1918, Piaget (then 22 years old) briefly introduced the idea of equilibration between society and the individual and anticipated by half a century the development of general systems theory when he wrote of Durkheim and Tarde that the former only sees the action of the whole on itself and on the parts while the latter sees only the

inverse, the action of the part on itself and on the whole. To understand society or the individual, Piaget asserted, these two schools had to be reconciled (Piaget 1977:49). In retrospect, now that Piaget is dead, it can be asserted that he did not achieve this reconciliation (he might not even have tried to do so) and that his scanty sociological work is in the tradition of Tarde, that is, he is primarily concerned with the action of the individual on himself and on society.

Fundamental to Piaget's early thought seems to have been the idea that children develop from a pre-social to a social stage of knowledge. He argued that the earliest stage of a child's thinking was "autistic"-- totally individualistic and asocial. From this the child developed through "egocentric" to "directed" thought. Egocentric thought, because it is developed from the child's own actions on the environment, leads to thoughts which revolve around the active ego and is impregnated with its subjectivity. As Light (1979:2) explains, "The essence of egocentrism is the child's embeddedness in his own point of view; only his own point of view, his schemas, his perceptions etc. really figure in his activities, and he is unaware that others see things differently." By "directed" though Piaget meant thought which is not only largely controlled by the individual but which was accommodated to the views of others and to accepted notions of reality. Directed thought is properly socialized thought. Egocentric thinking is transcended and becomes directed through the buffetings which the developing child suffers in the course of interaction with others (see Piaget 1926).

It is worth pausing to note here that though he has not provided a systematic discussion of the concept "egocentrism", the concept has nevertheless remained central to Piaget's work. Furthermore, because of his thesis that the ontogenesis of thought provides clues as regards its phylogenesis, the concept "egocentrism" and its characteristics are of relevance to the sociology of knowledge. As Piaget discovered, egocentric thinking leads children to make certain "mistakes" about reality. Three of the most common are:

(1) The tendency to regard certain psychological experiences (names, dreams, thoughts, stories, etc.) as real things (realism). (2) The converse tendency to endow physical things and non-human forms of life with human motives, thoughts, and feelings (animism). (3) The tendency to see everything as intended to serve some human purpose (artificialism) (Piaget and Inhelder 1969). Piaget has himself occasionally noted how these characteristic "errors" of child thought are reflected in the magical, religious and, even, scientific thinking of adults at various times and in different places. It would seem that "egocentrism" provides an important clue as regards the origin and nature of certain cultural items.

Despite his obvious sensitivity to social factors, a weakness in Piaget's writing has been his tendency to separate "impersonal" knowledge (e.g., logical, mathematical, scientific) from "interpersonal" knowledge (e.g., ethical, religious, artistic) and to neglect the latter (see Light 1979:6). Piaget's more recent work conveys a strong impression that certain basic logical, mathematical and scientific structures and items of knowledge are arrived at by the developing person virtually independent of social influences. Such items and structures may be judged to be not social at all even though they are elements of the knowledge repertoire of every normal adult and a fundamental part of all social transactions. They are the result of individual constructions which every normal person accomplishes during the early years of cognitive development.

Because of such views, Piaget probably feels that to some extent his "isolated individual" approach to cognitive development is justified (see Light 1979:6). Piaget accepts that man is social, but, as he has taken pains to point out, man is not simply the product of his social existence. He is also the product of his own actions and of the non-social environment. Whereas, as Light (1979:14) notes, Mead chose to deal with the dialectic between the developing individual and society, Piaget chose to deal with the dialectic between the developing child and the non-social environment. It is for this reason that Piaget can serve as a healthy corrective

to oversocialized conceptions of man while his own studies can benefit from a closer association with sociology.

The relative neglect of social knowledge and the social processes of knowledge by genetic epistemology contrasts rather sharply with the treatment which these have received in "evolutionary epistemology", an approach to knowledge which has much in common with genetic epistemology and which offers a convenient avenue for the extension of Piaget's work into the social realm. Stated differently, evolutionary epistemology may be used as a means of synthesizing genetic epistemology and the sociology of knowledge into a more comprehensive account of human knowledge than presently exists.

Evolutionary epistemology

Though Karl Popper is the chief current exponent of the approach known as 'evolutionary epistemology', he is not the inventor of the term. He remarks himself that as far as he is aware, the term was originated by his friend Donald T Campbell (see Popper 1973 and Campbell 1974). He also notes that the idea of an evolutionary epistemology is post-Darwinian and goes back to the end of the nineteenth century -- to the work of such individuals as Baldwin, Morgan and Jennings. As an approach to the study of knowledge, evolutionary epistemology is at present something of a minority movement and, besides Popper, Konrad Lorenz can be counted as an influential contemporary member.

As in the case of genetic epistemology, evolutionary epistemology constitutes a valuable contribution and extension to the sociology of knowledge. But it is a contribution which has, as yet, not received the appreciation it deserves. Part of the responsibility for this neglect lies with Popper himself since, apart from a number of tantalizing suggestions, he does not go very far towards integrating his epistemology with the sociology of knowledge nor deviate appreciably from his concentration on scientific knowledge. One of the purposes of this section is to highlight some of Popper's ideas which appear to me to be ideas from which the sociology of knowledge could benefit.

Both genetic epistemology and evolutionary epistemology

take the growth of knowledge as the fundamental problem of epistemology. Evolutionary epistemology, as its name suggests and like its genetic cousin, aims at producing a theory of knowledge which, according to Campbell (1974:413), takes cognizance of and is compatible with "man's status as a product of biological and social evolution". It has an interest in the "primitive fundamentals of knowledge (which) does not begin or end with the conscious content or sense-data of the philosopher himself" (Campbell 1974:418). Evolutionary epistemology holds that evolution is a knowledge process; that the natural selection paradigm can be applied to understanding the evolution of knowledge just as it has been to behaviour and morphology. "The growth of knowledge", explains Popper (1973:144), "is not a repetitive or cumulative process but one of error-elimination. It is Darwinian selection rather than Lamackian instruction."

Both Popper and Piaget are centrally concerned with analyzing the development of scientific knowledge though their levels of analysis differ. Popper is concerned primarily with the objective and social dimension of the growth of science while Piaget concentrates on the subjective and psychological dimension. For both these writers, science is one of the greatest, if not the paramount, creations of the human mind. One of the central tenets of evolutionary epistemology is that the trial and error strategies of learning responsible for the evolution of the species and the growth of intelligence in animals and humans are analogous to the strategy of conjecture and refutation of the scientific method. As Popper writes (1963:51):

> Assume that we have deliberately made it our task to live in this unknown world of ours; to adjust to it as well as we can; to take advantage of the opportunities we can find in it; and to explain it, if possible (we need not assume that it is), and as far as possible, with the help of laws and explanatory theories. <u>If we have made this out task, then there is no more rational procedure than the method of trial and error -- of conjecture and refutation</u>.

Popper's formula: P_1 - TT - EE - P_2 conveys the kernel

of his theory (see Popper 1973; 1974; 1977). He argues that living things (humans, animals and plants) always begin the knowledge acquisition process with some problem P_1. In seeking to solve this problem some tentative solution or theory TT is proposed in the form of ideas, actions or behaviour. This may or may not solve the problem but whatever it does, it does produce some sort of feedback as regards the efficacy of the tentative solution. It thus constitutes a moment in the process of error-elimination EE. In the course of the attempts at eliminating the errors EE of the tentative theory TT which was proposed as a possible solution to the initial problem P_1 the next point on the road to knowledge is reached. This point is designated P_2 and it consists of a new problem which incorporates and emerges out of the preceding epistemic activity. And so the cycle begins again.

Popper notes of P_2 that these problems arising out of our attempts at problem solving are not entirely of our making. We wish to solve P_1 and P_2 is the result of this activity. Hence, many of the problems we come to deal with are the result of our activities but they are not of our making. "New problems, P_2 arise from our own creative activity; and these new problems are not in general intentionally created by us, they emerge autonomously from the field of new relationships which we cannot help bringing into existence with every action, however little we intend doing so" (Popper 1973:119).

Popper's notion that each stage in the evolution of knowledge begins with problems is consistent with Piaget's idea that it begins with existing structures. A structureless organism could not have a problem. It is the structure of the organism as much as any extraneous feature that constitutes the problem. "Organic structures and problems arise together ... organic structures are theory-incorporating as well as problem-solving structures", is how Popper (1974:106) expresses this unity.

The process of knowledge acquisition just outlined applies according to Popper to all forms of life. It was employed by Einstein and is employed, in a more dogmatic

fashion, by the amoeba (Popper 1963:52; 1973:261). For evolutionary epistemologists, knowledge and life are inseparable. The lowest forms of life as much as the highest forms possess knowledge and are capable through the process of trial and error, conjecture and refutation, of acquiring more knowledge or modifying that which they have.

This approach leads both Popper and Lorenz to view an organism's physiology and behaviour as constituting theories, hypotheses or solutions (TT) proposed by the species in response to the problems of adaptation and survival. A fish's form is a solution to the problem of the fish being a being-in-water and hence may be regarded as a form of knowledge. The octopus's form is also a response to the problem of life living in water. That its form is different to that of a fish demonstrates graphically the fundamental relativity of knowledge. For Lorenz (1977) life is synthesized and systematized knowledge. The evolution of life and (among the higher forms of life) the development of the individual organism implies a progressive increment in knowledge. "Life itself", Lorenz (1969:13) has written, "is a knowledge process." In his writings Lorenz has attempted to validate the arguments of Popper and Campbell by revealing the ways in which the more primitive levels, forms and processes of knowledge are related to the more advanced.

Objective knowledge

In developing his evolutionary epistemology, Popper came to formulate an "epistemology without a knowing subject" (as he titled one of his famous lectures -- Popper 1973:126). He was led to this, as he acknowledges, by following the lead given by such writers as Bolzano and Frege. Their lead suggested that a distinction could be drawn between the contents of thought and the various psychological dimensions of thought, such as consciousness, attitude, feeling, puzzlement, belief, doubt, anxiety, and so forth. In other words, thoughts have a subjective and an objective dimension. Popper (1974:144) explains:

> One man's thought processes cannot contradict those of another man, or his own thought

> processes at some other time; but the contents of his thoughts -- that is, the statements in themselves -- can of course contradict the contents of other thoughts. On the other hand, contents or statements in themselves, cannot stand in psychological relations: thoughts in the sense of contents or statements in themselves and thoughts in the sense of thought processes belong to two entirely different "worlds".

The subjective dimension of knowledge is, for Popper, the concern of the psychology of knowledge. This branch of epistemology deals with the empirical facts of knowledge, with the origin and development of knowledge, as well as with the subjective features which, in consciousness, generally accompany the objective ones. The psychological approach is limited in that it cannot pronounce a thought true or false or one theory better than another in any objective way but only in terms of feelings of conviction or certainty or some other emotional intelligence.

The objective dimension of thought is the province of the logic of knowledge. The logical approach is unconcerned with the feelings which may accompany a proposition; it is concerned solely with the logical relationship between a proposition and other relevant propositions. In other words, the logical approach can lead, because it is based on logical inference rather than psychological evaluation, to objective judgements regarding the truth content of propositions and theories. "Popper's 'logic of knowledge' is concerned, then, with logical or objective features like truth and falsehood, deducibility, contradictoriness, deductive explanation, explanatory power or empirical content, simplicity, verisimilitude" (Musgrave 1974:573).

The objective nature of thought lies firstly in its being the object or content of our individual consciousness and, secondly, and more importantly, in its being a subjective object which we are able to make an object for others through the use of language. The objective nature of our thoughts is commonly experienced in the surprise evoked in us by our own thoughts or the shock experienced when reading something we have written.

By distinguishing the objective (or logical) dimension

of knowledge from the subjective (or psychological) Popper was able to formulate his pluralistic philosophy which proposes that the world consists of at least three ontologically distinct sub-worlds:

> The first is the physical world or the world of physical states; the second is the mental world or the world of mental states, and the third is the world of intelligibles, or of ideas in the objective sense.

(Popper 1973:154).

For Popper, the third world consists of all possible objects of thought: the world of theories in themselves, and their logical relations; of arguments in themselves; and of problem situations in themselves (1973:154). It is sufficient for something to qualify as objective knowledge that it has the potential of being grasped or known by a human mind. "I do admit", writes Popper (1973:116), "that in order to belong to the third world of objective knowledge, a book should -- in principle, or virtually -- be capable of being grasped (or deciphered, or understood, or 'known') by somebody. But I do not admit more." In his discussion of the third world, Popper describes some of its "inmates". These include the <u>contents</u>, in the logical sense, of statements, thoughts, problems and arguments as well as books, journals, letters, films, etc. Though he restricts his discussion of the third world to its scientific contents, Popper in various places acknowledges that this world has other contents and that his ideas can be extended to discussions of artistic knowledge, religious knowledge, common-sense knowledge, and so forth. Following Popper's lead it can be argued that truths, judgements, propositions, criticisms, interpretations, evaluations, meanings, and so forth, can also be objectively determined in non-scientific knowledge domains. This is an idea which the sociology of knowledge could profitably explore. The idea indicates that to some extent at least, the social determination argument has to be diluted if it is to be valid.

One of the fundamental problems raised by his pluralistic philosophy of mind, as Popper recognizes, is the

relationship between the three worlds. In exploring this relationship Popper makes an important contribution to both the psychology and the sociology of knowledge. He argues in terms of the relative autonomy of each of these worlds and conjectures that the only connection between the world of physical objects (W1) and the world of intelligibles (W3) is through the world of mental states (W2). But though World 2 is the mediator between World 1 and World 3, all these worlds have an effect on each other. For example, technological knowledge (W3) lies behind many physical changes in World 1 and the technological knowledge is itself a reflection of World 1 mediated by World 2 (see Popper 1973:154-156). The effects of World 1 and World 3 on the world of mental processes (W2) is something readily acknowledged though the exact relationships are the subject of much debate.

An interesting feature of the third world is that it can be considered to possess structures, properties and relationships -- even contents -- independently of any subject's awareness of them (Musgrave 1974:585; Popper 1974:147-149). From this it follows that to the extent that an individual gives himself over to this world, as intellectuals do to a great extent, this world becomes responsible for their thoughts. In other words, the world of objectivated knowledge imposes certain necessary lines of reasoning on the individual and may even be regarded as responsible for the conclusions which are reached. Levi-Strauss, who seems to have been particularly sensitive to this relation between the third and second worlds, has described his experience of it thus:

> ... my work gets thought in me unbeknown to me. I never had, and still do not have, the perception of feeling my personal identity. I appear to myself as the place where something is going on, but there is no "I", no "me". Each of us is a kind of crossroads where things happen. The crossroads is purely passive; something happens there. A different thing, equally valid, happens elsewhere. There is no choice, it is just a matter of chance.

(Levi-Strauss 1978:3-4).

The autonomy of the first world is generally acknowledged

and the relative autonomy of the second world is recognized in many philosophies. It is the existence and degree of autonomy of the third world that is problematic and explains why Popper has devoted so much energy to discussing it. Popper considers the third world to be partially autonomous. This is so, because, as just noted, the thoughts of an individual may be experienced as following a logic of their own and, once expressed, may have "unintended and unforeseen consequences" (Popper 1974:14). Among the examples Popper cites of ideas with unintended and unforeseen, even infinite, consequences is that of natural numbers and the problems these have given rise to and, no doubt, will give rise to in the future; problems which can only be discovered by us, which are not made by us (Popper 1973:160). He asserts, almost contradictorily, that even though the world of objective knowledge is a human product, there are many theories, arguments and problem situations in this realm which have not as yet come into the ambit of human cognition and which might never come into it or ever be understood by men (Popper 1973:116). "The third world is largely autonomous though created by us" (Popper 1973:118).

Popper's argument in favour of the relative autonomy of the third world and its power as a semi-independent source of knowledge and determiner of judgements supports certain ideas of Mannheim as well as Marx. Mannheim's "free floating intelligentsia" and Marx's "spokesmen for the proletariat" all achieve objective insights because they, as Popper would argue, have been able by virtue of their privileged positions and knowledge to give their thoughts over largely to the dictates of the third world. Along with Marx and Mannheim, Popper maintains that through permitting the free interplay of ideas under the guidance of the accepted rules of logic, science, criticism, interpretation, etc., certain privileged individuals are able to achieve the only kind of truth of which humankind is capable.

Besides complementing the thought of Mannheim and Marx in the way just indicated and challenging over-relativistic theories of knowledge, Popper's evolutionary epistemology leads to a further contribution to the sociology and

psychology of knowledge. This is his outright rejection of, what he calls, the "bucket theory of mind" or the "common-sense theory of knowledge". (Represented in sociology by references to the child's "TABULA RASA" at birth.) This theory still exerts a powerful influence in philosophy, psychology and sociology. It maintains, according to Popper (1973:62), that knowledge consists of things such as ideas, impressions, sense data, and so forth, which are in us and which we have assimilated from the pure, unadulterated elements of information which we have received. This theory holds that knowledge grows as a result of information received through the senses. This "bucket theory" of mind is, according to Popper (1973:61) "utterly naive and completely mistaken in all its versions". Proposed in its stead is the "searchlight theory" of knowledge which holds that all life forms, from amoeba to Einstein (a coupling much favoured by Popper), proceed by first having some expectation, theory, proposition, hunch and then seeking the information relevant to that. Every item of information we 'receive' is theory impregnated, which implies that it was not so much received as sought and expected. Our present knowledge is the result of searches prompted by yesterday's knowledge. Our oldest scientific theories emerged out of the searches encouraged by our pre-scientific myths which arose from even more primitive theories and expectations.

> Ontogenetically ... we thus regress to the expectations of the newborn child; phylogenetically ... we get to the state of expectations of unicellular organisms ... every organism is born with some horizon of expectations.

(Popper 1973:347).

This regressive line of reasoning leads Popper to the same conclusion reached by Piaget, Lorenz and others. He phrases the conclusion as follows:

> ... at every stage of the evolution of life and of the development of an organism, we have to assume the existence of some knowledge in the form of dispositions and expectations.

(Popper 1973:71). Elsewhere he states:

> I assert that every animal is born with

> expectations or anticipations, which could be framed as hypotheses; a kind of hypothetical knowledge. And I assert that we have, in this sense, some degree of inborn knowledge from which we may begin, even though it may be quite unreliable.

(Popper 1973:258). These assertions imply, if correct, not only that the highest forms of human knowledge developed in some way out of the more primitive forms going back eventually to innate dispositions, but also, and importantly, that these forms co-exist in the present and that a diachronic as well as a synchronic analysis of knowledge is possible.

The assertion that each level of knowledge achieved presupposes a prior level leads to the inevitable discovery, as Popper (1973:34) phrases it, that "all science, and all philosophy, are enlightened common sense". This discovery not only establishes a connection between social knowledge and individual knowledge but also between these forms of knowledge and genetically inherited dispositions. In short, scientific knowledge, philosophical knowledge and common-sense knowledge are socially, psychologically and biologically structured.

The ineradicable link which evolutionary epistemology discovers between scientific knowledge and common-sense knowledge echoes the link between scientific knowledge and operational thought discovered by genetic epistemology. These linkages and the unity they imply between science and common-sense suggest that the sociology of knowledge, especially its phenomenological branch, could benefit from these epistemologies. In recent years it has been the phenomenological approach to knowledge which has been stressing the close links and interdependencies between science and common-sense.

The two epistemologies considered and the sociology of knowledge

As rich as genetic epistemology and evolutionary epistemology are as fields for sociologists of knowledge to explore, they are just two of numerous fields which can

enrich the sociology of knowledge. The need to be brief has meant that not even the various representatives of even these two epistemologies have been given a fair hearing. Sociobiology, which applies evolutionary thinking very broadly, and ecosystemic epistemology, which concentrates on open yet bounded systems and recognizes paradox, contradiction and the quantum leaps of sudden change, are both fields which could have been reviewed with benefits for the sociology of knowledge (see Wilson 1975; 1978; Wilden 1972; 1976). Other fields and other writers could also have been reviewed with profit. As partial recompense for these necessary oversights, relevant aspects of these other theories of knowledge will be introduced where relevant in the following chapters.

Incomplete as it is, I nevertheless feel that the ideas of Popper and Piaget presented do serve to pave the way for what is to follow. The epistemologies referred to suggest ways in which the biological and psychological aspects of knowledge can be integrated into a more comprehensive sociological account. Certain ideas in the epistemologies considered have already been indicated as having some direct relevance to certain matters in the sociology of knowledge. It is worth noting a few more. For one, Piaget and Popper provide grounds for agreeing with Max Scheler that there are no absolute, historically constant forms and principles of reason, that knowledge, as well as the criteria for evaluating knowledge and the procedure for its production, evolves in the course of time (see Becker and Dahlke 1973: 202). For another, the naturalistic views of mind and knowledge found in the two epistemologies discussed concur with certain views expressed by Mead. As is apparent from his biography as well as from his recorded thought, Mead was deeply influenced by Darwin and the theory of biological evolution (see Coser 1977:348). Darwin's theory is the foundation of the pragmatism developed by Mead and his associates. For them, the mind and the knowledge it achieves are instruments for purposes of adaptation and survival. In statements which Popper as well as Piaget would no doubt endorse, Mead has stated, "The test of intelligence is found

in action" (1936:345). "Truth is ... synonymous with the solution of the problem" (1964:328). Science is "only the evolutionary process grown selfconscious" (1936:364). "The animal is doing the same thing the scientist is doing (1964: 346). (See Coser 1977:348-349 to whom I am indebted for drawing my attention to these important points of agreement between a significant figure in the sociology of knowledge and Piaget and Popper.) One further point of agreement between Mead and Piaget and Popper is his insistence on the indissoluble unity between the knowing subject and the object known. In extending the Romantic idealist argument that one cannot have an object without a subject, Mead argued that one similarly cannot have consciousness which is not consciousness of something. Subject and object are inevitably intertwined. Coser (1977:349) notes, "Mead learned from the German tradition the insistence on the interplay between subject and object in the process of knowing and in the construction of the self."

The biological notion of "mutation" finds its parallel in reflections on the development of knowledge which lead to the discovery of sudden ruptures in the flow of thought. This discovery not only signals an isomorphism between biological evolution and epistemic evolution but it also serves to draw the biology and the sociology of knowledge closer together, for both are confronted with the puzzle of novelty, of discontinuity, of creativity. As already noted, Piaget regards "novelty" as a key problem in his epistemology. It is also a problem in the sociology of knowledge. Le Court (1975:32) addresses this matter as follows, "One cannot get from the former (Newton's system) to the latter (Einstein's system) by collecting knowledges ... on the contrary, an effort of novelty is required ... there is not a <u>development</u> from the old doctrines towards the new ones, but far rather an <u>envelopment</u> of the old by the new ones." (See, also, Foucault 1974a, 1974b.) In his detailed discussion of cultural creation, Koestler (1969:227) wrote of mental evolution as being a continuation of biological evolution and stated (p 365), "The creative act itself has its evolutionary precedents in the phenomena of organic regeneration and in

the 'original adaptations' of which animals are capable in crisis."

Writing about creativity brings the name of Lucien Goldmann immediately to mind for it is he who has begun the task of developing a sociology of creativity for the sociology of knowledge (see Goldmann 1972; 1977). Goldmann is one of the few sociologists of note who admits, and reflects in his work, the influence of Jean Piaget. According to Maryl (1978:23-24) Goldmann and Piaget were personal friends and Goldmann learned from his friend as much as from Marx that man is neither an all powerful creator nor a simple spectator, but an actor who transforms the world and modifies himself in the process. But, whereas Piaget emphasizes the dialectic between the individual and the environment, Goldmann's approach is more thoroughly sociological. For example, he writes that "the true subjects of cultural creation are, in fact, social groups and not isolated individuals ..." (Goldmann 1977:ix). Furthermore, Goldmann credits Piaget with the idea that social processes or cultural productions should be explained in terms of their functional contribution to the relationship between a subject and its environment. Goldmann maintains that Piaget, like Hegel, Marx and Lukacs before him, understood that the behaviour of living things involves a "cyclical process of adaptation". In this process of adaptation both the living things and the environment are transformed. The structures which result from this drive to adapt, cognitive for Piaget and cultural/literary for Goldmann, constitute the structures to be investigated (Maryl 1978:23; Goldmann 1972:98).

Besides Goldmann, Habermas is a further contemporary sociologist who admits to having been influenced by Piaget. Habermas (1972:36) writes that his basically evolutionist interpretation of Marx has been reinforced by insights from "cognitive-genetic" psychology, stemming primarily from the work of Piaget and Kohlberg. On the basis of their "empirically saturated model of cognitive learning and socialization", Habermas has developed an evolutionary theory of societal learning. One of the chief strengths of Piaget's "genetic structuralism" for Habermas is, as he states (p 39),

that it is "... an approach which surmounted the traditional structuralist opposition to evolutionism by way of assimilating epistemological tenets from Kant and Peirce". He goes on to say that Piaget's work is of crucial importance for Marxist theory and he acknowledges Lucien Goldmann for having been one of the first Marxists to make this discovery and to integrate Piagetian ideas into a basically Marxist approach to culture.

Some differences between genetic epistemology and evolutionary epistemology

In discussing genetic epistemology and evolutionary epistemology, the impression might have been created that these are almost identical. This is not the case. Just as it is instructive to point to affinities, it is also instructive to point to differences. Consequently, as a conclusion to this chapter, it is worth noting a few of the differences.

One of the main differences between genetic epistemology and evolutionary epistemology arises from the latter's judgement that genetic epistemological questions are not the most important. Popper (1973:68) distinguishes between questions and problems relating to the "production" of knowledge and those relating to the "produced structures themselves". In addition, he maintains that the study of the products is vastly more important than the study of the production processes. He makes the rather dubious claim that we can learn more about the heuristics and the methodology and even the psychology of research by studying theories, and the arguments offered for and against them, than by any direct behaviouristic or psychological or sociological approach. In short, as he says, "... we epistemologists claim precedence over the geneticists ..." (Popper 1973:69). Piaget would take exception to such views. As has already been noted, he regards the rigid demarcation between the production of knowledge and the product knowledge as untenable and argues that a proper epistemology should be informed by a dialectical study of both production and product. In his evolutionary theory of knowledge Popper seems to have missed the important point so central to Piaget's thinking

that the canons of logic and the methods of science are themselves genetic products and subject to development. Popper's separation between his worlds is too rigid. In his eagerness to secure objective knowledge he simplifies and distorts the complex relationship that exists between his three worlds. Piaget's epistemology demonstrates, more correctly I submit, that these worlds are inextricably interwoven. They cannot be strung out like three beads on a string.

Another difference between evolutionary epistemology and genetic epistemology is the fact that the former relies on "trial and error" (or, for Lorenz 1977, "trial and success") and "conjecture and refutation" to explain the development of knowledge, the latter explains it in terms of "assimilation and accommodation". Though these processes are related in important ways, for example, they both imply action on the part of the organism, it is probably not too far off the mark to state that trial and error processes are but special instances of the more inclusive assimilation/accommodation processes. The idea of trial and error learning focuses attention on the information generating activities of the organism while the idea of assimilation and accommodation drawn attention to both information generation and the structural changes which result from this activity. It is the difference between a behaviouristic and a cognitive orientation. While both genetic epistemology and evolutionary epistemology are concerned primarily with scientific knowledge, the processes of trial and error serve better to explain the development of science than they do to explain the development of such other forms of human knowledge as religious knowledge or artistic knowledge. This is another reason why, in this study, the processes of assimilation and accommodation are preferred as the primary processes of intellectual and epistemic development.

As regards the driving force behind the need to know, evolutionary epistemology points to the negative consequences of error and the resulting drive for "error elimination" (Campbell 1974:417) or "problem solving" (Popper 1974:143; 1973:258). In this regard, genetic epistemology once more

proposes a more general process; that of "equilibration" (or "self regulation" as Piaget sometimes calls it). And, again, because "error elimination" is not a process which takes us very far towards accounting for the development of all varieties of knowledge, the more general Piagetian concept is emphasized in this study.

CHAPTER THREE

KNOWLEDGE: DEFINITIONS, PROCESSES AND VARIETIES

> ... it is impossible to speak in such a way that you cannot be misunderstood.
>
> Popper (1974:23)

In Chapter One it was noted that the sociology of knowledge inherited its conception of its subject matter from German philosophy of the last century and this, together with the discipline's tendency to oversocialize this narrow conception, has led to certain problems with its subject matter. In this chapter a conception of "knowledge" is proposed which is intended to assist in the solution of some of the problems of the conventional form of sociology of knowledge as it presently exists.

Sociologists who regard their discipline as a science, or who are merely concerned with communicating their ideas, generally express their irritation at the fuzzy concepts so prevalent in their discipline. Clarity is not only a scientific requirement, it is a human one as well for it is the essence of communication. Vague and troublesome definitions constitute a perennial lament and predictable critical comment in sociological writing. Such definitions are hard to avoid because sociology often deals with complex phenomena and uses common terms to describe them. The literature reveals that the list of concepts which cause sociologists grief increases rather than decreases as the discipline ages. This state of affairs permits the cynical assertion that sociology (if it is regarded as a science) appears to age without maturing. However plaintive the lament over the sins of omission and commission regarding definitions, the requirement remains that some terms must be defined if a

discussion is to be intelligible to more than the writer. The need for clarifying the meaning of a concept is especially crucial when a concept is put to a use which deviates from what most regard as its accepted usage or in cases where the concept is widely used in a variety of ways. Both these apply to the meaning attached to the work "knowledge" in what follows.

A number of specific meanings of the word "knowledge" have already been indicated. But even these, no matter how broad or inclusive they may be, still do not exhaust the range of things to which the word "knowledge" may be applied in the English language, let alone the privileged discourse of any discipline. As already noted, despite the philosophers' claim that they are concerned with knowing and knowledge (Yolton 1965:1), they are in fact only concerned with certain types of knowing and certain forms of knowledge. Philosophers recognize this fact. They often draw attention to certain annoying lexical difficulties in the English language which render the word "knowledge" especially problematic. In the idiom of English discourse we can equate knowledge as anything which can be said to be known. This obviously embraces a multitude of things. It is semantically correct to say that humankind knows how to go to the moon. In other words, humankind possesses the knowledge which makes flights to the moon possible. In the same manner of speaking it is also acceptable to say that people know how to breath, to walk, to drive, to climb, and so forth. We may even say that humans know how to be human, just as apes know how to be apes and fish, fish. In the spirit of this mode of expression, Chomsky has said that children know how to have two arms. The issue of consciously knowing how, or being able to report the method used, a criteria which some philosophers regard as essential if the claim to knowledge is to be allowed (see Hamlyn 1971:103), is obviously irrelevant to these examples which indicate that in ordinary English usage the domain covered by the word "knowledge" extends considerably beyond its philosophical boundary.

Because of the word's lexical difficulties, many philosophers draw a distinction between the knowledge "that"

and the knowledge "how". And, since they see the knowledge "that" as their prime concern, such philosophers generally, after a few perfunctory remarks about the knowledge "how" and the occasional recognition that it is somehow related to the knowledge "that", proceed to deal exclusively with the knowledge "that". This variety of knowledge is further subdivided and in this way the word's wide range of meanings is pared down and many lexical difficulties overcome. Over two thousand years of Western philosophy testifies to the fact that even though philosophers have dealt somewhat exclusively with one variety of knowledge, the variety focused on was worthy of the attention devoted to it.

Philosophers are generally only interested in particular forms of the knowledge "that" and hence a further distinction is often made between two types of knowledge "that". Russell (1959) terms these the knowledge "by acquaintance" and the knowledge "by description". The knowledge "by description" is taken by philosophers as the prime object of their study. It is also referred to as the knowledge "of facts" or the knowledge "of information" (see, for example, Russell 1959; Harman 1972; Ryle 1973; Pears 1971; Hamlyn 1971; and Lehrer 1974).

Piaget, Polanyi and others have argued that many of the problems philosophers encounter in studying the knowledge "that" stem from the impermeable boundary they construct around this variety of knowledge. By seeing it as related to other varieties of knowledge, especially the knowledge "how", some of these problems could be solved. It is for this reason that Piaget (1971:215) has argued, "To know how to (SAVOIR FAIRE) is a kind of knowledge (CONNAISSANCE) or ability or knowing (SAVOIR) like any other". The philosopher Pears (1971) is an exception among philosophers in that he, like Piaget, emphasizes the importance of the knowledge "how" and argues, contrary to Hamlyn, for example, that this type of knowledge occurs in the animal kingdom as well as the human one. What is more, life forms other than man not only know how to do things but can also be said, in certain instances, to know "that", to have some knowledge of fact. Pears (1971) argues in favour of the extension of the

knowledge "that" category to include certain acts of animal knowing.

The various usages to which the word "knowledge" has been put, some of which have been noted above and in the earlier parts of this study, have accumulated around this word a cloud of ambiguity, confusion and opacity. One may be tempted to throw up one's hands in despair and like the English philosophers Wilson and Pritchard to proclaim, even if for different reasons, that the word is indefinable.

"Knowledge" and information theory

In addition to the various usages of the word "knowledge" discussed above, there remains a further usage to which attention will now be directed. This usage offers a way out of many of the difficulties associated with some of the above usages and, as will be indicated, leads directly to the particular usage adopted in this study. The usage in question is one which has been developed by certain communication theorists and subsequently been employed by some general systems theorists, ethologists, biologists and psychologists.

In the broad field of communication theory, cybernetic terminology developed to label the host of new artifacts, processes, relationships, qualities and ideas which resulted from the invention of servo-machines, automations, and computers. This terminology and the visual, auditory and tactile imagery of its world offered the biological and human sciences a new language and set of symbols and images to replace the cliched mechanistic and organic languages which had been in service for so long. Just as eagles have been said to be good for "thinking with" by some tribal people, so computers have proven to be good for "thinking with" by modern industrial people. Many biological and social science texts are now replete with analogies, metaphors, models and concepts taken from cybernetics. Many of these have proven valuable by providing new insights and approaches to old puzzles. For example, Pribram (1976:84) writes that it is now standard practice among neurophysiologists to view the nervous system as an information

processing mechanism. According to Miller, Galanter and Pribram (1970:48), "The study of cognitive processes has made rapid strides by taking as its model brain mechanisms assumed to be similar to those of the digital computer."

Cybernetics begins with the fundamental insight that information is the controlling mechanism of the universe. This insight, as will become clear, bears an obvious relationship to the notion central to this dissertation that knowledge forms a distinct order of things and that this order is, among other things, the controlling mechanism of living systems. In a lecture to the International Conference on Cybernetics held in 1969, David Foster (as reported by Wilson 1975:31-35) described the universe as an enormous data generating, data processing and data utilizing mechanism. According to this view, the universe is alive by virtue of its banks of coded information and its activity controlling programmes. In terms of the computorial mode of expression adopted by Foster, an acorn may be regarded as programmed to develop into an oak tree. In other words, the acorn contains the basic information necessary to develop into an oak tree, given suitable environmental factors. Anticipating the meaning to be attached to the word knowledge, it would not be incorrect to say the acorn knows how to be an oak.

Cybernetics views the universe as composed of interacting members who continually exchange information, assimilate information and react in terms of the information at their disposal. Over time, informational exchanges have led under certain circumstances to the transformation of matter and life. Informational exchanges are even held to have been responsible for transforming inert matter into living form. Cybernetic theory asserts that the flow of information has produced in living organisms self-regulating controlling mechanisms. These are held to be not only the result of previous informational interactions between organism and environment, both in the course of phylogenesis and ontogenesis, but they are also involved in the continual process of responding to incoming and self-generated information. (See von Bertalanffy 1969; Campbell 1958; Buckley 1967; Shannon and Weaver 1949; MacKay 1969; Wiener 1968; and

Wilden 1972.)

"Knowledge" in evolutionary epistemology and genetic epistemology

Konrad Lorenz, who regards himself primarily as an ethologist but who is also an evolutionary epistemologist, admits to having been significantly influenced by cybernetics. In an important article he states that information theorists, most notably Hassenstein, led him to define knowledge as a "kind of transinformation between an organism and its environment that is affected by the adaptation of the former to the latter" (Lorenz 1969:14). In the same article he provides amplificatory alternatives to this definition. Knowledge is, "relevant, teleonomically organised information that has meaning for the organism receiving or possession it" and "knowledge is organised, relevant information". For Lorenz there is no difference between the words "information" and "knowledge" but in order to avoid confusion and misunderstanding he selects to speak of "information" when dealing with the cognitive functions of lower organisms and to speak of "knowledge" when referring to human thought. This is done to avoid the reproach of ascribing to creatures of lower rank human conscious knowledge processes. The employment of the words "information" and "knowledge" as semantic equivalents is continued in Lorenz's recent and seminal work entitled, "Behind the Mirror: A Search for a Natural History of Human Knowledge", published in English in 1977. In this book Lorenz argues that by acquiring knowledge an organism constructs for itself a progressively more detailed image of its environment and thereby enhances its chances of gaining energy and surviving.

Lorenz's approach to epistemological problems via ethology bears a close resemblance to that developed by Piaget via his biological and psychological investigations. This is particularly the case with their respective conceptualizations of knowledge, which are roughly similar. Despite agreement on some points, however, it should be pointed out that Piaget sees his overall theoretical approach as differing in important respects from that of Lorenz.

Piaget has taken pains to point this out (Piaget 1971:117, 313). Lorenz, on the other hand, though a contemporary of Piaget's seems not to have taken much note of Paiget's work. For example, Lorenz's "Behind the Mirror" (1977) deals with many of the same issues and presents many of the same arguments as Piaget's slightly earlier work "Biology and Knowledge" (1971) yet Lorenz makes not a single reference to Piaget's work. It hardly seems possible that Lorenz is unfamiliar with Piaget's work. This might be an example of professional jealousy and competition over credit for similar ideas developed independently.

Biologists have become interested in epistemological questions, as Piaget (1971:1) explains, because, "Among leading ethologists today there is a realisation that the problems of knowledge, including higher forms of human knowledge such as mathematics, can no longer remain outside the scope of biology". One of the main reasons for this involvement in epistemology is the fact, as Piaget (1971:2) explains, that "all knowledge presupposes a physical structure". This is hardly a new idea. What is new is the current attempts being made by many researchers in diverse fields to link the various hierarchical levels of matter, life and knowledge and to see how these relate and how the study of one level can further the understanding of the other levels and also, via this detour, further the understanding of itself.

That Piaget draws some inspiration from the field of cybernetics is apparent both in some of the terminology he uses and in the types of hypotheses he proposes. He says, for example (Piaget 1971:26), "The explanation of evolutionary mechanisms, so long shackled to the inescapable alternatives offered by Lamarchism and classical neo-Darwinism, seems set in the direction of a third solution, which is cybernetic and is, in effect, biased towards the theory of autoregulation". For Piaget (1971:26), "Life is essentially autoregulation". That is, life is grounded in the ability of organisms to acquire knowledge and to use this knowledge in the acquisition of even more knowledge. Life implies knowledge and the ability to modify the knowledge possessed

in response to environmental changes. The kernel of this idea dates back as far as Aristotle and features in various guises in the writings of many nineteenth and twentieth century writers, such as Mach, Rignano, Popper, Toulmin, Lorenz, Campbell and Capek.

The impact of cybernetics on neurobiology and neuropsychology has been considerable and brings the terminology employed in these disciplines close to that of Piaget and Lorenz and close to that which is employed in this study. Those who are concerned with studying the brain are fond of speaking of the brain as processing "information" and nerves are regarded as transmitting "information" electrically (Rose 1976:72). The cybernetic notions of "memory banks" or simply "memory", and "stored information" when used in relation to living organisms constitute near equivalents of the term "knowledge" as used by Piaget and Lorenz and as it is used in this study.

The cybernetic notion of "memory" is obviously derived from the older meaning of this word as it was and still is used to refer to the mind's (or brain's) storehouse of knowledge (or information). This older meaning of the word has not only been extended by analogy to the world of computers but also, by analogy or because of more substantive similarities, to organic entities and processes beyond the brain. Geneticists occasionally refer to the property which directs a growing organism to resemble its parents as an example of genetic "memory" (Piaget and Lorenz, as shall be indicated, speak in this instance of "innate knowledge"). In a similar fashion (these examples are from Rose 1976:254), immunologists sometimes refer to the way in which antibodies recognize antigens in tissues as examples of immunological "memory". According to Rose a lot is now known about the mechanisms of genetic "memory" and immunological "memory". The former depends on the properties of the molecules DNA and RNA and the latter on certain large protein molecules. He says of DNA, RNA and such protein molecules that they have become known as the "informational macromolecules"since they form specific information bearing codes (Rose 1976:254).

As good as cybernetic terminology is for "thinking

with", the mistake of allowing metaphor to determine the nature of the object which it is used to describe, must be guarded against. Social science has learned the bitter way the error of allowing organic and mechanic metaphors to distort its theories. For similar reasons, cybernetic terms, and, especially, the computer analogy, must be employed with discretion. It may be that our current tendency to think of the brain as a complex computer is due to the fact that we know more about computers than we do about the brain. "This analogy," writes Eccles, "rests on a superficial similarity with the process of input and output and may be disastrously misleading" (see Lausch 1975:159, from whom this quote is taken and who outlines the similarities and differences between brains and computers).

Knowledge defined

In the light of the foregoing discussions and bearing in mind the objectives of this study, two compatible ways of defining "knowledge" suggest themselves. The first is to define "knowledge" substantively, as the name given to the "organizing force" or "structure" or "programme" of life. The second is to define it genetically, in terms of its genesis. Obviously, as is true of all definitions, these definitions are intended as an initial orientation. The meaning of a concept can only emerge fully as it is used in discourse.

It is axiomatic to this study that there is an order of things existent in the observable analysable world which operates as the "programme" ("organizing force or structuring mechanism") of life, determining in its interactions with the environment the modes of being of all living things and thereby, paradoxically, also playing a role in its own development. This order of things has been variously labeled. In fact, its importance may be seen to be reflected in the large number of terms used to refer to it or to the things of which it consists. Among the more common ones are: "mind", "intelligence", "knowledge", "memory", "programme", "learning", "organization", "structure", "orienting system",

"action system", "plan", "behavioural abilities", "cognitive map", "neural network", "engram" and "cognitions". Such a plethora of descriptive terms underlines the abstract and problematic nature of this order. It also suggests a need for conceptual housekeeping. Understanding the order of things circumscribed by this array of terms could well be bogged down by terminological confusion.

In an attempt to bring some order into this terminology labyrinth, knowledge is defined in this study as the programme of life. It refers to that order of things responsible, as already noted, for the forms, behaviours, actions, thoughts, experiences and objectivations of living entities. This order of things can consequently be labeled the "knowledge order" or, alternatively, the "epistemic order".

(The adjective "epistemic" is derived from the Greek EPISTEME meaning knowledge and EPISTASTHAI meaning to know how to do. Hence, also, "epistemology" meaning theory or study of knowledge. The English word "Knowledge" does not work very satisfactorily as an adjective. It is for this reason that I have adopted "epistemic" as the adjectival synonym for "knowledge". This usage is encouraged by the widely accepted and used "epistemology". Though not yet in common use, the word "epistemic" is beginning to be used as it is here. Gruber and Vonecke (1977:xv) speak, for example, of the "epistemic subject" and the "epistemic Piaget". Maclean (1978:36) goes so far as to make a case for "epistemics" as a noun equivalent for epistemology and science.)

The epistemic order may be regarded as constituted out of everything that qualifies as knowledge. Thus, the stock of knowledge -- meaning the totality of that which can be said to be known -- constitutes the epistemic order. Though this study will sketch the outline of the epistemic order, a full discussion of it is obviously beyond its scope. The primary concern of this study, as has already been noted, is that part of the epistemic order which forms what may be called the human stock of knowledge. It is by concentrating on this, and in particular upon certain biological and psychological aspects of this stock of knowledge, that I

feel this work can make a contribution to the sociology of knowledge and to a comprehensive understanding of knowledge.

The genetic approach provides a second way in which "knowledge" may be defined. Thus, most briefly, knowledge is assimilated information. This definition is compatible with the former one and hopefully the two together capture the essential meaning of the concept as it is here intended. (As is explained later, assimilation implies accommodation and equilibration. This genetic definition is just that -- it cannot convey its full implications.)

Conceived in the above ways, the concept "knowledge" does, admittedly, deviate considerably from many of the more traditional usages. The merit of the concept as proposed should become clearer as the discussion unfolds. It can be noted at this point that, as defined, the concept subsumes many of the more restricted meanings of the word "knowledge" already referred to. These subsumed meanings may thus be regarded as sub-categories or specific instances of knowledge. This conceptual compatibility implies that the present formulation does not do violence to many of the academic and common English usages of the word. It should also become clear that the epistemic order which has now been defined is not a fiction created by language but a substantive order of things with observable, experienceable, even measurable, correlates.

Knowledge as assimilated information

The genetic definition of knowledge, that it is assimilated information, is derived from the manner in which the terms "knowledge", "information" and "assimilation" have been used by certain writers in the fields of biology, cybernetics, ethology and, especially, genetic epistemology -- as earlier comments were intended to reveal. My formulation is particularly indebted to the work of Piaget who, early in his studies, reached the illuminating insight that "all knowledge is an assimilation of a given external into the structures of the subject" (Gardner 1976:54).

By defining knowledge as assimilated information, a distinction between "information" and "knowledge" is being

drawn. This marks a deviation from, for example, Lorenz's (1969) definition of knowledge which, as was indicated previously, considers the two concepts as synonymous. Information and knowledge may be regarded as referring both to the poles of a process, and thus substantively different phenomena, as well as to the intermediate aspects of the process, and thus to phenomena which shade imperceptibly into each other. One may thus describe this process in both digital as well as analogal terms. Information is, thus, that which operates to "inform" an organism or a species. It determines the form of the organism's intelligence. It is the conveyor of messages but, because it becomes meaningful as it is assimilated, it is also the message. Knowledge on the other hand, is the meaning, intelligence, or knowing which life extracts out of information and which is to a greater or lesser extent incorporated into its structure and operation. Knowledge, referring to what a creature knows, contributes as much to information as does the "raw data" of that information.

Hence, as the concepts are intended in the present context, information and knowledge are related and complementary concepts but they are not synonymous. They are dialectically related. As regards life, knowledge is the product of the assimilation of information but knowledge actively constitutes the information it feeds on. Knowledge is a life possession, it is incorporated into the physiology of the organism and to some extent determines that physiology. Information and knowledge always imply each other. There is no knowledge unrelated to information and there can be no information outside the knowledge structures which construct information. The organism and the environment are as inextricably linked at the epistemic level as at the physical. Though information is constituted by the knowing organism, it is not totally, as the idealists would have it, a product of the knowing organism. It relates to the external reality at two levels. The first is at the level of the structures which constitute information and which themselves are the result of organism/environment interactions. The second is the stimuli which originate in the

external world.

According to Piaget (1971), life as we know it, however rudimentary or complex, implies certain undeniable associative characteristics. One such characteristic forms a fundamental point of departure for the present theory of knowledge as it does for Piaget. This characteristic is that all life entails knowledge and the ability to assimilate further knowledge from the range of information to which it is sensitive. In other words, at every stage of existence and development all life forms already possess a fund of previously assimilated knowledge and are able to supplement this by further acts of assimilation. It is for this reason that Lorenz (1969), as has already been mentioned, states that life is a knowledge process and Piaget (1971) states that life is essentially autoregulation, which is to say that life is an information assimilation process. Lorenz (1977:1) notes that it seems obvious to biologists but, for some reason, not to the philosopher or psychologist, "... that all human knowledge derives from the process of interaction between man as a physical entity, an active, perceiving subject, and the realities of an equally physical external world, the object of man's perception".

Life is the expression of knowledge. Life is made possible by the knowledge which organisms possess and by their ability to respond adaptively to the information they receive. All this implies a unity, an indissoluble communication link between organism and environment. It also implies a degree of plasticity in the face of communication. It should be noted that the responsiveness of the organism is not a passive and mechanical plasticity, such as the invariable expansion of gases when heated or the shape of the imprint of a fist pressed into soft clay. Instead, it is an active dialectical process in which organism and environment fuse in creating the types of information assimilable by the organism. The information which matters to life cannot be thought as existing independently from life because the life forms determine for themselves as a result of past informational assimilations what shall constitute information for them. Each species has its own range of species-specific

information. Outside the range of information which a life form constitutes for itself by virtue of its biological nature there is, as far as that life form is concerned, literally nothing else. Light and colour do not exist for life forms that cannot see, and as Lorenz (1977:6-7) remarks in the case of the human predicament, "We know nothing that can be made the object of scientific investigation but what we learn about ... (via) our phylogenetically evolved mechanisms for acquiring information ...". It is thus possible and accurate to consider the environment of every species to be totally composed of its range of information. In other words, whatever can serve as information for an organism constitutes the limits of its world. It delimits what Von Uexkull has called the UMWELT -- the perceptual universe -- of the organism. Von Uexkull defines the environment of any organism as the sum of the sensory stimuli affecting the behaviour of that organism (see Bleibtreu 1976:24; Piaget 1971:203). In a similar vein, H Weber is reported by Piaget (1971:203) to have defined the environment as the overall sum of influences, irrespective of their quality, to which a species or organism is susceptible.

Information

Since knowledge has been defined above as assimilated information, it is appropriate to pay some attention to what is meant by information and, as is done later, assimilation. One way of approaching the concept "information" is to begin with the idea of variation. It does not take much thought to reach the conclusion that without variation there could be no information and no knowledge. In fact, there could be no such thing as life. From what is known about the evolution of life it is inconceivable that it could have evolved in an unvarying environment. Variation in the environment is responsible for the origin and evolution of life. What is more, the rich variation of the Earth is responsible for its abundance of living forms and intelligences. The variety of living forms is a product, reflection and part of the Earth's variability. The simple observation of the richness of life in the intertidal zones of the sea and seashore provides

some substantiation for the view that such abundant variety is related to the great physical and, consequently, organic variation found in these zones. It would seem that as far as life is concerned variation begets variation.

The connection between variation and information lies in the fact that variation implies information. "Information may most simply and adequately be defined as 'variety' imprinted on a matter-energy base," writes Wilden (1976:268). At this level of analysis, information, like variation, has no meaning or significance and is not intrinsically distinct from what information theorists call "noise". However, as Wilden adds, for a living creature information represents "structured or coded variety" and noise "unstructured or uncoded variety". As a general rule, according to Wilden, more complex organisms employ a wider range and more types of variety as information than do simpler organisms. He concludes by stating that, "The distinction between energy and information is thus neither objective nor subjective as such, it is systemic." Information refers to any occurrence or variation in the environment or the organism which excites, irritates, stimulates, or in some other way makes an impression on the organism. In short, information is anything that makes a difference (see Shannon 1951: MacKay 1969).

While variation is the source of life, it is also its nemesis. Because of this, organisms have evolved not only to fill specific niches in the environment, but they have also developed the capacity to collect, process and use the available information. By using information regarding environmental change, organisms strive, through movement, bodily changes, intelligent behaviour, reproduction, and so forth, to make the necessary adjustments to ensure that the environment remains relatively benign. In this way adaptation and survival are secured. Thus it is that life cannot exist without utilizing information and acquiring knowledge. It is for this reason that Lorenz (1977:23) regards information as being the "root of all processes of adaptation".

Just as living forms have evolved to occupy different

environmental niches, so too have they evolved to occupy different positions in epistemic space. That is, each species is sensitive to and uses a particular range and variety of types of information and so achieves a species-specific stock of knowledge. Not all variation within an environment makes a difference to all life forms within it. Presidential elections matter not a jot to American cockroaches. For variation to make a difference, that is to serve as information for a particular organism, it must be possible for that organism to detect that variation in some way. Hence, the features of the organism which are sensitive to particular external and internal variation combine with selected physical attributes of such variation to constitute what is here referred to as information. It is only by means of its ability to make external and internal emanations subjectively meaningful that an organism can acquire any knowledge of its surroundings or its internal state. (A complex organism consists of interconnected parts and the function of the organism as a whole is dependent on informational exchanges between its various parts.) Information, as it is dialectically constituted by the organism in interaction with its environment, is the source of all knowledge. We may thus view knowledge as metamorphosed and biomorphosed information. Stated differently, information serves to inform the organism. Once the organism is informed it can be said to know; the piece of information which informed it has been assimilated and is thus no longer information but knowledge. It is a possession of the organism, part of its understanding of itself and its world and part of its internal structure. Because of each species's unique internal structure, stock of knowledge and range of information we may say, along with Von Uexhull, that man lives in a man world, dogs live in a dog world and fish in a fish world. No creature lives in <u>the</u> world. There is no <u>the</u> world.

Underlying the present study is the epistemological position of "hypothetical realism". A position derived from or implied in the works of such individuals as Lorenz, Campbell, Popper, Piaget, Cassirer, Wilson, etc. This

position, simply stated, assumes the existence of real living organisms in an equally real material world. It holds, as Campbell (1966) has argued, that though the Kantian thing-in-itself is not and cannot be apprehended as it is, each species nevertheless, as is evidenced by its very existence, has a knowledge of reality. This epistemological position permits the claim that the information which reaches an organism reaches it from some external or internal source. In both cases the information is taken as having a physical or material referent and constitutive dimension. Because it emanates from something, information conveys some data about that from which it emanates.

At its most basic, information consists of a flow of energy, whether in the form of pressure, light, sound, heat, electricity, radiation, chemical change, or any other form, which affects the organism in some way. Most generally, we may consider information whatever excites or irritates an orgamism. Excitability or irritability is a property of living matter manifest throughout the phylogenetic scale. It marks the beginning of the process by which organisms become informed about their surroundings and their own states. Information, beginning as emanation, may be regarded as undergoing a series of stages of biological translation as it progresses from excitation to sensation to perception and finally to cognition. As each of these stages, the message, so to speak, conveyed by the information, is prepared for the next stage. This process, quite obviously, requires at each stage an increasing amount of input from the organism itself. From studies of sensation and perception, it has been found that organisms actively constitute the information they receive. They select from among the wide range of information available. The initial selection is simply a function of the type of sensing devices they have. "No organism," writes Hinde (1970:71), "is equipped with sense organs suitable for detecting all possible physical changes in the environment." From within the band of information they are sensitive to, organisms select further in terms of what Popper (1973:145-6) calls their "interpretations", "prejudices", "theories" and "expectations". Some of these

are built into the sense organs and nervous systems of organisms and are part of their genetic inheritance, others are the result of perceptual and cognitive learning (see Gibson 1969).

John (1976:3-5) views sensations as first-order information because all it consists of "are the spatiotemporal patters of information arriving in the central nervous system because of the excitation of exteroceptive and introceptive organs". Perceptions are second-order information because they "are the interpretation of the meaning of sensations in the context of stored information about previous experiences". Consciousness is third-order information because it "is a process in which information about multiple individual modalities of sensation and perception is combined into a unified, multidimensional representation of the state of the system and its environment and is integrated with information about memories and the needs of the organism, generating emotional reactions and programs of behaviour to adjust the organism to its environment". John proceeds to characterize "subjective experience" as fourth-order information, "the self" as fifth-order information and "self-awareness" as sixth-order information. What is clear from his grading of types of information is that the organism is active in forming each and that this active role and the organismic contribution increases as one proceeds from considering first-order to sixth-order information. But though the "mix" does vary, the basic point is that information at each stage and order of constitution and assimilation represents a synthesis of what is external and what is internal, what is subjective and what is objective, it is a fusing of organism and environment (see Buckley 1967; MacKay 1961; Furth 1969; Polanyi 1964). This point is admirably made by Cassirer (1955:29) who wrote:

> It is one of the first essential insights of critical philosophy that objects are not "given" to consciousness in a rigid, finished state, in their naked "as suchness", but that the relation of representation to object presupposes an independent, spontaneous act of consciousness. The object does not exist prior to and outside of synthetic unity but

> is constituted only by this synthetic unity; it is no fixed form that imprints itself on consciousness but is the product of a formative operation affected by the basic instrumentality of consciousness, by intuition and pure thought.

The point is also made by Piaget (1971:4). He writes, "... no form of knowledge, not even perceptual knowledge, constitutes a simple copy of reality, because it always includes a process of assimilation to previous structures".

To recap somewhat poetically, information represents the environment projecting itself inwards into living organisms. Knowledge represents the organism projecting itself outwards into the environment. But these two projections, like two beams of light, are always intersecting and dependent upon one another. Without the beam of information there could be no knowledge and without the beam of knowledge information would remain a cosmic cacophony and meaningless light show. As the stock of knowledge of an organism increases, its light gets brighter, illuminating its world more widely. This allows the light of its world to enter consciousness more fully.

The fundamental epistemic processes

The concept "assimilation" has been used to describe the processes which transform information into knowledge. Having dealt with "information" and "knowledge" above as they are to be understood in this study, it is now time to expand on the meaning to be attached to "assimilation".

It should already be apparent that the concept "assimilation" is intended to be understood very broadly and generally. What is more, as this section will make clear, it is supposed to be read as implying the associated processes of "accommodation" and "equilibrium" since there is no assimilation without these.

Because there are so many different types of knowledge and such a variety of processes whereby life acquires knowledge, it may be objected that the use of one concept (or three associated concepts) to describe all these processes is to distort and simplify them. While such an objection

may have merit, it seems to me that the concept "assimilation" (or, more fully, the concepts "assimilation", "accommodation", "equilibrium") if properly understood and applied can be used to describe all these processes. Its advantage is that it directs attention at the fundamental similarities and presuppositions of all knowledge and knowledge processes while at the same time helping us to understand what is peculiar about each type and process of knowledge. Much of this dissertation is devoted to an elaboration of the basic thesis of genetic epistemology which holds that knowledge is the product of life and itself a life process. To the extent that this claim is valid, it seems reasonable to suppose that the concepts which can be used to describe biological evolution would also be of value in describing the evolution of knowledge. This dissertation is in part an exploration of this possibility.

As a life system and as a living system, knowledge involves, like all biological systems, both organization and adaptation. That is, at every stage of epistemic development there exists a structure which has content and which exists in some sort of relationship with its environment. The nature of this relationship is a dynamic one, variation characterizes both the organism and the environment, so that adaptation is an ongoing necessity. One way in which an organism adapts is by modifying its knowledge in response to changes in its relationship with its environment. Following Piaget, this adaptive modification of knowledge, which constitutes epistemogenesis, involves three related yet distinguishable processes. These are always involved in the development of knowledge and may be regarded as basic to any account thereof. The three processes are: assimilation, accommodation and equilibrium.

Assimilation

"Assimilation" refers to the process or series of processes whereby information is transformed into knowledge and becomes integrated with an existing stock of knowledge. The concept is derived mainly from Piaget's work in which it features prominently. For him, assimilation denotes the

process whereby living entities incorporate environmental data into their own organization. "Assimilation is the incorporation of an outside element (object, event, and so forth) into the subject's sensorimotor or conceptual scheme" (Piaget 1978:6). The concept conveys the central idea that between the external world and an organism's representation of that world there operate certain processes which translate and transform the available information into an assimilable form. Thus, though there always pertains a correspondence between the external world and an organism's representation thereof, this representation is peculiar to the organism. It reflects its nature as much as it reflects the external environment. Knowledge is thus necessarily biologically relative. Assimilation implies that only that which is assimilable can be assimilated. What an organism comes to know is determined by both information available and its existing structures.

Accommodation

In assimilating anything, a living organism has, of necessity, to change in some fashion. As a minimal condition, the organism is changed by the simple fact that something new has been added. The term which is commonly employed to refer to the changes which assimilation necessitates is "accommodation". The two concepts are thus complementary, the one presupposes the other and to speak of one is to imply the other. Though thus related, it is analytically necessary to employ the two concepts because they direct attention at different aspects of a holistic process. Whereas assimilation centres attention on the processes which operate on information to produce knowledge, accommodation centres attention on the processes which operate on the existing structures to incorporate the new knowledge. Thus, accomodation involves the altering of existing organic structures to match and integrate a new input. Piaget (1978:7) puts it thus: "The entire scheme of assimilation must alter as it accommodates to the elements it assimilates; that is, it modifies itself in relation to the particularities of events but does not lose its continuity nor its earlier power of

assimilation." Assimilation refers primarily to the development of knowledge via the acquisition of new elements. Accommodation, on the other hand, refers to the development of knowledge as a result of the internal changes which take place in response to new elements being encountered or which lead to such encounters taking place. Though both are always present, specific instances of epistemogenesis may be seen as primarily assimilatory while others may be primarily accommodatory. This statement should become clearer later.

Equilibrium

A basic characteristic of life is that it is precarious and exists always in dynamic tension with its environment. Life is, Piaget (1971:37) has written, "at the mercy of every possible disequilibrating factor, since it is always dependent on an environment which has no fixed limits and is constantly fluctuating". This tension between organism and world, between subject and object, which is reflected in the tension between assimilation and accommodation, describes one of the most basic structures of the life world. The dynamic character of this tension derives from both the nature of the environment and that of life. It is a tension that seems to be without end though it varies in intensity. It is in the nature of life to strive to reduce this tension. That life has this capacity is without question as the whole of evolution bears witness to it.

It is this striving, this struggle to survive, which results in the adaptations which chronicle the development of life. Without this striving there would have been no biological evolution and no epistemogenesis. Life seems to be driven by an inner necessity to equilibrate what is in disequilibrium. And, as Piaget has shown, just as morphogenesis can be accounted for in terms of equilibration so too can epistemogenesis. Equilibration describes the tendency of all living entities to seek to restore balance in situations of imbalance. As regards the epistemic process, it refers to the seemingly inherent tendency of living organisms to learn about their environments in order to achieve a balance between what they need to know in order to survive

and what they come to know. Another way of phrasing this is to say that organisms seek to balance assimilation with accommodation. "Piaget proposes," writes Lerner (1976:162), "that an organism's adaptation to its environment involves a balance, an equilibrium, between the activity of the organism on its environment and the activity of the environment on the organism."

Piaget regards equilibrium as the fundamental factor accounting for epistemogenesis. It is the moving force behind all cognitive development whether at the level of the individual or society. Though his discussions have been criticized, the concept "equilibration", according to Flavell (1971:125), is perhaps the only serious candidate there is for a true "mechanism of development". Piaget regards the tendency to equilibrate as an internal necessity which corresponds with disequilibrium, whether internally or externally induced, as its complementary necessity. There can be no development without disequilibrium and the capacity to equilibrate. Knowledge cannot come into being without coming into a relationship with already existing structures, i.e. without being equilibrated. At the same time, the existing structures, because they are involved in the equilibration, have themselves to change to accommodate what is new.

> The infant acting on objects, the perceptual system centring and recentring, the equilibrium of operations in middle childhood and adolescence, the scientist developing a theory, <u>any</u> kind of biological or intellectual function or structure involves autoregulation, an equilibrating interaction with the environment -- Russell (1978:115)

The tendency to equilibrate in the face of disequilibrium provides the 'need' or the 'motivation' for activity. "Nonbalance," writes Piaget (1978:13), "produces the driving force of development." We do not act unless we are momentarily in disequilibrium. We do not eat unless we are hungry nor do we work unless we need to do so. Similarly, as Piaget and Popper have both argued, there is no act of intelligence without a problem. Knowledge evolves as a result of what Piaget (1978:13) refers to as "increasing reequilibration" and "without nonbalance there would not be

increasing reequilibration". Disequilibrium opens the way to development since it offers a challenge to be surmounted and in this way can result in a higher state of equilibrium being achieved. "It is therefore evident that the real source of progress is to be sought in both the insufficiency responsible for the conflict and the improvement expressed in the equilibration" (Piaget 1978:13).

It is one of the paradoxes of genetic epistemology that despite the tendency to equilibrate, living forms seldom if ever achieve anything more than momentary equilibrium. Equilibrium is a process which, in striving for closure, is in fact simultaneously responsible for opening new instances of imbalance. "By no means does an equilibrium constitute a stopping point, since any finished structure can always give rise to new requirements in fresh substructures or to integrations in greater structures. The fact that states of equilibrium are always exceeded is the result ... of a very positive force. Any knowledge raises new problems as it solves preceding ones" (Piaget 1978:30). For Piaget, the structures which lead to a particular equilibrium continue to function beyond such a point and the result of such an equilibrium, even if it is more or less durable, has the potential to spawn further development. Paradoxically, an equilibrated structure can itself be responsible for disequilibrium and thus for change. Piaget feels that to regard equilibration as a mere step to equilibrium is misleading because equilibration continues beyond particular equilibriums and "it is constantly attempting to achieve <u>better</u> equilibrium" (Piaget 1978:30). The reason why equilibration produces <u>both</u> equilibrium and disequilibrium is that it involves an intrinsic necessity to construct, to continue functioning. Equilibration thus leads through momentary or simple equilibrations to what Piaget (1978:31) calls "increasing equilibrations". In our cognitive development, for example, and as is discussed in detail later, we achieve many equilibrations through the balancing of assimilation with accommodation. But our cognitive development does not stop with any of these. All such equilibrations are an essential ingredient in future imbalances and they are part

of the resources we employ in achieving further equilibrations. Science, for example, begins with problems and ends with problems (Popper 1977). This paradoxical nature of biological and epistemic equilibration is sufficient to distance the present usage of this term from those conceptions which have been attacked as promoting a static or conservative view of reality.

As the above indicates, assimilation, accommodation and equilibration are concepts which describe the dialectical nature of the relationship between information and knowledge and between the organism and environment. It is thus not surprising that these concepts are similar to those employed by other dialecticians. To describe the moments or processes of development, Baldwin referred to "integration" and "differentiation". Popper speaks of conjectures and refutation and trial and error. Other writers have spoken of "imitation" and "invention" while Hegel's wellknown trinity: thesis, antithesis and synthesis, stands as a parallel conception to that of Piaget. For Hegel, as for Piaget, all epistemogenesis proceeds dialectically. An important feature of Hegel's theory of knowledge, as Russell (1978:34) points out, is the way in which every item of knowledge is treated as a stage in a process. All knowledge is seen as standing in a relationship to what precedes it and what succeeds it. Knowledge is hence unavoidably potentially progressive and always relative. The Piagetian argument that equilibration is most accurately viewed as "progressive" or "increasing" is supported by writers such as Baldwin and Parsons, who spoke of "moving equilibrium", and Spencer, who referred to "open systems of fluent equilibrium" (see Russell 1978:41). Lorenz (1977:199) also views knowledge as developing dialectically and requiring continuing equilibration. He writes, "As bone cannot grow without the dismantling of bone structure so human knowledge cannot advance unless what has already been adapted and is already known gives way step by step to be replaced by new and higher knowledge."

The concepts "assimilation", "accommodation" and "equilibration" do not refer to single or simple processes. All three are blanket terms for a variety of processes many

of which are extremely complex and continuous. The full extent of these processes and their mode of operation and complexity will become clearer when specific examples and types are discussed later. The numerous processes which are embraced by these three related concepts may lead to the objection that their ambit has been stretched too far. But such an objection would be resting on a category mistake for while, as will be shown, there are many separate epistemic processes these can be conveniently summarized under the above concepts. And, what is more, such a summarization helps to emphasize a basic thesis of genetic epistemology which holds that all knowledge is the outgrowth of biological processes and reflect these. Knowledge, it is submitted, may be seen as the result of the assimilations, accommodations and equilibrations that have taken place in three contexts. These are: the context of the species, the individual organism, and the interacting organisms. Thus, knowledge is seen as being phylogenetically, ontogenetically and sociogenetically acquired and developed. To mark the major categories of knowledge produced I shall speak of innate knowledge, learnt knowledge and social knowledge. The major task of this study is to deal with innate knowledge and to show how it relates to learnt knowledge and social knowledge.

The human stock of knowledge -- a synopsis

As it is not possible to discuss all aspects of the human stock of knowledge in a work such as this, it is useful to present a synopsis of some of the major topics which such a discussion might include. This synopsis can serve the purpose of indicating how certain biological and psychological ideas and findings can be of relevance to the sociology of knowledge. Also, it can demonstrate to some extent the usefulness of defining knowledge and knowledge processes in the way they have been in the foregoing pages.

The phrase "stock of knowledge" is largely inspired by the work of Schutz (1974) though it is often encountered less formally used in epistemological discussions. The full meaning and aptness of this phrase is easily appreciated when it is realized that it is an English rendering of the

German word WISSENVORRAT extensively employed by Schutz and that the word VORRAT is philologically related to both the idea of "storehouse" and "provisions". Certain of Schutz's applications of the phrase "stock of knowledge" come close to what Piaget means by "action scheme" or what was earlier referred to as life's "organizing force", "structuring mechanism", "behavioural programme", etc. I have selected to use the Schutzian concept because it fits more smoothly and consistently into the overall conceptual framework being developed. In other instances, as has already been indicated, Piagetian phraseology is preferred and employed.

Very broadly and generally conceived, as the concept is used here, the stock of knowledge of any living entity is the totality of the things which it knows. It is the sum of all the information assimilated by that entity and at its disposal. The particular entity in question allows us to qualify the concept and in this way restrict its coverage. Thus, for example, we may speak of the universal stock of knowledge, implying by this the totality of the knowledge possessed by living forms. This stock of knowledge may in turn be viewed as comprised of the particular stocks of the various individual species, and, within these, of the individual members of each species. The whole can be understood by dealing with these more manageable units.

At the level of analysis of individual species, we may speak of the stock of knowledge peculiar to each species and label these accordingly. Thus, for example, we may refer to the canine stock of knowledge or the bovine stock of knowledge, meaning by this the knowledge possessed by dogs and cattle. While the main concern of this study is the human stock of knowledge, it will be necessary from time to time to make references to animal and, even, insect stocks of knowledge in order to understand certain aspects of the human stock of knowledge and its operation.

The human stock of knowledge consists of the totality of assimilated information possessed by currently living humans. By this I imply more than what is incorporated under Schutz's notion of the social stock of knowledge. The human stock of knowledge is much richer, variated, and complex

than, for example, Durkheim's idea of the "collective consciousness". The sociological concept "culture" includes some but not all the areas spanned by the concept "human stock of knowledge". The human stock of knowledge, as the phrase is used here, includes both the "knowledge that" and the "knowledge how" as distinguished in philosophy. It includes whatever intelligence of the human species informs either its emotions, its sensations, its perceptions, its thoughts or its behaviour. It includes the deep and distant epistemological regions mapped out by such investigators as Jung and Freud as well as the various epistemic levels described by Piaget and Lorenz. It encompasses the multiple forms of knowledge described by Schutz, Gurvitz, and Scheler. It includes all that some writers classify as skill, ability, habit, belief, ideology, truth, etc. In short, it incorporates all the varieties and types of knowledge at the disposal of mankind.

Just as each species may be considered to have a stock of knowledge, so too may each individual member of a species be considered to have its own particular stock of knowledge. In the case of the individual organism we shall speak simply of the "individual stock of knowledge" to refer to the sum of knowledge at its disposal. At their particular levels of analysis, both the species and the individual stocks of knowledge are comprised of a variety of distinguishable forms and types of knowledge. This variety is legion, and the knowledge which humans possess constitutes the most variegated and complex stock of knowledge known to exist. Confronted by the richness and complexity of the things which pass for knowledge in terms of the definition adopted it is obvious that if this totality is not ordered and labeled in some fashion a sensible discussion cannot proceed. A taxonomy of the varieties of knowledge is consequently essential. However, it should be remembered, the stock of knowledge can be divided and categorized in numerous, and essentially arbitrary, ways. The value of any taxonomy should be judged in terms of its efficacy in promoting understanding, initiating research, and facilitating discussion.

As was indicated earlier, the basic question with which

genetic epistemology concerns itself is, "How does knowledge come about?" (Furth 1969:255). This question and the answers it entails provides one way of categorizing, organizing and analyzing the universal stock of knowledge. In answer to this question, it may be said that all knowledge, it seems, as far as is presently known to science, arises from life in interaction with itself and its environment, or, as it may be abbreviated, the life predicament. Through this interaction process and the assimilation, adaptation, and evolution it implies, various forms and types of knowledge have come into being. The biological sciences, comparative psychology, genetic epistemology, and ethology have provided descriptions and taxonomies of many of these forms and types of knowledge. These sciences reveal that not only do the higher forms of life share many of the biological processes and structures with more rudimentary life forms but they also share many varieties of knowledge with them. In the light of this discovery Piaget (1971:80) has argued that it is "impossible to study human reasoning power as though it were a watertight compartment, quite separate from the evolutionary process of the other orders". It is for this reason that Piaget is primarily concerned with the problem of epistemogenesis, and initiated the approach he calls genetic epistemology.

In his seminal work "Biology and Knowledge", Piaget (1971) is concerned with tracing the parallels between the evolution of life and the evolution of knowledge and reason. He attempts to demonstrate the essential unity of life and knowledge in order to corroborate the neo-evolutionist epistemological thesis which he proposes. Piaget (1971:80) is of the opinion that the fact that man shares certain varieties of knowledge with other forms of life, "serves to corroborate the evolutionist interpretation". The isomorphisms between epistemogenesis and morphogenesis provide further corroboration. Piaget is one among a series of scholars to view the processes of knowledge acquisition as being, at their root, analogous to the natural selection processes advanced by theories of evolution. As a representative of this type of reasoning, Campbell (1969:6) puts the

kernel of the argument well by stating, "Learning, perception, and other increases in knowledge at the individual level, and increases in the accuracy and scope of scientific knowledge, are part processes of the more general case of increases in the adaptive fit of organisms to environment. ... Knowing and science are continuations of organic and social evolution and share their basic epistemology."

The sources of knowledge

Inquiries into the ways in which the things which are known came to be known have generally led investigators to the conclusion that knowledge is phylogenetically and ontogenetically acquired. Lorenz (1969; 1977), for one, was led by his investigations to this dichotomy. He emphasized that there are only two sources of knowledge, the genetic structure of the organism and the interaction between organism and environment. Thorpe (1963) also operates with this dichotomy and suggests that it should be possible to determine quantitatively the amount of phylogenetically and ontogenetically acquired behaviour possessed by any individual species member. Pringle (1951) has stressed that the characteristics of any organism (and this includes knowledge) come from only two sources: the zygote and the environment of the developing individual. (See, also, Rignano 1926.)

The knowledge which is ontogenetically acquired, that is, which an individual organism acquires as a result of its own experiences in the course of its lifetime, is designated "learnt knowledge" for the purposes of this study. Just as individual organisms to a greater or lesser extent acquire knowledge in the course of their lifetimes through interaction with the environment, so too entire species may be considered as ongoingly acquiring knowledge as a result of their interactions with the environment. This is what is meant when it is claimed that knowledge is phylogenetically acquired. According to Furth (1969) and Piaget (1971), the knowledge which is phylogenetically acquired and which may be viewed as evolutionary learning or learning by the genome, is as true a learning process as is ontogenetic learning. Because phylogenetic learning is learning by the genome, the

source of all inherited knowledge, it follows that such knowledge is genetically transmittable. For this reason this type of knowledge has been called "innate knowledge" by such writers as Piaget (1971), Bleibtreu (1976), Lorenz (1969, 1977) and Popper (1977). The term "innate knowledge" is adopted in this study to describe the knowledge possessed by a species which is genetically transmitted and which is the result of phylogenetic assimilatory, accommodatory and equilibratory epistemic processes. Put differently, innate knowledge, in contrast to learnt knowledge, is the knowledge shared by species members because it has been genetically inherited and is not the product of self discovery or learning. The totality of the phylogenetically assimilated information of a species or an organism constitutes, what is here referred to as, the "innate stock of knowledge" of that species or organism. At the level of the individual organism, the innate stock of knowledge forms the foundation and core of the individual stock of knowledge. If an organism is to be capable of learning it seems axiomatic that an innate stock of knowledge and a range of information must be assumed. The sum of information which is ontogenetically assimilated constitutes what is here called the "learnt stock of knowledge".

Social knowledge

Though the dichotomy "innate knowledge"/"learnt knowledge" includes all varieties of knowledge and subsumes all processes of knowledge acquisition, there is a third major category which can be added to these, though its taxonomic position would not be the same. This third major category is necessary because of the fact that there are so many social species. That is, many, if not most, organisms acquire some knowledge from their own kind as a result of social interaction (see, for example, Von Frisch 1967; Lindauer 1971; Wilson 1968; Etkin 1964; Barash 1977). The amount of knowledge so acquired obviously varies from the less social to the truly social species and according to their capacity for learning. The social process of knowledge acquisition and communication is sufficiently distinct, it

seems to me, to warrant a separate category.

The third process whereby knowledge may be acquired may be referred to as the "sociogenetic process". This refers to the means whereby a social entity (organism, collectivity, group, society, etc.) transmits information and whereby individual members of a social entity acquire knowledge from such socially transmitted information. The knowledge which results from this process is here referred to simply as "social knowledge". Social knowledge is the result of the assimilation of information originating in the behaviour and communications of conspecifics. Items of social knowledge are to a greater or lesser extent shares and shareable by the members of a social entity and its members acquire such knowledge as the result of informational exchanges with contemporaries and predecessors. When such items cease to be socially transmitted, they cease to be part of the social stock of knowledge but may exist as bits of archaeological information waiting to be rediscovered and reintroduced into the living stock of knowledge. Quite understandably this epistemic category has a central place in any treatment of the human stock of knowledge, especially as this is dealt with in the sociology of knowledge. As defined, this category does not imply a contradiction of the generalization that all knowledge is, in the last analysis, ontogenetically or phylogenetically acquired. Quite obviously, social knowledge is subsumable under the category "learnt knowledge".

The study of social communication in animals indicates that such communications are strongly genetically determined. Whereas, for example, ants use a chemical system, humans use primarily a vocal one. The systems have an obvious relationship to different genetic dispositions and features. Many species have evolved elaborate mating rituals requiring the social exchange of detailed information. The dependence of sexual reproduction on the exchange of social information, and hence the acquisition of social knowledge, illustrates the paradoxical and dialectical nature of the relationship between the genetic and the social component of knowledge. Not only does social communication presuppose genes, but genes presuppose social communication for their reproduction.

It seems therefore inescapable that the deepest structures of sociality are somehow articulated with genetically transmitted schemas.

The communicating and interpreting schemas of the various species differ greatly in terms of a number of features. In an influential article, Thorpe (1972) has compared the communication system of animals and humans in terms of certain "design features" first developed by Hockett (1960). An analysis of these provides insight into the features which the human communication system shares with those of other species and those which are more or less unique. Among the widely shared features are: the use of the vocal-auditory channel; broadcast transmission and directional reception; rapid fading; interchangeability; specialization; complete feedback; semanticity; and arbitrariness. The features more or less unique to human communication include discreteness (implying that the repertoire is discrete, not continuous; and that the possible messages in any language constitute a discrete rather than a continuous one), displacement (implying that signals can refer to things remote in time and space), openness (implying that messages are coined freely and easily and, in context, can be immediately understood), tradition (implying that messages can be passed on by teaching and learning from one group or generation to another), duality of patterning (implying that though the signal elements themselves may be meaningless, patterned combinations of them are meaningful), prevarication (implying the ability to transmit untrue, misleading or nonsensical messages with deliberate intent), reflectiveness (implying the ability of the communicator to reflect on and formulate messages about the communication system itself), and, finally, learnability (implying that the speaker of one language can learn another language).

In terms of design features such as the above, the communication schemas of the various species may be described. Such descriptions reveal the unique as well as shared design features of many such schemas. The human communication schema is revealed as unique in a special sense; it makes possible a new kind of life and form of social knowledge (see

Lorenz 1977:171-172). All the evidence available about what the various species know and can come to know suggests that there is a qualitative difference between humans and all other living forms. This qualitative difference is the capacity to produce, transmit, acquire and store social knowledge in a way not found in other creatures. This way is the way of language and conceptual thought.

What is it in humans that makes language possible? The full answer to this question is still being sought. In his discussion of the roots of conceptual thought, Lorenz (1977) provides a partial answer. He describes seven cognitive functions which, though all found in animals, are combined in humans in such a way that radically new cognitive capacities have arisen. The seven functions are: abstracting; insight and the cognitive representation of space; insight and learning; voluntary movements; curiosity and self-exploration; imitation; and, tradition (Lorenz 1977: 113). As is noted below, the work of Lenneberg, Chomsky, Bower, Lorenz and others supports the conviction that humans have language because they have an innate aptitude for it which other animals seem to lack. This aptitude can be seen as shaping language and the knowledge this leads to.

Cultural knowledge

The inborn aptitude which humans have for language makes available to them forms of knowledge and modes of communication unavailable to the other animals. To mark this distinction we may say that whereas many species (humankind included) acquire social knowledge, only humans to any significant degree acquire cultural knowledge. Cultural knowledge is a particularly human form of social knowledge even though it has obvious ties with forms of social knowledge found in animals. Among the characteristics of cultural knowledge are the following: it is learnt; it is acquired from others; its range of sharedness varies from a few persons to all persons; it is generally symbolically transmitted; it is expressed in and interwoven with the material aspects of society; it is often objectivated and available in some lasting material form; it is interpreted and

assimilated in terms of schemas that are themselves culturally developed; it is forever changing and immensely changeable; and it is generally consciously produced, transmitted and acquired.

As here understood, cultural knowledge comes close in meaning to that classical definition of culture provided by E B Tylor in 1871, "Culture is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (quoted in Gould and Kolb 1964:166). Because cultural knowledge is here defined in terms of its mode of production, acquisition and transmission and has nothing to do with questions of truth or falsity or the nature of the objects known, the list of things which are included as cultural knowledge is extremely inclusive. It includes, for example, attitudes, ideas, interpretations, explanations, accounts, descriptions, assumptions, theories, beliefs, axioms, truisms, dogmas, sentiments, traditions, faiths, creeds, myths, theologies, doctrines, taboos, legends, superstitions, lies, truths, fictions, jokes, fairy tales, facts, proverbs, languages, values, norms, ideals, goals, skills, abilities, techniques, etc. etc.

Cultural knowledge is not only a particular kind of knowledge, developed and acquired in a particular way as described here. It is also, obviously, the knowledge which expresses itself as "culture" in the full sense with which this term is employed in sociology and anthropology. Adopting the perspective of genetic epistemology, as is done here, does, however, place this work among the 'idealist' approaches to culture. According to Bidney (1970:174), cultural idealists are "impressed with the role of linguistic symbols in the communication and acquisition of knowledge and experience", and have as a consequence viewed culture "as the aggregate and historical continuity of communicated ideas or meanings exemplified in artifacts, institutions, and the behaviour of persons".

The "idealistic" approach to culture and society is well established in sociology and anthropology and complements the epistemic approach to biology and psychology adopted in

this study. According to Martindale (1964:346) the Tardean and Giddings branches of sociology, "stated that the ultimate subject matter of sociology consisted of ideas and beliefs". James and Cooley also regarded society as largely an epistemic phenomenon, a relation between individual stocks of knowledge. Cooley put the matter thus,

> ... the imaginations people have of one another are the solid facts of society ... Society exists in my mind as the contact and reciprocal influence of certain ideas named "I", Thomas, Henry, Susan, Bridget, and so on. It exists in your mind as a similar group, and so in every mind.

(Cooley 1902:84; quoted in Martindale 1964:344 and 347). Kroeber, the cultural anthropologist, may also be regarded as someone who saw society and social evolution in terms of shared cultural knowledge and the transmission of cultural knowledge. He wrote:

> All civilization in a sense exists only in the mind. Gudpowder, textiles, arts, machinery, laws, telephones are not themselves transmitted from man to man nor from generation to generation, at least not permanently. It is the perception, the knowledge and understanding of them, their ideas in the Platonic sense, that are passed along. Everything social can have existence only through mentality.

(Kroeber 1917:186; quoted in Bidney 1970:37).

The systems approach in sociology is also, fundamentally, an "idealistic" or "epistemic" approach as is the semantic approach. These are illustrated by Buckley (1967:43), who regards the relations of parts of society as "primarily psychic, involving complex communicative processes of information exchange", and Zijderveld (1974:39), who regards society as a "compilation of meaningful configurations". In recent years, it is the phenomenological branch of sociology and the sociology of knowledge as well as its offshoot, ethnomethodology, which most fully represents the idealistic approach to the analysis of social phenomena. Some indication of the idealism of phenomenological sociology and ethnomethodology is provided by their central concepts. Concepts such as externalization, objectivation, socialization, internalization, roles, meanings, typifications,

routines, rituals, legitimations, interpretive procedures, glosses, life-world, stock of knowledge, etc. (See, for example, Berger and Luckmann 1967; Schutz 1974; Cicourel 1973; Garfinkel 1967; Goffman 1959, 1971).

In the sociology of knowledge, which is concerned primarily with ideas, the approach is obviously "idealistic" though the various representatives of this discipline range (philosophically speaking) from extreme materialists, who see ideas as epi-phenomena, to extreme idealists, who see ideas as the prime determinants of reality. For reasons already expressed, genetic epistemology regards social and cultural knowledge as a part, and an expression, of matter while at the same time living matter and organized matter is taken to be an expression of knowledge. In short, the kind of theory of knowledge being developed here is neither materialist nor idealist, as already stated. Even the word dialectical, conveying as it does the notion of an exchange between two poles or objects misses the mark. Though matter and knowledge are at times opposed, they are just as often inseparable. It is thus futile to rigidly oppose mind and matter. Culture is not simply material and cultural knowledge is not immaculately conceived.

The "idealistic" or "epistemic" conception of culture adopted in this study implies a distinction between culture as artifact and culture as the knowledge embodied in artifact. Conventional sociology of knowledge concerns itself with some culture as knowledge but not with all. It is this that limits its scope. By regarding all cultural contents as knowledge, the sociology of knowledge would encompass, in addition to its present concerns, the "social phantasms and superstition and socially conditioned errors and forms of deception" referred to by Scheler (1980:75). It would furthermore begin to reverse the process of the "denial of the body" by thus also encompassing those forms of cultural knowledge which express themselves primarily in movement, in physical skills, in labour, and in technique, as well as in feelings and emotions.

Rather than being, as it is, a small and separate specialization, the sociology of knowledge by seeing all

culture as knowledge would expand to include the epistemic aspects of such other sociological specializations as the sociologies of art, education, culture and religion. This expansion together with the sociology of knowledge's obvious links with psychology and biology paves the way towards a comprehensive epistemic science devoted to the exploration of the entire epistemic order. From this could come the sort of interdisciplinary theorizing and cooperation which may yield a better understanding of the human stock of knowledge.

As designating major varieties of knowledge, innate knowledge, learnt knowledge, social knowledge and cultural knowledge must be treated as "ideal types". No one variety is ever present in pure form in reality. There is no way that they could be since organism and the physical and social environment form an inseparable unity. Social, cultural and individual learning presupposes an organism capable of learning. It thus presupposes at least some innate knowledge. Conversely, innate knowledge structures depend for their existence, operation and development on experiential and environmental factors. The articulation of these various types and processes of knowledge with each other should become clearer in the following chapters.

CHAPTER FOUR

INNATE KNOWLEDGE

> There is more reason in your body than in your best wisdom.
>
> Nietzche (1968:146)

The concern of this chapter is to discuss that variety of knowledge which organisms possess by virtue of their genetic inheritance. Genetically inherited knowledge, like ontogenetically acquired knowledge, is inseparable from the organism itself. The organism is a representation of what it knows. Knowledge, physical form and behaviour are all attributes of living things and to speak of one is to imply the others. Thus, while it can be said that innate knowledge is transmitted from parents to offspring in the same way as anatomical features, we must not make the mistake of thinking that knowledge and anatomical features are mutually exclusive things. The genetic transmission of knowledge implies the genetic transmission of anatomical form and behaviour characteristics. To describe life in terms of knowledge is to refer to much that is shared by anatomic and behavioural descriptions. Life is synthesis and unity.

Knowledge and organism originate in the same instance. The knowledge of an organism, which is, in a manner of speaking, the organism itself, originates in the process of conception. The information conveyed by sperm and ovum fuse by mutual and simultaneous assimilation to form an embryonic organism with its corresponding embryonic stock of knowledge.

Though conception takes place in a physical environment, it seems from the study of conception that the information exchange which takes place between sperm and ovum is so massive in comparison with the little if any information

exchanged between sperm and ovum and environment that we can legitimately regard such information as basically genetically transmitted and assimilated. Furthermore, because the transmission of information from parents to offspring during conception is the very process which constitutes a creature capable of experience we may regard the conceptually transmitted information as ontogenetically A PRIORI knowledge. (This is not strictly correct because both sperm and ovum are living cells and themselves capable of experience which can modify the information they transmit. The difficulty and, to some extent, artificiality of separating inheritance and experience is recognized but the fact remains that both are also, to some extent, real and have to be taken into account.) It is for these, and other, fundamental reasons that I consider it necessary and justifiable to establish and use the terms "innate knowledge" and "learnt knowledge".

Innatism defended

The considerable opposition to biological arguments and theories characteristic of much social science during the past fifty years has had the effect of making the word "innate" a dirty word. A word which, like other emotionally charged words, has the effect of inducing various forms of psychological disturbance in both user and opponent. This emotional halo is obviously not conducive to an objective study of the phenomena which the word labels.

In 1976 Lerner wrote that the nature/nurture controversy was still very much alive whereas in 1978 Barash (p 24) wrote that, "The old nature/nurture controversy has effectively been buried." Who is correct? Probably both, it is all a matter of the constituencies which they were representing. My own experience and reading suggests that for society as a whole, or even for social scientists as a group, the controversy is still alive and well. There may be no point in flogging dead horses as Koestler (1970:391) kindly tells us. But even a brief encounter with the social sciences is sufficient to inform one that there are no dead horses! In what follows I wish to defend a certain version of innatism

and in this way clarify further what is meant by "innate knowledge" in this study.

Innatist ideas, like biological arguments in general, have been consistently attacked during the past half century because they can be used, and have been used, to support racist, fascist or sexist ideologies and actions. In addition, such ideas are often considered to be reductionist; detracting attention away from the grandeur and irreducible nature of humankind and culture by reducing humans to a chemical equation, a double helix or an ape or some other demeaning entity. The recent emergence of sociobiology and its widespread condemnation is handy proof that the nature of human nature is still very much a living issue (see, for example, Caplan 1978). This is no doubt partly due to the scientific fact that so many important questions regarding human nature still remain to be satisfactorily answered. Equally importantly, ideas regarding the nature of human nature form a crucial element of all ideological systems and hence it is naive to expect a single model of human nature to be universally adopted even if science were to produce such a model. In brief, it cannot be denied that ideological considerations infect innatist theories and criticisms of such theories. Accepting such an admission should serve to make us all more cautious in proposing innatist arguments and in dismissing them.

Since conjecture and refutation are the essence of the scientific enterprise, it is not surprising that criticisms of innatism have been instrumental in the development of more satisfactory innatist theories and that the past ten years have witnessed a growing acceptance of some of these by the scientific community. Had the fundamental idea of innatism been worthless or erroneous it is unlikely that it would have survived its baptism by criticism. That it has survived suggests not only that it is a useful idea but also that it has empirical and theoretical support.

Space does not permit a full cataloguing of all the objections that have been raised against innatist ideas. Hebb (1958), Lehrman (1953), Beach (1955), Taylor (1958), Drever (1961), Tinbergen (1963), Putnam (1967), Hinde (1968),

Lerner (1976) are a few among a host of writers who have criticized innatist ideas. A common criticism of innatism is the argument that it is not possible for some forms of mind to be acquired and others to be innate (see Taylor 1958). This criticism makes the mistake of overlooking the fact that the innate aspects of mind are also acquired, only they are not acquired in the same way as those aspects acquired ontogenetically. To explain mind means to account for both acquisitions and the articulation of the phylogenetically acquired forms with those that are ontogenetically acquired. The above objection also seems to involve a category mistake since it is a logical error to expect that the acquisition of the innate aspects of mind could be accounted for in the same discourse as would suit an account of its learnt aspects.

From the kind of mistaken logic just referred to flows a related objection that holds that by employing concepts such as "innate", "instinctive" or "genetically given", an investigator is taking the easy way out of solving a crucial theoretical and empirical question. In the context of learning, Putnam (1967:2) puts such an objection thus: "Invoking 'innateness' only postpones the problem of learning, it does not solve it." One response to this is that far from being the easy way out or postponing the problem, references to what is innate can be seen as an honest attempt to deal with the full complexity of learning and of human nature. That an honest scholar does then not proceed to elaborate on the innate black box could just as readily be ascribed to a reluctance to enter a different universe of discourse. But, by noting the connection between, say, learning and what is innate, such a scholar prepares the way for the integration of his or her own ideas with those of scholars who have taken upon themselves the task of investigating the genetically derived aspects of human nature. The task of unravelling humankind's genetic inheritance is anything but an easy task. The efforts and failures of molecular biologists, geneticists, ethologists, sociobiologists, generative linguists and others attest to this fact. In reply to the above criticism, one might just as easily say that recourse to experience or

learning or environment is the easy way out because these things quite literally stare us in the face.

Lerner (1976:101) is among the writers who advocates that in studying behavioural development the term "innate" should be avoided because, as he states, "Such terms end scientific investigations by simply saying that behaviour develops in a certain way because the organism is built that way." Lerner advocates this despite admitting that the dichotomies nature/nurture, innate/learned are useful, despite accepting Piaget's use of the concept "innate schema" and despite himself writing (p 104), "All species of animals have processes available that are adaptive; that is every living species, by virtue of its existence, has processes that allow it to adapt to its environment." Since, as is indicated below, Lerner's basic position is similar to that adopted in this study, it is hard to understand why he is so strongly opposed to the concept "innate". Lorenz's use of innatism in particular is attacked. In this attack the travesty of so much scholastic criticism is clearly in evidence. What Lerner attacks is a caricature of Lorenz's thought. Obviously such a caricature cannot offer sound reasons for rejecting innatism.

In his attack on Lorenz, Lerner overlooks a basic fact of all scientific writing. Some things have to be left unsaid. One page 100 of his book Lerner attributes to Lorenz the view that certain properties appear in an organism "directly from the genotype, with experience having no influence". Does Lerner believe that a scholar of Lorenz's stature could seriously hold such a view? The use of the term 'phenotype' by Lorenz underlines his awareness of the unity between organism and environment and between experience and gene. It seems to me that Lorenz, like others, takes the "umwelt" for granted. Lerner wishes to remind us of it. Lorenz points to properties which develop as a matter of course in the phenotype, given that it exists in an environment roughly similar to that in which the genes evolved. Lerner tells us that ontogenesis always involves interaction between organism and environment. The one is referring to phylogenetic experience passed on genetically, the other is

referring to ontogenetic experience. To admit the former is not to deny the latter but to accept the latter without accepting the former is to propose an organismless organism.

Lerner maintains that there is simply no isomorphism between genotype and eventual behaviour. How can this be taken seriously? A great deal of ethology and animal psychology -- which does the obvious thing of assuming a natural habitat -- demonstrates that in a given environment, clear isomorphisms do exist between genotype and behaviour for many species. How in fact can one infer anything about the genotype -- which is an abstraction -- except from its phenotypic expressions which imply environment and experience?

Nowhere in Lorenz's writing have I come across the assertion that "genes can directly give you behaviour" (Lerner 1976:101) and nowhere have I found Lorenz to be so dogmatic as to argue that certain behaviour is "unavailable to environmental influence" or that "an organism must develop certain behaviours because it inherited a certain genotype" (Lerner 1976:101; Lehrman 1970:3). As a qualified medical doctor Lorenz must at least have been aware of the radical effects environment and experience can have on behaviour, especially when these lie behind mutation, physical injury or poisoning, to cite a most obvious point somehow overlooked by Lehrman and Lerner. It is only by understanding Lorenz's use of certain terms in the way he intended them to be understood that proper sense can be made of his work. In reply to criticisms levelled at his employment of the term "innate", Lorenz has stated, "Contrary to Hume, we believe, just as Kant did, that a 'pure' science of innate forms of human thought independent of all experience is possible." Were one to interpret "experience" here to mean both phylo- and ontogenetic experience then this would read like a metaphysical or idealistic proposition, not a scientific one. But I take Lorenz to imply ontogenetic experience and as such it makes sense within the bounds of his evolutionary epistemology. That is, he uses "experience" in the same way as does Hebb (1972:118) when he writes of the pecking behaviour of chickens, "... learning is not essential for all aspects of behaviour: the tendency to peck at small objects is present

in the newly hatched chick, and it has been reported that no prior experience is needed to make the chick peck at rounded objects rather than sharp-cornered ones." I am certain that Lerner would not misconstrue Hebb's meaning as he has Lorenz's.

It does seem to be the case, as Lorenz claims, that certain organic forms, behaviours and properties of mind do develop relatively invariably in the members of the species despite substantial variations in their environments and experiences. Because of this, the concept "innate" can be regarded as referring to something of substance. This is most clear if we regard that substance as the information coded in the DNA nucleotide sequences which constitute the genes. It is this DNA that lies behind the invariance of the characteristics of the members of each species. In an important statement, Monod (1974:107) says of the functional 'interpretation' of genetic information that it is unequivocal and rigorous.

> No supplementary input of information other than the genetic is necessary; nor, it seems, even possible, as the mechanism as we know it leaves no room for any. And to the extent that all the structures and performances of organisms result from the structures and activities of the proteins composing them, one must regard the total organism as the ultimate epigenetic expression of the genetic message itself.

According to Monod (p 108), there is no conceivable mechanism in existence whereby any instruction or piece of information (in the DNA sense) could be transferred to DNA. (The recent development of gene splicing is not a contradiction of this claim as Monod can be regarded as referring to <u>natural</u> mechanisms. On the other hand, the recent discovery that simple organisms such as viruses do assimilate and transmit pieces of DNA obtained from other organisms does suggest that mechanisms for the transfer of DNA do exist in nature and that such transfers have taken place and do take place. However, as regards complex organisms, it seems likely that structures have evolved to make the assimilation of foreign DNA difficult if not impossible. Hence, in a qualified sense, Monod may be correct. Since the 1980s are witnessing a

revolution in biochemistry and microbiology it seems that in the near future many widely accepted ideas and theories will have to be amended in the light of the incredible discoveries now being made about life. See Davis 1980.)

In the sense that it reproduces itself virtually invariably, the operation of DNA, "... denies dialectical description. It is not Hegelian at all, but thoroughly Cartesian: the cell is indeed a machine" (Monod 1974:108). So insensitive is DNA to "experience", "environment", and "learning" that the the anatomical outlines of the main phyla were differentiated over five million years ago. Biology tells us that certain species have hardly changed in hundreds of millions of years. Monod (p 117) cites the example of lingula which have remained unchanged for 450 000 000 years and the oyster which has not changed in 150 000 000 years. Furthermore, the basic chemical structure of living cells has been in existence for two or three thousand million years. The stability of life in the face of the forces of variation makes stability as much a puzzle as evolution.

What the foregoing amounts to is an argument for the retention of the dichotomy "innate/learnt". Both concepts are substantively, theoretically and empirically warranted. Chomsky (1968:73) has stated that, "We cannot avoid being struck by the enormous disparity between knowledge and experience", and proceeded to argue that for this reason, among others, an innate structure must be postulated that is rich enough to account for the disparities between experience and knowledge. Bidney (1970:xx) points out that without innate and universal properties there would be no particulars or variables to study, "Because human nature does not explain everything about culture, it does not follow that it explains nothing and may be disregarded for explanatory purposes."

The unity of life and environment

A proper appreciation of the nature and acquisition of knowledge seems to preclude opposing in any absolute fashion the concepts "innate" and "learnt". It does not seem meaningful or even possible to categorize an actual item of knowledge as purely innate or learnt. Knowledge, like

physical form and behaviour, is a phenotypic phenomenon. As such, innate/learnt, organism/environment, inheritance/experience are all aspects of the phenotype. It cannot be described in terms of one to the exclusion of the other. It is for this reason that Lorenz (1969:21) has stated, "... the stratified structure of the whole organism forbids the conceptualisation of living systems or life processes in terms of 'disjunctive' -- that is to say, mutually exclusive -- concepts. It is nonsense to oppose to each other 'animal' and 'man', 'nature' and 'culture', 'innate programming' and 'learning' ... Man ... is still an animal; human nature persists in and is the basis of culture; and all learning is very specifically innately programmed." Pribram (1969:2), who regards the neglect of the issues conceptualized by earlier investigators under the title "innate" as the consequence of the later narrow devotion of psychologists to behaviourism, posits that the correct behavioural response to the "innate/learnt" riddle is the view that all behaviour is inextricably composed of both innate and learned factors and that these are in continuous interaction.

Knowledge should not be seen as <u>either</u> innate or learnt, even though the requirements of discourse force us to adopt such categories. The truth is probably inexpressible. A line adapted from Lerner (1976:52) suggests how inexpressible; 100 per cent innate knowledge and 100 per cent learnt knowledge constitute knowledge and thinking 100 per cent of the time. The epigenetic approach to this conundrum seems to offer the most satisfactory solution. This approach maintains that each higher level of complexity is characterized by a new characteristic that was not present at the lower level. The unity of organism and environment is suggested by the epigenetic claim that the emergent characteristic has no direct precursor in the earlier state of the organism (Lerner 1976:31). Piaget (1971:125) expresses the essential epigenetic argument by stating that the development of knowledge as a biological attribute precludes

> any idea of empiricism or A PRIORISM and favours a continuous construction embracing the two aspects of inseparable relational totalities and historical development. The

> formation of knowledge is thus seen as the history of a progressive organisation; by eliminating any kind of fixity in both object and subject, the explanation of it necessarily lies in the direction of equilibrium and autoregulation mechanisms, as much in order to link the respective contributions made by subject and object into one functional totality.

The inextricable nature of the relationship between innate knowledge can be further illustrated by emphasizing the dependence of what is acquired through learning on what is genetically given. As was stressed earlier, all knowledge presupposes a biological component. Lorenz (1965:585) says in this regard, "the innate" is "what must be in existence before all individual learning in order to make learning possible". It is Lorenz's view that all learning is performed by mechanisms which contain "phylogenetically acquired information". A basically similar argument has been presented by Piaget (1971:252) who states that every kind of knowledge presupposes an irreducible biological component as a necessary and continuous functioning accompaniment. Just as learning depends upon and reflects what is innate, so too, in an analagous way, what is innate depends upon the environment and experience for its unfolding. If we pause for a moment to consider what is meant by environment or experience it will be clear that a phenotype cannot develop without both of these no matter how rigidly its genes are held to determine it. Most obviously and fundamentally, the phenotype is developed out of material taken from the environment. This is itself an organism/environment interaction, a form of experience. Also, "environment" is not a simple, unproblematic concept. Where does organism end and environment begin? Sensations, perceptions, cognitions are all a fusion of both. Each part of an organism has its own "environment". As Ausubel (1957:27) states, "... the influence of genes on development is never complete or absolute, but always reflects to a variable extent the influence of the intracellular, intercellular, gestational or external environment."

Modern genetics has discovered that the genetic information available at conception is insufficient to produce a fully developed organism. To develop, the embryonic stock

of knowledge has to be supplemented by information from outside -- even in the most genetically determined organisms. Because of the constancy of certain bits of information in the environment, life seems to have adopted the strategy of a traveller. That is, life, like a traveller, does not have to have at the beginning of its journey all the information necessary for its journey or for arriving at its destination. All that is required is the knowledge necessary to recognize, decode and assimilate salient information encountered on the way. The road to development is externally signposted just as is a journey. Buckley (1967:61) notes in this connection, "... it is not necessary for the genes to carry all the detailed information, but rather it suffices for them to carry a set of rules to generate the information." Because it is keyed into the environment, knowledge, whether innate or learnt, can simplify matters by resorting to condensation, abbreviation, signing, symbolism, anticipation, abstraction, generalization, selective forgetting, etc. etc. Constancies in the environment and constancies in the genes account for the constancies in the adult phenotype.

Though issue was taken with Lerner earlier as regards his unfair treatment of Lorenz, it is worth referring to him in concluding this section as he provides, in his description of the "organismic position", a statement of a theoretical position which I would endorse. This position is characterized by the fact that it is epigenetic, probabilistic, anti-reductionist, qualitative, multiplicative, and interactionist (Lerner 1976:15-16, 31). An organism's form, behaviour, experiences, knowledge, and so forth, are a product of what is innate and what is learnt. The development of knowledge is characterized by qualitative changes that are due to both innate and learnt factors. Knowledge develops, to some extent, epigenetically. Different stages are characterized by forms of knowledge not directly derived from earlier forms. They are the result of creative equilibrations, involving existing knowledge and action upon this resource and the environment. Organisms do not passively acquire knowledge, knowledge is a construction. Knowledge drives organisms to act upon their environment just as much as environ-

mental events can be seen to produce reactions in the organism.

Granted that what is innate and what is learnt are inextricably interwoven, it is fair to ask whether it is worth hanging on to this distinction. Some theorists, like Lerner, suggest that we abandon "innate" but then we might just as well abandon "learnt". It seems to me that given the state of knowledge currently available and the structure of human discourse, we have no alternative but to resort to and use such admittedly unsatisfactory concepts. To speak about reality we have to begin somewhere and focus on something. There is no other way we have discovered to come to grips with our world. We have no alternative but to seek truth via the distortions which set in once we begin seeking. In seeking to speak about the nature of humankind we are probably trying to speak about something that is unspeakable. Herein lies many of our difficulties. The concepts "innate knowledge" and "learnt knowledge" are used here in the sense that certain forms of knowledge are "primarily" genetically acquired while others are "primarily" acquired through learning. The preceding discussion should serve as qualification for the use of these concepts in this study and the meaning that should be attached to "primarily".

The phylogenetic process of knowledge acquisition

Innate knowledge refers to the knowledge an organism possesses by virtue of being a member of a specific species. In what follows attention is devoted to the manner in which species may be considered to have acquired the knowledge which its members transfer genetically to offspring. Because the origin and development of innate knowledge is reflected in the genesis of physical characteristics and behaviour, it can be asserted that a fair amount is known about the genesis of this form of knowledge.

In addressing the problem of the acquisition of innate knowledge the genomic perspective needs to be adopted since it is the genome which is the controlling system of a species. It is the genome which acquires innate knowledge and modifies its knowledge. The innate knowledge inherited

by individual organisms is, as far as is now known, genetically speaking, basically static. It does not change and is not added to as it exists in the individual phenotypes.

The genome acquires knowledge or alters its knowledge through the phylogenetic assimilation of information. Thus, "... instinctual, or more strictly innate, knowledge refers to learning that took place during the millenia of biological evolution" (Furth 1969:186). Throughout the eons of their existence, the various species have, by means of the phylogenetic assimilation of information, acquired and continued to acquire the knowledge of the physical form and modes of behaviour suited to survival in their environments. Because the relationship between species and environment is characterized by both periods of relative stability and rapid change, a species may be regarded as essentially confirming the effectiveness of the knowledge it has acquired during the periods of stability and attempting to modify this knowledge in some advantageous direction during periods of change. As knowledge is the product of billions of years of interaction between genome and environment it is to be expected that the innate stock of knowledge would reveal strong teleonomic characteristics. The stock of innate knowledge seems to ensure a remarkable fit between species and environment. Individual species members seem, under normal circumstances, eminently genetically prepared for the world they inhabit. To illustrate, Piaget (1971) has drawn attention to this general point by referring to the case of instinct which may, in this context, be regarded as representative of a variety of innate knowledge. He writes (Piaget 1971:196), "Instinct is the model of behaviour which is both pre-established, since it rests on genetic information to a large extent and yet also remarkably anticipatory, since it adjusts itself to the external environment as though it had both knowledge of the end in view and instrumental relationships subordinating to this end a series of successive and connected means in a soundly adapted manner."

The origin of life marks the origin of innate knowledge. Its genesis is to be found in the appearance on Earth of the first forms of life which resulted from an accumulation of

random events involving the organic molecules present in the upper layers of the warm oceans (Burnet 1980:6). According to Hawkins (1964:269), life commenced with the appearance of self-reproducing molecules. These molecules did not learn to reproduce themselves; rather, they learned to live. Like a hoof in soft turf leaves its impression, these molecules of necessity reproduced themselves whenever it chanced that they came into contact with the necessary molecular material under appropriate conditions. Seen thus, life is, in a most fundamental sense, epigenetic since, "out of a solution of monomeric molecules devoid of any symmetry, larger molecules, of a higher degree of order, have appeared and immediately acquired functional properties previously absent" (Monod 1974:84). But life is also the result of chance preformations and the laws governing inert matter. Accurately considered, therefore, life is neither solely preformed nor epigenetic. "The complete structure was never preformed; but the architectural plan for it was present in its constituents themselves, so enabling it to come into being spontaneously and autonomously, without outside help and without the injection of additional information. The necessary information was present, but unexpressed, in the constituents. The epigenetic building of a structure is not a <u>creation</u>; it is a <u>revelation</u>", writes Monod (1974:87).

Hawkins (1964:269) makes the important observation that self-reproducing molecules, even though internally inert and externally naked, are nevertheless subject to the Darwinian principles of variation and selection. Differences in the "reproductive behaviour" of such molecules and in their capacity to use the environment could conceivably have given some an advantage over others and thus initiated the enduring saga of evolution. Life appeared, writes Hawkins, when certain self-reproducing molecules became, probably as a result of molecular variation and primitive selection forces, encapsulated in a membrane that gave them a new advantage. What the membrane did was probably to increase the concentration of material used for reproduction and thereby increase the reproduction rate. It is obvious that an informational exchange is involved between self-reproducing

molecule and environment in the acquisition of reproductive material. "The semipermeable membrane, which admits one molecule and excludes another, is an informed membrane", writes Hawkins (1964:270), "The cell is discriminating, selective, it sets itself over against its environment, it is not merely an inert element, it is an ensemble. It is a microcosm that maintains commerce with the world and is not just kicked around, it is alive." According to Monod (1974:52), the "teleonomic" performance of protein molecules in cell construction and reproduction rests upon their 'stereospecific' properties, "... upon their ability to 'recognize' other molecules (including other proteins) by their shape, this shape being determined by their molecular structure. There is here, quite literally, a microscopic discriminative (if not 'cognitive') faculty."

As remarked earlier, variation is the fundamental source of life, information and knowledge. It is now accepted by many scientists that chance events in cosmic terms lie behind the formation of our life supporting Earth. Similarly, chance lies behind the variations which produced life. And, finally, Earth's living forms are the result of chance occurrences in environment and in genetic structure. What is basic to life is both the arbitrary arrangement of the primary proteins and their faithful reproduction in structure after structure through countless ages. That life should have occurred at all is, as Monod convincingly argues, massively improbable, even miraculous. But it did happen because, as Monod states, "A totally blind process can by definition lead to anything; it can even lead to vision itself." Life is, from its inception, the product of chance and necessity. The same may be said of knowledge.

The paradox of life is that while DNA guarantees the invariance of the species, microscopic variations in the transfer of information in genetic reproduction and in the codes themselves ensure the changes upon which natural selection operates and from which evolution flows. These microscopic variations are due to the inherent variability of molecular, atomic and sub-atomic matter. Modern physics, says Monod (1974:108), has discovered that no microscopic

entity can fail to undergo quantum perturbations whose accumulation within a macroscopic system will slowly but surely alter its structure. Because of this fundamental physical fact, genetic reproduction, seen microscopically, is not quite the guarantor of invariance it appears when viewed macroscopically. A small perturbation in the chemistry of the DNA will be replicated in reproduction. Similarly, during reproduction miniscule "errors" in translation might lead to a minute difference between parent DNA and offspring DNA. Such an error or mutation might thereafter be faithfully reproduced in succeeding generations. Monod (1974:109) lists some of the discrete accidental alterations which DNA sequences might suffer. Such mutations might be due to: (1) The substitution of a single pair of nucleotides for another pair. (2) The deletion or addition of one or several pairs of nucleotides. (3) Various kinds of 'scrambling' of the genetic text by inversion, duplication, displacement, or fusion of more or less extended segments. An example of the last form of mutation is offered by Hill et al. (1971:278). This form of mutation is called "crossing-over" and occurs when the order in which genes lie on the chromosomal thread is altered through the thread looping in such a way that it breaks at the point of the loop and the loop ends switch connections with the rest of the chromosomal thread. In this simple rearrangement the information available to an organism or species may be significantly altered. (For further examples, see Monod 1974:177-180.)

Because of the tenacious conservatism of DNA it is common to regard mutations as extremely rare events. But mutations are not quite as rare as many texts lead one to believe. In fact, mutation can be seen as the rule rather than the exception. Because of either the vast numbers and rapid rates of reproduction of simple organisms or the massive amounts of information contained in the genes of higher organisms and their high number of cellular generations in the germinal line, mutations are fairly common. Monod (1974:116), from whom this important insight comes, estimates that in the present-day human population there

occur, with each new generation, about a hundred thousand million to a billion mutations. Rather than life evolving on a meagre sum of variation, it has a "vast reservoir of fortuitous variability ... in spite of the jealously conservative properties of the replicative mechanisms" (Monod 1974: 117). The vastness of this variability makes the stability of forms as much a puzzle as evolution.

What is particularly significant about the variations just referred to is that these are accidental events. From this observation flows the profound discovery that since such variations "... constitute the only possible source of modification in the genetic text, itself the sole repository of the organism's hereditary structure, it necessarily follows that chance alone is at the source of every innovation, of all creation in the biosphere" (Monod 1974:110). According to Monod, this hypothesis is today the only conceivable one that is compatible with observed and tested fact. He is, further, of the opinion that nothing warrants the supposition (or hope) that this hypothesis could be wrong. His conclusion is worth quoting, "... the same source of fortuitous perturbations, of 'noise', which in a nonliving (i.e. nonreplicative) system would gradually lead to the disintegration of all structure, is the progenitor of evolution in the biosphere and accounts for its unrestricted liberty of creation, thanks to the replicative structure of DNA: that registry of chance, that tone-deaf conservatory where the noise is preserved along with the music" (Monod 1974:113).

Since life is the product of the fortuitous variability of matter, as just indicated, it is not entirely surprising that life "discovered" the value of creating differences. Most living species have evolved structures and processes to generate variation; these may be seen as producing "designed" rather than "fortuitous" variation. Because of both of these forms of variation, organisms are intrinsically variable even before they undergo differentiating experiences. Sexual reproduction involving MEIOSIS is the primary genetically "designed" variation generating mechanism found in nature. (MEIOSIS refers to the variation generating probability mechanism by which lawfully combined random samples of genes and

chromosomes are passed on from parent to offspring. (See Hirsch 1972:298; Hill et al. 1971:8.) Genotypic variance is compounded in the phenotype. According to Hinde (1970:428), the variance of any biological characteristic is "the sum of the quantities representing phenotypic variance, genotypic variance, and the variance in the interaction between genotype and the environment". The adaptive advantage of any single genetic variation is tested in terms of, firstly its interaction with the rest of the organism's genetic structure, secondly, its interaction, as part of the phenotype, with other organisms of the same kind, and, thirdly, its interaction, again as part of the phenotype, with the physical environment. Because a miniscule variation in the genotype can be compounded into something significantly advantageous in the phenotype as a result of these interactions, it is not stretching credibility too far to imagine that much of evolution has proceeded on the basis of such tiny variations. It is worth remembering that it was one of the important discoveries of Darwin and Wallace that the individual members of a species show variation in all characteristics (Hill et al. 1971:291). This abundance of variation must be seen as both the producer and the product of biological evolution.

It is from assimilating the information flowing from its own variability and from that of the environment and phenotypic responses that the genome acquires knowledge and modifies its existing knowledge. Each new generation instructs the genome as regards which phenotypes best match the demands of existence. The genome accommodates its knowledge to this information. Its knowledge evolves towards an equilibrium between itself and the sources of variation. Though certain equilibrations are achieved during this evolutionary process, no final or absolute equilibration is achievable because of the fundamental contradictions involved in the evolution of life and knowledge. Hawkins (1964:279) puts this well when he wrote, "It is in the nature of life to change its nature."

The fact that some variation is genetically produced has led certain writers to see the genome as acting "blindly

intelligently". We can recall Popper's (1963:51) words, "... to live in this world of ours ... there is no more rational procedure than the method of trial and error -- of conjecture and refutation." One may view the designed yet random differences generated by particular species as "hypotheses" or "experiments" leading to better adaptations. Which is to say, to a better match between organic structure and reality. These genetic "hypotheses" or /experiments" are confirmed or rejected by organism/environment interaction. Thus, as Lorenz (1965; 1977) suggests, we may see the genome learning about itself and the world through the process of "trial" and "success". As Lorenz (1965:19) explains, the genome cannot learn from its mistakes as can an intelligent organism. The hit and miss method of genetic variation gains only by its successes and not by its failures. The genome continues blindly to produce those variations that have proved unsuccessful millions of years ago -- it proceeds like a scientist who has no memory and keeps no notes of the outcome of his experiments. Thus while we may appropriately see the individual organism as learning from both its errors and successes, the blindness of the genome implies that it can only learn from its successes. These successes will drag with them all the errors which are not fatal but which are, objectively speaking, surplus baggage. In this hamstrung fashion the genome achieves its knowledge. Only the successful variations survive to reproduce. The most fit of these reproduce most prolifically. They thus direct the route of evolution in the direction of their characteristics. In sum, innate knowledge develops through the genetic generation of variability and the survival and reproduction of specific stocks of knowledge under the selective pressures of the environment.

The processes sketched above provide part of an answer to the question, "Where does innate knowledge come from?" Though it seems highly improbably that genes can contain all the information ascribed to them and that chance, variation and natural selection should account for this information, this is as things stood until fairly recently. (As already noted, the current explosion in biological knowledge as a

result of the discoveries made possible by the "new biology" may require that many of the ideas expressed here will have to be severely modified.) According to Lorenz (1969:23) there seems to be no limit to the quantity of information the gene can acquire and retain. Its capacity seems to be superior to that of mind and culture.

As fantastic a procedure as the genomic assimilation of information is, it has two fundamental weaknesses. (1) It cannot deal with rapid changes in the environment, especially with those that take place in the "dead time" between one reproductive season and another. (2) Despite its incredible informational capacity it cannot convey a completely detailed knowledge of the environment in all its minute detail. It is probably because of these limitations that mechanisms for processing detailed instantaneous information about the environment and for ontogenetic learning have evolved. The senses, the nervous system and the brain may be seen as ways in which the genome overcame some of its inherent weaknesses as an intelligent instrument. The variability of information made available to the individual organism by these organs led, it seems, to the selection of the superior organs at each evolutionary stage. Obviously, the organism enjoying the most accurate picture of its environment had a better chance of survival and reproduction than one with a less accurate picture. Hence it was that the sensory, perceptual and cognitive apparatuses evolved along with their associated and gradually improving stocks of knowledge. By acquiring the capacity for instantaneous information utilization and for learning certain species achieved a new form of knowledge -- learnt knowledge. This form of knowing was in its turn handicapped in that the knowledge it yielded always died with the individual organism. It was only when a few species learnt to learn from their own kind and other creatures that this handicap was overcome. The result of this phylogenetic advance was social learning which yielded first social knowledge and, in a few species, eventually cultural knowledge.

An alternative view

The foregoing is a description in primarily neo-Darwinian

terms of the acquisition of knowledge by the genome. This is, scientifically speaking, the most respected approach today. But since, among biologists, the issue of natural selection and mutation versus types of Lamarckism has still not been settled, it is worth noting a few Lamarckian or "dialectical" ideas. Piaget is among those who argue that evolutionary theories employing the notions of chance mutation and natural selection (like that of Monod) to account for the evolution of the species constitute an unsatisfactory body of explanation (see Piaget 1971). The solution to the Lamarckism versus Darwinism debate Piaget finds most satisfactory is one employing the notion of "regulatory interactions". Such interactions he considers to supply "the epigenetic system with information about the external environment" and in this way effect alterations in the stock of knowledge of the species (Piaget 1971:238). Piaget says of such regulatory interactions that they can be conceived in the light of a number of explanations, including the Lamarckism and the even more promising present-day cybernetics. Koestler has commented in several books on the matter of Lamarckism versus Darwinism and has provided powerful evidence against the unqualified acceptance of the Darwinian position. His view is that experience does affect hereditary but not in the simple and direct way posited by Lamarckism (see, for example, Koestler 1970:141; 1979:193-204). Lamarck, as is well known, argued that adaptive modifications of ways of life which an animal acquired to cope more effectively with its environment could be transmitted by heredity to its offspring. Lamarckism, as this doctrine became known, if valid, thus provides one answer to the question of how the stock of innate knowledge is altered and alterable.

Writers who adopt something of a Lamarckian stance as regards evolution seem to be in general agreement that life does possess some self-regulatory or mnemonic quality (to borrow concepts used by Paiget 1971 and Rignano 1926). It is this biological quality which for such writers lies at the root of the explanation of the origin and development of living forms and their various properties.

According to Rignano (1926:34), the notion of (what is here called) "innate knowledge" in biology can be traced back to the work of Semon, Haeckel, Butler and Orr who all saw in the phenomenon of the recapitulation of phylogeny by ontogeny evidence for a thesis that living matter somehow "remembered all the modes of being through which the species had passed as a result of the continual acquisition of new characteristics superimposed on old". This thesis led, as Rignano goes on to say, to Hering's 1870 proposal that "memory is the universal and fundamental function of all living substance". This thesis was further developed by Semon and by Rignano himself, especially in his work "Biological memory" (1926) being referred to here. The thesis of life being a knowledge acquisition or memory process helps, according to Rignano, explain the behaviour of cells, the transmissibility of acquired characteristics, the ontogenetic development of organisms, the instincts of animals, thinking, memory, and logical reasoning. "All these phenomena", states Rignano (1926:34), "thanks to the mnemonic substratum which can be detected in all of them, may be considered as merely very different manifestations of one and the same fundamental phenomena."

In developing his brand of Lamarckism, Rignano came to argue that the fertilized egg embodied in its nucleus all the memories acquired during the past history of its race. According to MacBride (in Rignano 1926:4-6), Rignano assumed that all reactions on the part of an organism leave some kind of trace in its body. Repetitions of the reaction gradually engrain the trace deeper and deeper and in this way may come to be genetically transmitted. The ideas of Rignano regarding biological memory referred to above find a modern counterpart in the work that has been done and is being done in the field of molecular memory. Discoveries in this field are obviously germane to a discussion of phylogenetic information assimilation processes. Bleibtreu (1976: 106-109) sees the discoveries made in the field of molecular memory as substantiating the "flesh-as-knowledge" view. A view, which minus its theological extravagances, comes close to the arguments of this study. Bleibtreu comments at length

on the work of Sager, Sonneborn, Hyden and McConnell. Among the things suggested by this work is that both in the chromosomes and the flesh or cytoplasm of the cell there is "hereditable information or knowledge" (Bleibtreu 1976:107). The work of Sager and Sonneborn suggests that cytoplasmic genes are more responsive to environmental factors than chromosomal genes and so may play an important role in phylogenetic information assimilation and, especially, the development of instincts.

While the exact mechanisms whereby species acquire knowledge is uncertain, findings like those of Zamenhof (1968) indicate that Lamarckism still holds promise for a possible solution. Zamenhof and his associates have shown that the dietary restriction of the protein intake of developing foetuses may result in reduced DNA content and thus lead to a reduced cell number in the brain of the eventual offspring of such foetuses -- even though the offspring are well fed throughout their lives. McConnell's (1964) famous experiments with flatworms is also often cited as providing evidence for the thesis that ontogenetic learning can become incorporated in some way into genetic material. Discoveries like those of Zamenhof, McConnell, Sager, Sonneborn and Hyden suggest that it is probable that a complex two-way interactional relationship seems to apply between innate knowledge and learnt knowledge. The phylogenetic and ontogenetic processes of information assimilation seem to be linked and intersect in seemingly more direct ways than is granted by those who opt for the more exclusive mutation-variation-and-natural-selection thesis.

It may be, as Piaget suggests, that the future will see the emergence of a more satisfactory theory of organic evolution which is neither Darwinian nor Lamarckian. However, since most modern investigators adopt a Neo-Darwinian approach and it is this that is being modified and improved, they might continue to call their approach "Darwinian" long after the point where it begins to incorporate certain "Lamarckian" ideas. The position at present seems to be that most recent biological discoveries are seen as further "substantiations" of Darwin's theory. For example, the

recent discoveries that pieces of DNA from one organism are fairly routinely incorporated in other organisms in nature, that mutations are more common than formerly thought and that each species is characterized by incredible variation at the molecular level as well as at the morphological and behavioural levels are all seen as deepening our understanding of the processes of organic evolution and as providing further confirmation of Darwin's theory. It seems that Lamarck's theory has lost its struggle for survival. So much is known today, and so much has been demonstrated that one prominent biologist has been able to proclaim, "Except for those skeptics willing to discard rationality, Darwin's theory has now become Darwin's Law" (Davis 1980:79).

Because of the constraints under which this study proceeds, it is not possible to explore these interesting matters further. The above is intended to provide some idea as to how it is that innate stocks of knowledge arise and evolve. That the exact nature of these processes is still a matter of lively debate and continuing research is an indication of both their importance and complexity. Life did not arise in a day nor, it seems, will it be understood in a lifetime.

Innate knowledge in animals

Innate knowledge, as mentioned earlier, is not directly observable, it is inferred from its representations in such things as physical form, behaviour, the deep structures of language and the universals of culture. Since humankind is an animal species, it seems appropriate to consider a few examples of innate knowledge in animals before proceeding to the human stock of innate knowledge.

In looking at animal and human behaviour and cognition one is observing the "working" ("operation", "functioning", "application") of their stocks of knowledge. Behaviour and thought imply knowing how to behave and how to think. The appropriateness of behaviour and thought in most situations also indicates that animals and humans know what to do (or think) in particular situations. Furthermore, because of the capacities they reveal for making discriminations between

objects, events and their own behaviour and thought, humans and animals may also be said to possess the knowledge "that".

Because an organism's knowledge is organized it is useful to use such terms as "schema", "system" or "programme" to refer to particular arrangements of knowledge. My preference is for the term "schema" because this suggests something of the "schematic" yet structured nature of knowledge. Knowledge being a schematic assimilation from information providing a definite yet never final mapping of the world and of behaviour and thought. Though the term is employed here more broadly than it is by Piaget, this usage is nevertheless consistent with his. Defined most simply, a schema is a system of knowledge. Addressing the abstract nature of the concept, Piaget has written (1973:156), "Now the schema of an action is neither perceptible (one perceives a particular action, but not its schema) nor directly introspectible, and one becomes conscious of its implications only in repeating the action and in comparing the successive results ... they (schemas) remain unconscious as long as 'reflective abstraction' does not transform them into operations." Flavell (1977:16) who adopts a basically Piagetian approach, defines a schema (he calls it, more accurately he claims, a "scheme") as an "enduring cognitive organization or knowledge structure within a child's head that does the assimilating and accommodating".

Biological, ethological and psychological literature is replete with examples of phenotypic representations of innate knowledge. Direct observations and film and television documentaries provide further examples. Though the methodology of the social sciences has not yet come to terms with the scientific status of film and television as sources of information, these provide a rich supplement to the meagre direct observations of nature by most urbanites. It may be that the time has come to rank the celluloid and video image alongside that of written articles as a source of ideas and a substantiator of arguments. There is much to be learnt about innate knowledge from directly observing animals. Failing this, it is probably the case that as much can be learnt from documentary films today as can be learnt from the

literature about innate knowledge in animals.

For example, a documentary film dealing with the South American sloth brought home vividly to me the fact that the genome of the sloth had, during the millenia of its evolution, gradually assimilated the fact that there are numerous predators in its environment which are orientated to catching moving prey. Movement is a sign of life and food to them, not surprisingly. It is easy to imagine natural selection moving away from the faster, more frenetic sloths, favouring the slower ones and thus giving rise gradually to the now existing extremely slow moving and cautious variety. It is difficult to imagine, but equally difficult to deny once the idea takes root, that there is some sort of determinate connection between the keen eye and speed of the eagle and the ponderous movements of the sloth. In a way, the eagle has been assimilated by the sloth. Its deathlike movements suggest that it knows something of the nature of eagles.

Another interesting animal example of innate knowledge was provided by a television documentary on cuckoos. How and why the cuckoo came to highjack the nests and incubating and parenting labours of other birds in order to propagate itself is still a mystery. But it is undeniably an eminently adaptive strategy as far as the genome is concerned. However, in subverting the property and energies of other birds to its own ends, the cuckoo as a species has had to assimilate the knowledge which allows it to do this successfully. Through the interaction between cuckoos and other bird species, the cuckoo genome has assimilated a fair amount of ornithological knowledge. For example, it has acquired the intelligence which allows its eggs to hatch faster than those of its hosts. The cuckoo, of necessity, must lay its eggs after its prospective host lays hers. (Eggs in the nest are an obvious sign that the cuckoo's addition to the nest will be sat on.) As a rule, the cuckoo's egg hatches before those of the host. The cuckoo genome has also acquired the knowledge which ensures that the eggs laid roughly or, even, exactly match the eggs of the host in colouring and markings. The fact that the sizes are different is itself instructive -- the host does not reject eggs which differ in size but are

similar or identical in markings and colouring. Because each cuckoo carries this knowledge with it, cuckoos as a rule only lay their eggs in the nests of members of the species which raised them. The newly hatched cuckoo appears, from its behaviour, to have some innate inkling regarding its relation to its environment, siblings and unwitting foster-parents. One of the first things newly hatched cuckoos set about doing is to eject the eggs containing rival siblings from the nest. In the documentary being referred to, a baby cuckoo got under one of the eggs in its nest by pushing backwards against the egg. By arching its wings backwards, the cuckoo was able to balance the egg on its back and then, by standing up, was able to tilt the egg out of the bowl-shaped nest. Two other eggs in the nest were attended to in the same way. Such detailed and ruthlessly efficient behaviour suggests, for me, that the cuckoo is endowed with the knowledge that its small hosts cannot adequately feed the large, hungry chick it will be while also feeding their own young. Its behaviour is clearly teleonomic.

Since, as was noted, the scientific status of the validation of ideas in terms of references to film and television sources is still to be decided upon, it is safer to leave such sources at this point and to turn to the vast literature which has accumulated from the systematic study of animals. These documents, if used correctly, are endowed by science with the power to validate theories and hypotheses. Among other things, these documents provide evidence for the reality of innate knowledge as proposed here.

It seems from the literature that many forms of animal behaviour not only develop independently of learning but cannot easily be modified by experience. It has been discovered, for example, that visual experience is not essential for the development of space perception in chicks and that some ability for form discrimination is present in visually naive mammals (Hinde 1970:498; Hebb 1972:118). Barraud (1961) reports the case of hand-reared twelve-day-old great tits which, without any previous such experience immediately crouched and froze at the sound of the high-pitched whistle generally emitted by adult great tits on the approach of a

flying predator. Other sound patterns of similar intensity did not elicit this response. A thirty-day-old chaffinch which has never seen an owl will evidently exhibit the mobbing response on the first occasion that an owl is presented to it (see Hinde 1954). Such investigators as Caspari (1958), Fuller and Thompson (1960) and Ewing and Manning (1967) have conducted experiments in which animals of different species were similarly reared and have in this way demonstrated that certain behavioural differences are largely genetically determined.

Bird song patterns provide further examples of varieties of innate knowledge. Baeumer (1962) and Lade and Thorpe (1964) are among the investigators who have demonstrated that the avian species-characteristic vocalization repertoire is sometimes capable of being developed independently of example. Studies such as these suggest that many species of bird genetically transmit what amount, following development, to auditory templets. These templets permit the young of such species, even when they are reared in isolation, to correct their spontaneous improvized vocalizations and eventually, when song matches templet, to fix the song in its correct form. Practice and the immediate feedback and learning it permits are obviously involved in this song producing process but the genetic dimension is also illustrated by these song productions. Such cases help to substantiate, as Hinde (1970:462) points out, "the impossibility of dichotomising behaviour into categories such as 'innate' and 'learned'". A sentiment which this study endorses.

An interesting example of an innate schema is provided by Hodgkin (1976:43) in his description of the behaviour of the young kingfisher. The kingfisher evidently emerges from the nest endowed with an innate capacity for catching fish with an accuracy of about one in twenty according to Hodgkin. This figure is generally improved as a result of practice and maturation to about seven in twenty by the developing kingfisher. The five per cent success rate due seemingly to innate capacities is regarded by Hodgkin as surprisingly low in comparison to the largely genetically attributable success rate found in many insect species. Hodgkin also draws

attention to the fact that bees and ants are genetically programmed with a vast stock of detailed knowledge of community living. Spiders, at a similar level of evolution are capable of weaving a perfect web having never seen one before or having practised web-weaving. In the world of insects the unfolding of unrehearsed and unrepeated schemas provides a wealth of evidence for, and examples of, innate epistemic systems.

The thesis that certain forms of knowledge are largely innate and that knowledge is inextricably linked to the anatomy of an organism is supported by such findings as those reported by Weiss (1941). Weiss surgically interchanged the left and right forelimb rudiments of salamander embryos at a stage when the axes of the limbs were already developed. The grafted limb rudiments developed naturally, but as could be expected, they faced backwards instead of forwards and moved just as they would have done in their original positions. Being in opposite positions, however, the grafted limbs operated to move the body backwards when the rest of the body was attempting to propel itself forward. Weiss reports that a year's experience with such contrary functioning forelimbs did not lead to any reversal in the movement of these grafted limbs.

Manifestations or representations of innate knowledge suggest, among other things, that innate knowledge structures are not present in the organism in its early life in any full blown operative fashion. Rather, the evidence suggests that the stock of innate knowledge should be viewed as dynamic and unfolding through time. It is more epigenetic in development than preformed. Processes of epistemic epigenesis akin to the processes of morphologic epigenesis described by biologists seem to be responsible for this gradual unfolding. An unfolding, like morphological unfolding, characterized by the emergence, in a definite order and with definite regularity, of specific features in the life of the members of a particular species. This unfolding of innate knowledge is itself the representation of an overall innate development stimulating and monitoring schema. Thus, for example, the schemas which control the action of the heart, the lungs,

the production of semen, the process of menstruation, and so forth, are established and activated at different times. The physical growth of an organism is also controlled by an innate schema -- a schema which operates during the years of growth of the organism and is terminated at maturity. An example of an emergent innate psychological schema is provided by Hebb (1972:205). He notes that the "fear" of snakes in chimpanzees does not appear to be learned. Studies indicate that the year-old chimpanzee is not disturbed by the sight of a snake but an adult chimpanzee who sees one for the first time is generally thrown into a paroxysm of fear and agitation.

Evidence reveals further that though innate knowledge is not acquired by the individual organism on the basis of learning, certain innate schemas are only manifest in the context of learning activities and others must be elicited by particular sign stimuli. The triggering of mating and parenting behaviour by definite sign stimuli in many species provides a good example of this connection between certain innate schemas and external information. The organism, so to speak, knows innately how to mate and produce and care for its young but it relies on the environment to tell it about the things it does not know -- that is, when to start doing these things and where to do them. The profound unity of organism and environment is evident from discoveries such as these.

Organisms seem to have both repeating innate schemas and single-run schemas. The overall growth and development schema is an example of a single-run or linear schema. The cycles of breathing, eating/digesting/eliminating, reproduction, and so forth, provide examples of repeating schemas. Writers like Lorenz (1969, 1977), Hinde (1970) and Thouless (1963) provide a large number of examples of behaviours representing the operation of innate schemas. Among the most commonly observed are those called irritability, the regulating feedback cycle, the pseudopod response, the phobic response, taxes, innate releasing mechanisms, fixed motor patterns, search images, orientation responses, orientational reflexes, spontaneous behaviour, avoidance and fear responses

and neuronal models.

The foregoing may all be regarded as examples of varieties of innate knowledge or examples of this form of knowledge expressed in observable behaviour. To comment on a few: the fact that the members of a given species respond in a predictable fashion to hitherto unencountered situations has led to the postulation of the innate releasing mechanism. The members of the species in question seem to know by genetic means exactly what to do under certain conditions in a particular situation. The notion of an innate search image is used in connection with the observation that many animal and insect species know what food to look for and eat without having been taught this. The idea of spontaneous behaviour is used to account for the observed changes in the behaviour of an organism which cannot be satisfactorily accounted for in terms of any external factors. Many of the above examples can be grouped under the more general but less satisfactory title of "instincts". The general characteristics of instincts as set out by Thouless (1963:27) can usefully be listed at this point as they help to clarify the idea of innate schemas. According to Thouless, instincts (1) have an adaptive teleonomic character, (2) are relatively unmodifiable, (3) are common to all the members of the species, (4) occur with a remarkable degree of perfection on their first performance, and (5) are remarkably complex.

Many other examples of representations of innate knowledge in the animal behaviour literature could be cited. In addition, I could cite examples I have myself observed in an unsystematic fashion in the course of personal encounters with animals. The sympathetic reader could also probably add some examples. Such further examples would not serve much purpose at this point and so the discussion can proceed to deal with the human stock of innate knowledge after the following brief note.

Knowledge and behaviour

Since many of those concerned with studying animals (and humans) are devoted to a behaviourist approach, it is worthwhile pausing for a moment to consider what advantage,

if any, an epistemic approach offers. An initial point is that an epistemic approach is not the antithesis of a behaviourist one. Knowledge and behaviour are related phenomena, though not synonymous. No organism behaves without utilizing its knowledge but at the same time its behaviour is not its knowledge. It is knowledge that "informs" behaviour -- that is, it is knowledge which gives form, structure, meaning, intelligence, etc., to behaviour. But though there is an element of knowledge in all behaviour, any observable behaviour is a phenotypic representation of an organism's knowledge. It is its knowledge working in a given context, in the face of specific environmental inputs and constraints. Behaviour is a complex amalgam of internal and external factors. Small wonder then that behaviourists have had such difficulties with the genotypic notions of "innate characteristics" or "instincts" and have tended to overemphasize behaviour, learning and environment. One obvious advantage, therefore, of the epistemic over the behaviourist approach is that it opens up and facilitates avenues of synthesis difficult to achieve via behaviourism. It is not difficult, as I hope this study shows, to move from behaviour to knowledge, consciousness and dreams or from blind innate knowledge to conscious thought and culture using the epistemic approach. Furthermore, while the behaviourist approach tends to devalue certain phenomena, even denying some, the epistemic approach, I submit, permits the integration of different orders of phenomena and in this way may convey a more accurate picture of reality. The strength of the behaviouristic approach is obviously its strong reliance on observables. Though the epistemic approach is open to the reproach that the objects about which it speaks are largely unobservable, its strength lies in the fact that we all routinely do infer knowledge from observables.

Inferring knowledge from observables

The procedure of inferring knowledge from observables and experiences is a common procedure. We all do it. It is a necessary part of social intercourse and self knowledge. In our everyday lives we are continually judging the extent

of other people's knowledge on the basis of a few performances. We can soon say whether people know their jobs by watching them work or inspecting the products of their labours. It is also only by observing our own performances that we gain some measure of the extent and variety of our own stock of knowledge. But we also learn from our experiences in inferring knowledge that it is an imprecise measure. Even such highly formalized and objective measures of knowledge as tests and examinations fail to satisfactorily overcome the disparity which seems to exist between knowledge possessed and knowledge revealed, the distinction between competence and performance as it is sometimes couched. In our own experience, we sometimes imagine we know some fact or think we know how to do something (like juggling) only to discover perhaps that we do not. Yet, as imprecise and unsatisfactory as inferring knowledge from performance might be it is the only method known to us and we find it indispensable. Inferring knowledge from behaviour is a common procedure in science, even in behaviourism. Linguists and psychologists, for example, when studying language use the indirect evidence of linguistic performance to infer a child's knowledge of the rules of its language. It is obvious from such inferences that children gradually gain a knowledge of the grammar of their language though they are seldom formally taught this and can only, with difficulty, articulate what such linguistic rules are.

The human stock of innate knowledge

No living creature is without innate knowledge. Numerous writers have discussed aspects of the genetically determined intelligence which humans seem to possess. The list of these writers includes such persons as Freud, Marx, Jung, Levi-Strauss, Goldmann, Levy Bruhl, Chomsky, Maslow, Scheler, Pareto, Nietzche, Gurvitch, Popper, Piaget, Lorenz and Wilson among a host of others. While it is still necessary to exercise caution when speaking about innate properties in humankind, it seems, after a shaky start, that the time has arrived when it is not only possible but necessary to speak about such properties. Humankind's genetic

endowment has been neglected by certain of the sciences due to factors mentioned earlier. This has led some scholars to be timid and reticent in instances where the logic of their arguments forced them to speak about innate human properties. The neglect of the innate in humans, has, many now agree, delayed the proper understanding of humankind and, in many instances, produced distorted images of humankind.

Innate knowledge is present in humans at the molecular and cellular levels just as it is in the most elementary forms of life. It is also present at the neural and anatomic levels as is the case of other higher forms of life. Humankind's entire repertoire of behaviour, both motor and cognitive, is constructed upon and dependent upon its stock of innate knowledge. In individual human beings, this stock of knowledge is present as an operating system or schema: a schema of integrated complexity. It is a complexity built out of simpler semi-autonomous schemas. Some fairly simple schemas are common. DNA, RNA and the living cells they constitute may be considered the physical and chemical correlates of a most basic type of innate knowledge. Another basic type of innate knowledge or innate schema common to living organisms from the simplest to the most complex is the knowledge these have about the dangers of ultraviolet light and the ability to repair some of the damage this causes. The ensymes responsible for the replication and repair of DNA may be seen as representing knowledge achieved phylogenetically (see Burnet 1980:19-20). A knowledge which both points to a reality of the organism/environment unity and the organism's adjustment to this. By its repair of radiation damage the cell signals its knowledge about such a danger and its knowledge of how to repair such damage. Need it be said that were there no such thing as radiation damage it would be inconceivable that such knowledge would exist?

The monosynapse (in the jargon of neurobiology) may be considered as another rudimentary and fundamental example of an innate schema. The monosynapse is characterized by the invariant response it produces in an effector organ as a direct result of the stimulation of the sense receptor (Rose 1976:115-117). Viewed behaviourally, a monosynapse

constitutes a simple reflex. Reflexes together with tropisms represent, in epistemic discourse, some of the simplest innate schemas of which we are aware. Reflexes represent intelligence which has been phylogenetically acquired and which is genetically transmitted. An organism lives to a great extent in terms of its endowment of reflexes and also uses these to deal with threatening situations. Our bodies and those of other organisms know how to do numerous things without ever being taught. That much of this doing takes place unconsciously is a further indication that it relies on non-cognitive and non-learnt forms of knowledge. According to Lausch (1975:148), reflexes are reactions of the body which are not improved by reflection. Like all innate knowledge, which is blind to sudden and minute changes and atypical situations, the generally benevolent and 'intelligent' reflex can sometimes prove malevolent and stupid. One has only to consider the case of the moth consumed by the candle flame or a human's reflex to jerk an arm back after it has gone through a pane of glass. It has been estimated that over twenty thousand reflex paths protect the human organism (Lausch 1975:149). This gives some indication of the richness of humankind's stock of innate knowledge.

Simple and complex innate schemas are shared by humans and the other mammals. All these species are, for example, genetically endowed with the knowledge which allows them to keep their bodies at a certain temperature despite fluctuations in the external temperature. Besides this they also innately know how to maintain a constant blood pressure, how to sleep, how to match oxygen supply with oxygen demand, how to digest and eliminate food, how to take in moisture and eliminate waste and toxic-substances, how to combat certain diseases, how to mend certain wounds and injuries, how to communicate, how to copulate, how to reproduce and rear their own kind, and so forth. These abilities, these acts of knowing how, are largely involuntary and dependent on inborn reflexes as Penfield (1969:139) has pointed out. In the same vein, Kelly (1963:51) has drawn attention to the fact that human behaviour is partly based on many "interlocking equivalence-difference patterns which are never

communicated in symbolic speech". He proceeds to cite some instances of the body's ability to make certain discriminations on a purely physiological and non-conscious level. Kelly speaks of "physiological construction systems" and, to indicate the coincidence of his formulation with the unity between innate and learnt knowledge proposed in this study, goes on to say (p 52), "... we may subsume a person's physiological construction system within our own psychological system". Among the examples of physiological construction systems Kelly refers to are those discriminatory behaviours involved in digestion and glandular secretions. As an aside, Kelly's incorporation of the notion of physiological constructs into his overall systems of constructs contradicts his constructive alternativism argument. Physiological constructs, as a variety of innate knowledge, are biologically given and, as was pointed out above and as most geneticists agree, alternativism at the genetic level is possible only via phylogenetic processes and here it is usually extremely gradual and non-spectacular in its operation.

The human male may have to learn to copulate but he does not learn how to produce semen or to ejaculate. Similarly, the human female conceives without being aware of this happening. It is copulation which occupies her mind and of which she is conscious. Furthermore, it is largely in ignorance and outside consciousness that she nurtures and the foetus develops during gestation. We may thus legitimately say that in the womb the foetus and the mother are directed by innate knowledge. The irrelevance of cognition and consciousness to this process of reproduction is emphasized by women in coma who have delivered viable offspring. What is known about conception makes it possible to suppose that a woman in coma could also conceive.

The partial morphological recapitulation by the developing embryo of the phylogenetic morphological stages can be cited as an example of innate knowledge. Illustrating as it does in a very graphic fashion the thesis that higher forms of knowledge develop out of lower forms and incorporate these to some extent in their own structures. Examples of

more specific innate schemas in the developing embryo can be mentioned. One of these, present after about the second month after conception, is represented in the avoidance reaction which the embryo exhibits if an unpleasant stimulus is applied to its upper lip. The reaction consists of the withdrawal of the hand region by contraction of the neck muscles (Rose 1976:192).

The intra-uterine behaviour of the foetus and its rates and stages of development are further examples of innate knowledge systems in operation. During its period of growth, the foetus exhibits a kick reflex and spontaneously exercises other, what seem to be, innate schemas. These activities are a prelude to the more commonly noted reflexes and motor activities which occur at birth and soon thereafter. And while these are the result of both exercise and innate elements, the regularity and inevitability of their occurrence justifies treating them as representations of innate schemas.

The stock of knowledge constituted at the moment of conception unfolds and develops according to an innate monitoring schema and results at the time of birth in a vastly expanded stock of knowledge. This knowledge directs the infant's behaviour just prior to and during birth in such a fashion that the infant actually co-operates in and facilitates the birth process. This stock of knowledge is also sufficient to ensure that at birth and shortly thereafter the child does perform certain rudimentary behaviours which enhance its chances of survival.

The new born infant often begins breathing spontaneously. Even if the infant has to be assisted to start breathing it nevertheless remains the case that the bulk of the activity represents the operation of the infant's own breathing schema which is largely innately determined. Crying, another initially primarily innately directed activity, presupposes the functioning of the breathing schema. Crying lays the foundation for communication between infant and adult. By its cry, the child signals that it knows how to register and to express pain, displeasure, discomfort and fear. Neonatal crying is a good example of teleonomic activity. By its

crying the baby indicates its innate awareness that this rather than some other motor activity is the path to comfort. The existence of the caring "other" is thus somehow phylogenetically built into the child's basic behavioural repertoire. The young of many other species get on with the job of restoring comfort by themselves, they are programmed to do this. They have assimilated the existential fact of the indifference, impotence and ignorance of their parents.

The teleonomic nature of the human infant cry is further evidenced by the discovery that the distress calls of a child, to which we seem to respond innately to some extent, fall within the frequency range of about 3 000 cycles per second, the most sensitive part of our auditory range. (Eibl-Eibesfeldt 1970:462.) Wolff's (1969) discussion of the neonatal cry is consistent with, though more detailed than, that of Eibl-Eibesfeldt. Wolff has reported that the neonate's cry is essentially a high-frequency micro-rhythm, regulated by apparently endogenous brain mechanisms arranged as an auditory pattern involving quite complex time sequences. She has also indicated that there are at least three distinct varieties of crying and that mothers generally have little difficulty in distinguishing them. This latter observation and the reports of parents, especially mothers, suggests that human adults seem to exhibit a reaction to crying that is innate at base. The innate arousal properties of the baby's cry rouses parents from the deepest sleep and is, if continuous, so disturbing to cerebral and emotional functioning that it seems highly likely that it is an important factor in accounting for baby bashing.

Crying, as initially largely an innately directed performance is modified as a result of experience and maturation but learning theory is nevertheless inadequate to account for its attention getting effect on parents. It is as if the child and the parent are so biologically orchestrated that the child emits sounds which are particularly disturbing to the parent and in this way the child virtually compels the parent to take some action to stop the crying. Not surprisingly, it is the pain cry in particular which has the most extreme arousing properties and seems to compel parents to

prompt action. Judging from the arousal properties stemming from the various types of neonatal cry, it appears that there seems to be some sort of biological correspondence between the message conveyed by the cry and its "meaning" at the adult innate knowledge level. Wolff's research and findings in sociobiology reported by Barash (1980) suggest that mothers are more sensitive to their babies' crying than are fathers. Sociobiology would argue that this difference in response is due to genetic factors. A claim that would no doubt upset those who argue that there is no such thing as a maternal instinct or innate mother-child bond. There is little doubt that infant crying upsets some males strongly; this is clearly evidenced by the brutal punishment some males dish out to crying infants in order to get them to "shut up". Other males react with considerable compassion towards crying babies. Though there may or may not be innate male or female differences in this regard, what seems inescapable is the fact that humans are so biologically constructed that it is difficult for most of them to ignore the cries of an infant, especially their own.

Breathing and crying are among a growing list of complex behaviours which psychologists have come to recognize that the newborn is capable of without practice or example. To avoid the word reflex for such complicated behaviours some writers use such words as "rules" or "strategies" to label them. These words come close in meaning to what is here called epistemic systems or schemas. For example, Holme (1971:81) writes, "It seems as though nature has endowed the newborn with general rules for behaving in certain situations." He cites, as one example, the sucking reflex. Of this he says, "If sucking were merely a reflex response to a nipple in the mouth, the baby would suck at any time, but it is well known that he will not ... it appears that one of the rules with which the baby comes into the world is: if aroused and nipple is in mouth, then suck." Hinde (1970:436) views the lateral head movement of the neonate as an example of stereotyped behaviour which he regards as not necessarily specific to feeding but which is nevertheless useful in locating the nipple and sucking. D.H. Lawrence (1921:51) in

reply to the question how the child finds the breast with its blind and mindless little mouth answered poetically that the child needs no eyes or mind, "From the great first-mind of the abdomen it moves direct, with an anterior knowledge almost like magnetic propulsion as if the little mouth were drawn or propelled to the maternal breast by vital magnetism, whose center of directive control lies in the solar plexus." (See also La Barre 1954; Thouless 1963; McCandless 1967.)

Among other innate schemas which can be cited are the well known Moro reflex, the grasping reflex, the primary walking reflex, the Babinsky reflex, the yawning reflex and the sneezing reflex. These reflexes all seem to have clear phylogenetic antecedents. (On the various reflexes see Hinde 1970; Prechtl 1965; La Barre 1954; McCandless 1967; Rose 1976; McCall 1975.)

The observation is now well established that a number of innate schemas, operative at birth or soon thereafter, wane in the weeks following birth. Part of the explanation for this seems to lie in the fact that the infant's nervous system is still being formed during the weeks and months after birth. The phylogenetically older parts of the nervous system, for example, are formed before the newer parts. Thus, in a sense, the newborn is a more physiologically primitive being than is the two-year-old. Its relative primitiveness is witnessed by its range of innate behaviours. As the nervous system develops, what appeared at one moment of development to be fixed and inflexible innate schemas disappear through processes such as schematic fragmentation and the subordination of innate schemas by more complex and flexible schemas often under volitional control. It is widely accepted that the human young are prematurely ejected from the womb in terms of their physical and nervous development. This premature expulsion and consequent period of development are seen as important factors in humankind's vast capacity for learning. The information assimilated simultaneously with the final stages of development of the nervous system -- particularly as seen in the convolutions of the cortex -- seems to form a permanent and basic strata in the stock of learnt knowledge. Things, like language, assimilated

during this period leave their stamp on all subsequent assimilations.

As an example of the process whereby what was initially a reflex gives rise to and becomes incorporated into an open and flexible voluntarily controlled set of schemas, the sucking reflex can be considered. The innately directed activity of the tongue forms an important element in the sucking reflex. The behaviour of the tongue in this situation has not been much commented upon in the literature and hence I have asked adults who are ignorant of the behaviour of infants when feeding to explain to me how they think an infant sucks and to demonstrate their method to me. None of the sizable group I have questioned could describe to me what an infant in fact does, which is to create a vacuum of sorts between the top of its tongue and the roof of its mouth by rhythmically moving the tongue slightly up and down and slightly back and forth. The nipple being held in the mouth by this vacuum, and the pressure of the tongue holding it against the upper gum and lip. The lower jaw, gum, and lip are free and the baby breathes to some extent independently of its feeding activity. This latter aspect of the feeding procedure gives rise to the terrible problem of air swallowed with the milk. The reason for citing this example is that it illustrates a kind of knowledge which the infant has which human adults find hard to imagine, choosing instead to think in terms of sucking with both lips clasped over the nipple, in drinking-straw fashion, and using the lungs to create the difference in pressure. (The sucking reflex and sucking patterns have been extensively described by Lipsitt (1967) and Sameroff (1968). They have both drawn attention to the instinctive aspects of sucking, the phenotypic variations in practice, the effects of experience and exercise, and the possibilities of learning and conditioning. Kessen, Haith and Salapatek (1970) and McCall (1975) have also described infant sucking.)

As infants mature, their reflexive sucking and feeding schemas gradually develop and become incorporated into open, flexible and voluntary schemas. The fact that humans achieve volitional control over these initially innate schemas is an

observable feature of normal development and is inexorably linked to the development of speech. To be able to speak it is obviously necessary that the cerebral cortex gain control over the organs of speech, of which the tongue, lips, lower jaw and larynx are of prime importance. Some volitional control over breathing must also be achieved but it is easy to demonstrate that such control is never absolute. While we can refrain from speaking for as long as we choose, we cannot commit suicide by simply holding our breath. The innate breathing schema automatically takes over when the oxygen supply in the body falls below a certain level. Observations such as this suggest that some innate schemas remain relatively intact but are incorporated into other schemas to form more complex and flexible schemas during development.

The operating human stock of innate knowledge consists of many kinds of innate schemas -- too many to all be dealt with here. Some of these, as just indicated, become incorporated into learnt schemas, others operate throughout life with learning having relatively little influence on them. Yet others only become operative at specific moments in ontogenesis. The schemas responsible for sexual responses and behaviours provide a good example. At the psychological level, it seems that humans have an innate schema which operates under normal circumstances to produce such things as the fear of imaginary creatures or events associated with the darkness. Such a fear is rare in the human child before the age of three yet common thereafter. Similarly, infants from about six months of age appear to begin avoiding strangers spontaneously. (These examples are from Hebb 1972: 119, 129.) Obviously, in these examples, learning, experience and maturation are all involved, but the invariance of these behaviours points to invariates in humankind's genetic make-up and in its life situation.

An innate schema was discovered by Bower et al. (1970) which is worth noting. In a series of experiments conducted by Bower et al. and replicated and extended by Ball and Tronick (1971) it has been demonstrated that very young infants indicate by their actions that they know certain

objects and events are "dangerous" and that they know how, in a rudimentary fashion, to take evasive action. These experiments also suggest that very young infants organize their visual perceptions three dimensionally. They know when objects are near or far and whether they are approaching or receding. In the experiments babies as young as one or two weeks of age were placed in a position to watch a large patterned box approach. The box was moved in various ways in these experiments and the infants' reactions carefully observed. It was found, for example, that if the box was moved directly towards the infants, they exhibited a characteristic response: they all put their hands up between their faces and the approaching box, pulled their heads back and opened their eyes wide. The infants did not do these things when the box was moved along a "miss path". Moore (1975:452), one of the original discoverers of the schema described, has written:

> These results indicate that the babies know the consequences of what is happening -- that this thing approaching them may hit them and that they should protect themselves from it as well as they can. This sequence of behaviours is a complex reaction, and it is most unlikely that it could have been learned.

Motivational and orientational schemas

Besides those already mentioned, humans are genetically endowed with, what may be called, motivational and orientational schemas. These presuppose, like all schemas, those most elementary and necessary of all schemas, the schemas responsible for the rudiments of life: form, organization and energy. The motivational and orientational schemas operate to produce the "drives" described in psychology. A close look at drives indicates that these consist not only of internally generated forces which compel organisms to activity, but they are always structured, expressing themselves in particular types of activity directed towards identifiable objectives. Drives are, on inspection, highly teleonomic in character. They generally function to organize perception, cognition, feelings and behaviour in such a way that enhances the chances of the organism attaining a

particular life supporting, even life enhancing, state of affairs. A thirsty animal will be driven to drink and when the time for reproduction is reached it will be driven to copulate. In the case of humans, beginning at birth, such drives as the respiratory drive, the hunger and thirst drive, the stimulation drive, the curiosity drive, the exercise drive, the attachment drive and the sex drive all represent to a greater or lesser extent the operation of distinct innate motivational and orientational schemas.

The recognition that humans are innately endowed with some knowledge as regards which physiological, environmental, social and psychological states and experiences are "good" for them and which are "bad" suggests that the sharp distinction between knowledge and values drawn in philosophy and the social sciences needs to be reconsidered. It would seem that human beings, like all creatures, are endowed with a rudimentary system of values which, because it manifests itself in feelings, gradually leads to the cognitive knowledge of human preferences and dislikes and also, eventually, to highly abstract cultural values. Homans (1974:27) has described this genesis and interconnection between the various levels and types of human values. He writes, "A value is learned by being linked with an action that is successful in obtaining a more primordial value ... By such processes of linking, men may learn and maintain long chains of behaviour leading to some ultimate reward." In his book, "The Biological Origin of Human Values", Pugh (1978) clarifies the origin and structure of human values and describes the relationships between different types of values in conscious human decision making. His major insights are drawn from a comparison of the human value schema with the decision criteria and programmes used by computers. According to his analysis (p 8), decision systems normally use two types of values. These he calls "primary" and "secondary". The primary values are those that are built-in by the designer (or innate). These define the decision system's ultimate criteria for decision making. Secondary values are derived from the primary ones and may be developed by the decision system itself as a practical aid in decision making. Pugh

cites pain and hunger as primary values of the human value schema and morality, love of money and art appreciation as secondary values. He distinguishes between prescriptive and descriptive knowledge and shows how, in deciding upon a course of action, both forms of knowledge are inevitably involved. "We draw on our factual or descriptive knowledge to predict the consequences of a proposed action. We draw on our prescriptive knowledge to evaluate the consequences so we can decide which course of action is 'best'." (Pugh 1978:11.) In short, our sensations, feelings and emotions are a form of "gut" knowledge which informs our consciousnesses about the things the genome has discovered to be life enhancing or life endangering. The coordinates and pathways encouraged by this innate knowledge may be seen to leave its mark upon the shape of individual lives as well as human history and culture. As Pugh (1978:9) notes, "Human values provide the guiding criteria for all personal decisions. They are therefore the fundamental driving force of human history."

Humankind's innate evaluative (or prescriptive) knowledge is and remains a fundamental part of the human stock of knowledge at every point of cultural evolution. Though culture evolves rapidly, our innate evaluative knowledge, it is generally agreed, has hardly changed in cultural time (though it certainly may have in biological time). This observation is important for it suggests that the development of cultural knowledge is everywhere and at all time ballasted by similar fundamental orientational promptings. Each generation of children looks to find their primary values expressed in society in some way. They are, after all, along with our other ancestors, the phylogenetic parents of society. Though it is obvious that cultural values can come to contradict biological values, it is also obvious that if human societies survive they have, at least minimally, equilibrated these two levels of value to some extent at each stage. Biological values then, apart from providing the initial impetus and direction for the development of culture, also serve as the ultimate judge of culture.

In learning theory in psychology, the existence of some

sort of innate motivation and orientation (or value) schema is generally assumed. This is true especially of theories which see organisms learning in terms of the effects of pleasure and pain. Obviously, stimuli are not in themselves either pleasurable or painful. They are only so in terms of an organism's biological structure. An organism's innate value schema generally ensures that it will learn to avoid painful stimuli and experiences and seek pleasurable ones. It also generally ensures that the learnt elements of its total value schema will bear the imprint of the innate one and remain, to some extent, equilibrated with it no matter how extensive the learning of values becomes.

To demonstrate the structured goodness or teleonomic nature of humankind's innate value schema, Pulliam and Dunford (1980:32-34) cite experiments which have been conducted using newly weaned infants as subjects. These infants revealed that they seemed to possess some unlearnt knowledge as regards what foods and what quantities were good for them. Pulliam and Dunford also cite detailed experiments with rats which also show them to have a complex innate knowledge of an adequate and healthy diet.

In his book, "The Whisperings Within", Barash (1980:39) asks the prosaic yet interesting question, "Why is sugar sweet?" He answers, "Because it contains sucrose, of course." He then asks the more pertinent question, "But why do we experience it the way we do?" Evolutionary reasoning supplies the answer. Our distant ancestors spent a great deal of time in the trees and ate a lot of fruit. Ripe fruit is more nutritious and has more sugar than unripe fruit. Following Barash, it can be supposed that a slight preference for ripe fruit led, in evolutionary time, not only to the selection of those ancestors who preferred ripe fruit but also to the selection of those who liked it most. Those encouraged by their preferences to eat the more nutritious fruit were thereby rendered biologically fitter than their contemporaries. That is, they matched physiological needs more optimally with the available food than did the others. Their greater fitness probably expressed itself in higher energy levels, more robustness and enhanced reproductive

success. In this way sugar became phylogenetically sweeter until it is now all but irresistible to humans and primates. The high biological value attached to sugar is now no longer only reflected in its sweetness, but is also expressed in our highly advanced knowledge, technology, economics, culture and medicine of sugar. Paradoxically, because of the overabundance of sugar made possible by these value induced achievements, humans in the industrialized countries of the world are exposed to a danger foreign to early or less industrialized societies. This is the danger of eating too much sugar. It may be that because of this danger individuals with a lower preference for sugar are being selected today as the more fit among individuals living in a situation of overabundant sweetness.

The matter of cravings for, and the "sweetness" and "tastiness" of, certain foodstuffs and beverages rather than others provides a fairly straightforward example of, what is at base, a biologically evolved schema of motivation and orientation. Sociobiology provides many further examples. In fact, the whole corpus of sociobiology to date may be read as a catalogue of what has been found to be, or is claimed to be, "sweet" or "sour" to the human genome. According to sociobiological theory, human individuals are the genome's method of adapting and surviving. Our learning, adaptation, reproduction, survival and other life achievements are as much the genome's achievements as they are ours. (See, for example, Wilson 1975, 1978; Barash 1977, 1979; Trivers 1971; Dawkins 1976; and Gregory et al. 1978.)

In its eons of evolution, the human genome discovered many things to be life enhancing and life diminishing. The push and pull between these and the teleonomic nature of life seem to have caused life to evolve towards what is beneficial and away from what is threatening. However, since what benefits and what threatens life depends on the structure of life, we now know that each change in structure heralded a new set of benefits and threats; evolution is a road without end. The evolution towards sociality, to survival through strength of numbers and the pooling of learning spawned its own dangers. It is thus not surprising that in achieving the

benefits of sociality the genome has also learnt of its costs. This is reflected, for example, in our innate value schema which includes altruistic and selfish elements. According to sociobiology, genes are fundamentally selfish. They operate simply to live and reproduce themselves. Their ultimate task, states Barash (1979:133), "is to manipulate the bodies within which they find themselves, so as to make as many copies of themselves as they possibly can". According to Barash, our genes "whisper" to us, telling us not so much what is good for us as individuals but what is good for the life and reproduction of our genes. Our knowledge of marriage and of what type of mate to marry, of how to relate to our relations, of how many children to have, of how to rear them, and of how to marry them off, are all amplifications of the whisperings of our genes, of our innate knowledge. We hear these whisperings, if we choose to listen, in the voice of our emotions and in the loud proclamations of cultural norms, values and laws. Human altruism is not a love and sacrifice for all, it is a selective altruism which may not make much sense in terms of universal ethical systems but makes a great deal of sense in biology. Because we share more genes with more immediate blood relatives it appears that our genes have encouraged ideas about family and self sacrifice which favour most highly those who share most genes with us. Sociobiology provides much surprising evidence in support of this argument. Blood seems indeed to be thicker than water for all living things, as Barash (1979:132) remarks. Humans, like other living things, exhibit in knowledge and behaviour a tendency to maximize their inclusive fitness; to maximize their reproductive success through their offspring plus that of their relatives (Barash 1979: 136).

Sociobiology documents other genetic "whisperings" which have shaped culture in a way beneficial to the survival and reproduction of human genes. It also indicates something of the extent to which such inner promptings can be complicated and muted in the human case and can lead to contradictory and disequilibrated results. These need not be entered into here since it seems that though much controversy still surrounds

sociobiology and it is still an infant science, its basic message is incontrovertible: the human genome has played and continues to play a significant role in shaping human knowledge, culture and behaviour.

In modern sociology it is that small new branch called "existential sociology" which portrays most clearly the relationship between what is here called the innate value schema and culture. A passage from Douglas (1978) is worth quoting since it conveys the essence of both existential sociology and the relationship between innate values and culture.

> Love and hate, ecstasy and agony, pleasure and pain, lust and satiety, hope and despair, satisfaction and frustration, excitement and boredom, sympathy and spite, full and hungry, comfort and discomfort. These and a vast number of other feelings, named and unnameable, are the core of our being, the stuff of our everyday lives. They are the foundations of all society. They come before symbolic meaning and value, lead us continually to reinterpret, hide from, evade, overthrow, and recreate thoughts and values. Feelings pervade all meanings and values. They inspire our practical uses of rules and they are the reasons behind reasoned accounts ... without feeling, without brute being, there would be no use for rules, ideas, or social structures; and there would be none.

Douglas (1978:51).

It is because we know reality through our feelings as well as our thoughts that we are not social puppets. We are necessarily social but we are also necessarily outside and often in conflict with society (Douglas 1978:49). The brute side of our being feels, speaks and acts in a primordial language which echoes through culture and society but can also oppose them. It seems to me that sociology can move beyond its "oversocialized" and "cognitivist" distortions (see Wrong 1961; 1980) by recognizing that feelings and emotions are a form of knowledge and information. They represent the wisdom of the genome and the body and are their way of speaking to society and mind.

CHAPTER FIVE

THE INNATE LEARNING SCHEMA

> When behaviour implies elements acquired through experience, they are acquired according to a program, and that program is innate -- that is to say, genetically determined. The program's structure initiates and guides early learning, which will follow a certain pre-established pattern defined in the species' genetic patrimony.
>
> Jacques Monod (in Fox 1975:1)

It was argued earlier that knowledge has only two sources. The first is the assimilation of information by the genome and the second is its assimilation by the individual organism. One of the things for which innate knowledge is responsible is the various basic assimilatory schemas which any knowledge acquisition presupposes. These, while they make the ontogenetic assimilation of information possible, also direct and limit this assimilation and the knowledge which flows from it.

The schemas which enable individual organisms to assimilate information are of various types and yield different varieties of knowledge. Some such schemas inform the organism of its internal state, others convey information about the environment. Some information is assimilated and utilized without ever reaching consciousness, other information is consciously assimilated and used. Some information is instantaneously assimilated and used, other information is permanently assimilated and used repeatedly.

It seems that all living organisms and even plants are capable of assimilating some forms of information. All life is thus, to some extent, capable of acquiring knowledge individually. Sensations represent a low level but important form of awareness and as such may legitimately be regarded

as a form of knowledge. Such sensory knowledge is probably the most basic and universal of the various forms of individually acquired knowledge. It is a form of knowledge without which life could not exist. According to Lorenz (1977:45) all forms of life, including bacteria and plants, possess some potential for the acquisition of sensory knowledge.

Beginning with sensory knowledge and the sensory schemas which it presupposes, knowledge may be seen to have evolved to perceptual knowledge and cognitive knowledge as the capacity of organisms to learn from their sensations and irritations expanded. Following Hebb (1972:29) perceptual knowledge is a form of learnt knowledge because such knowledge produces a lasting change in the perception of an object or event as a result of earlier perceptions and experiences. For Hebb, perceptual knowledge is inseparable from cognitive knowledge. He writes (p 219), "Perception ... is the beginning of a thought process and cannot occur where there is no thought."

Learnt knowledge

Sensory knowledge is instantaneous knowledge. It is fleeting and stimulus bound. Sensory schemas on their own yield no lasting increase in an organism's stock of knowledge. However, when such schemas are integrated with perceptual and cognitive schemas such increases become possible. Irritability -- or sensitivity -- is thus not only the basis of instantaneous knowing, it is also the basis of more permanent types of knowledge. It provides the basis for all higher processes of information assimilation (see Lorenz 1977:45; Taylor 1962:340).

The value to life of both instantaneous knowledge and more lasting knowledge is self apparent. The evolution of schemas yielding these two forms of knowledge is thus not surprising. And while sensory (or instantaneous) knowledge is universal, even very simple life forms seem capable to some extent of acquiring more lasting knowledge from sensory knowledge. The knowledge assimilated from the immediacy of experience constitutes what I have called "learnt knowledge".

This knowledge, because it is incorporated more or less permanently into the organism's stock of knowledge, may have the effect, unlike sensory knowledge, of actually modifying the schemas through which it is constituted. For, as Lorenz (1977:66) has argued, it is essential to all learning that an adaptive change should take place in the structures of the sense organs and nervous system that are concerned with behaviour. It is in a modification of physiological structure that the storing of knowledge is actually accomplished. The distinction between learnt knowledge and instantaneous knowledge is captured by Piaget (1973:105) when he states, "In contrast to perception and immediate understanding it is necessary then to reserve the term learning to an acquisition as a function of experience but unfolding in time, that is mediate and not immediate like instantaneous perception or understanding." Learnt knowledge may thus be defined as that knowledge which is ontogenetically more or less lastingly assimilated by an organism out of the information at its disposal.

The fact that certain forms of knowledge appear to be the immediate results of ontogenetic accommodatory and equilibratory processes should not be seen as undermining this definition. For, as already noted, the latter processes also, always, imply assimilation and all learning, even if achieved primarily through accommodatory and equilibratory processes, reaches back ultimately to initiatory assimilations and implies the assimilation of self generated information. For example, though infants can be said to <u>construct</u> aspects of language for themselves on the basis of accommodatory and equilibratory processes, they rely on their own linguistic acts and those of others to supply the information without which these other processes and such construction would be impossible.

The phrase "learnt knowledge" may not be very elegant but it accurately describes that form of lasting knowledge which cannot be primarily attributed to or explained in terms of genetic factors. In the light of what was written earlier about innate knowledge, it is important to note that learnt knowledge is not something entirely distinct from innate

knowledge. They are not opposites nor are they exclusive categories. Learning always takes place and can only take place in terms of the operation of innate schemas.

By defining "learnt knowledge" as ontogenetically assimilated information a meaning is being attached to the word "learning" which signals a deviation from the more strict behaviourist or S-R usage. Learning is basically a process which modifies the stock of knowledge, generally in an incremental fashion, and since only certain items of knowledge relate directly to observable behaviour, any approach to learning too narrowly bound to the notion of changes in observable behaviour of necessity omits a great deal of the substantive change actually resulting from the learning process. A novel or altered form of behaviour is not what is acquired as a result of learning; how could a behaviour be stored? What is acquired is the knowledge of which the behaviour is a manifestation.

A little reflection is enough to confirm for ourselves that not all knowledge is represented in observable behaviour. Unused knowledge does not mean non-existent knowledge. A great deal of knowledge is represented in such things as conscious thought, dreams, feelings and emotions. It seems that we know more than we show. And, given the present state of our knowledge of ourselves, we know more than we know we know. Even in the context of scientific knowledge, as Polanyi (1967) has so persuasively argued, more knowledge is involved than we are even aware of. As he says, in doing science, "... we know more than we can tell" (Polanyi 1967: 4). Objectivity is impossible, all scientific knowledge is, in a profound sense, personal knowledge. An example of an inadequate behavioural definition of learning is provided by Hilgard (1956:3). Hilgard defines learning as: "The process by which an activity originates or is changed through reacting to an encountered situation, provided that the characteristics of the change in activity cannot be explained on the basis of native response tendencies, maturation, or temporary states of the organism." This definition seems to me unsatisfactory because it detracts attention from what is actually acquired by learning, pointing instead to its

representation -- a new or changed activity. What is actually acquired and what the learner has as a lasting possession is not the activity -- this is bound in time and place -- but the knowledge which makes that sort of activity possible. There is no one to one relationship between learning (learnt knowledge) and activity or behaviour since activity or behaviour generally involves environmental inputs as well as inputs from the organism. Hence, what has been learnt may remain constant while its representation in behaviour will vary. What has been learnt is not always rigidly bound to the stimuli or situation from which it was assimilated. Learning can be applied and is applied in a creative and synthetic fashion to many and varied situations. Furthermore, the emphasis on activity obscures in the case of cognition the difference between the process and content of cognition. Much cognitive learning makes little difference to the process of thought while radically altering its content. Cognitive definitions, such as that proposed by Krech and Crutchfield (1948:112) to the effect that, "Learning is a reorganization of the cognitive field", are adequate as far as cognitive learning is concerned but as learning does not only apply to the domain of the cognitive, such definitions must also be judged inadequate.

Definitions of learning which refer to the physiological changes resulting from particular experiences are closer than the behaviouristic ones to the conception preferred in this study. (See, for example, Eugelski 1956; Penfield 1969; Rose 1976). The acquisition of knowledge or its modification implies some alteration in material structure. It is the altered material structure which results from learning experiences and it is this that is responsible for changes in behaviour. These altered structures are more homologous with learnt knowledge than is altered behaviour. The idea of the "engram" as used by Taylor (1962) is consistent with the notion "learnt knowledge" as used here. For example, it can be said of learnt knowledge, just as Taylor (p 340) says of the "engram", that it "... is not something that was there from the beginning ... (it) ... represents a portion of the organism's commerce with the environment, written in

the form of temporary connections built into the brain."

Unlearnt learnt knowledge

Learning theorists regard behavioural changes due to maturation or development as something LESS than what is to be understood by learning even though these take place as a result of experience and simultaneously with learning. Maturation and development are characterized by the absence of sufficiently direct and definite experiences to which the changes they signal can be attributed. On the other hand, learning theorists like Piaget and Furth have pointed out that the human stock of knowledge includes certain items and schemas which represent something MORE than what is commonly understood by learning. Such theorists have drawn attention to the knowledge which is universally encountered among humans but which can be empirically demonstrated to be dependent for its emergence on both physical and intellectual maturational factors as well as environmental experience in general but on no specific learning experiences in particular. Piaget has argued that certain invariants of normal human thinking, such as the permanent object, the self, the other, space, time, class, number, logic, conservation, reversibility and causality cannot, in terms of more conventional definitions of learning, be regarded as instances or the product of learning. Besides these invariants, there are other types of knowledge which individuals achieve not as a direct result of learning but as a result of working on what they have learnt. The knowledge of the permanence of objects or of reversibility might be achieved by all of us through no direct effort on our part and through no direct learning experience but simply, as Furth (1969:225) puts it, as a result of "normal living and biological time". But other types of cognitive knowledge involve conscious effort even though they too do not arise "directly" from specifiable learning situations as does language, for example. Included here would be self achieved generalizations, new meanings and understandings, new concepts and arguments, new theories; in fact all knowledge involving a high degree of creativity. Thinking and dreaming are processes which can generate novel

information which is, at least to some extent, "immaculately" conceived. Obviously, knowledge created in this way is only "unlearnt" for the creative individual. If it is communicated to someone else through speech, writing, gesture, movement, art, music, and so forth, it is acquired by that person in the more conventional learning way. The forms of knowledge identified by Piaget, noted above, are unique in that they cannot be transmitted to others. Every individual has to create or discover these for himself. They are "... not just given, to be taken from a tree or a book", they are "actively constructed by the person" (Furth 1969:221).

Piaget (1971:4) provides an important clue as to the nature and genesis of "unlearnt" knowledge when he insists that, "The essential starting point here is the fact that no form of knowledge, not even perceptual knowledge, constitutes a simple copy of reality, because it always includes a process of assimilation to previous structures." All learning is an active and constructive process and we see in "unlearnt" knowledge the operation of characteristics present in even simple cases of learning.

Piaget rejects empirical theories of knowledge because, although sensations or perceptions are continually at work in the elementary stages of the formation of knowledge, they are never alone in this process. That which is added is, for him, at the very least, equally important in the development of knowledge (Piaget 1972:46). Consider a child playing with objects and thereby learning about them and the lessons which such play can give rise to. Certain of these lessons are essentially "empirical" as they relate to the position, movement and property of the objects. But such object play also generates knowledge not about the objects as such but about relationships and properties which play and the child's existing knowledge impose on the objects. For example, object play often leads to classification, ordering, placing in correspondence, counting and measuring and, hence, to the kinds of knowledge such activities (not objects) are primarily responsible for. Piaget calls such activities "logico-mathematical" activities because they lead to logico-mathematical knowledge. In distinguishing "empirical" from

"logico-mathematical" knowledge, Piaget (1972:21) writes, "Study of the child's behaviour in relation to objects indicates that there are two kinds of experience and two kinds of abstraction, according to whether experience draws on the nature of the things themselves and permits discovery of some of their properties, or whether it draws on relationships which are not intrinsic in the things themselves, but which some action imposes upon them."

In view of Piaget's work, it can be asserted that many conventional views of learning are simplistic and misleading. To call the process whereby an individual's stock of knowledge develops "learning" is to give prominence to some processes while detracting attention from others of equal importance. The development of knowledge involves, as Piaget helps us appreciate, not only the passive assimilation of information but also the active seeking after and construction of knowledge. It also involves maturational and developmental factors and "normal living". It also involves equilibratory processes which operate to motivate learning and to integrate and articulate new knowledge with existing knowledge. It also involves the creation of new items and levels of knowledge out of more fundamental items and levels.

Rather than speaking of "learnt knowledge" therefore, it might be more accurate to speak, depending on context, of "learnt knowledge", "constructed knowledge", "maturational knowledge", "empirical knowledge", "abstracted knowledge", "equilibrated knowledge", "created knowledge", etc. In this way the other processes apart from learning which are responsible for the ontogenetic development of knowledge might be given the prominence they deserve. Piaget himself addressed this problem when he drew the distinction between "learning in the strict sense" and "learning in the broad sense" (Piaget 1973:105). Learning in the strict sense refers to all learning that is acquired as a function of experience. Learning in the broad sense is, for Piaget (1973:105), "... the combination of learning in the strict sense and the processes of equilibrium".

Though the concept "learnt knowledge" (or "learning") is problematic and unsatisfactory for reasons such as those

just mentioned, I have chosen to follow convention to some extent and use the word "learnt" to refer to all the above types of knowledge -- including those which are to a large extent "unlearnt". That is, the meaning of learning in the broad sense used by Piaget is adopted.

Learnt knowledge basic to life

The argument that life is a knowledge process applies in two senses. Firstly, as has been discussed, the evolution of a species implies the phylogenetic assimilation of knowledge. Secondly, the members of most if not all species are capable of modifying their knowledge as a result of experience. It should be obvious that by developing a capacity whereby individual organisms can acquire knowledge a species enhances its capacity for adaptation and survival. In this way adaptations to the finer variations in the environment are possible and the species is able to bridge the dead time between one generation and the next when genetic adjustments are not possible. Furthermore, by the development of capacities for the individual acquisition of knowledge, species are able to utilize types of knowledge and information which cannot be genetically transmitted. It would seem that because of the advantages it offers, many species have evolved in the direction of the individual utilization and acquisition of knowledge. Some writers see the genome of the various life forms as having evolved in one of two directions: either a concentration on the direct genetic transmission of knowledge or an increasing genetic development of the know-how for the individual acquisition of knowledge. The insects are an example of the former and the animals of the latter. This division is, however, too crude to be of much use because of the widespread nature of learning capacities.

The capacity for learning has been so repeatedly and convincingly demonstrated for animals, birds, and reptiles that it is now taken for granted as a feature of life at these phyletic levels. But the capacity to learn has been discovered to extend even further. In 1912 Yerkes demonstrated that earthworms could learn to traverse a simple

T-shaped maze and Semon around the same time referred to learning at the plant and protozoan level (referred to in Rignano 1926:110). In 1940 French discovered that Paramecia could modify their behaviour in certain directions as the result of specific experiences. Corning, Dyal, and Willows (1973), in a detailed review of invertebrate learning, arrived at the conclusion that despite the fact that the evidence for simple learning remains highly controversial, there does exist compelling evidence that life forms as rudimentary as protozoons display the ability to learn. Thus the point has now been reached where it is scientifically acceptable to regard learning in some form or other as a capacity of life down to the insect and protozoan level. Thus it can be said that all life from man to protozoa possesses a stock of knowledge which includes both items which are innate and items which have been modified or added as a result of the organisms own experiences.

Lorenz (1977) is opposed to the notion that the capacity for learning extends to protozoa. He maintains that, "Only animals with a central nervous system are capable of learning in the strict sense of the term" (Lorenz 1977:83). He argues that extending the capacity to learn to the lowest of living creatures is the result of self-deception, "... born of the need to believe in a unified world picture" (p 41). His reason for objecting to the view that the ability to learn in some form or other is found virtually throughout all the forms of life is that he regards it as, "... essential to all learning processes that an adaptive change should take place in the 'machinery' -- that is, in the structure of the sense organs and nervous system that are concerned with behaviour" (p 66). As indicated in the preceding paragraph, the evidence seems to be against Lorenz on this point. It seems that certain elementary life forms do alter their behaviour as a result of experience and that this can only be accounted for in terms of some semi-permanent or lingering structural change. Pursuing the discussion of his narrow conception of learning, Lorenz (1977:69) speaks of such things as facilitation by practice, sensitation, habituation, habit, avoidance responses acquired by trauma, and imprinting as

"half-way" houses between instantaneous information utilization, which is clearly not learning at all, and learning proper. In this study, because learning, like other epistemic processes, emerges imperceptibly out of the interaction between phylum and environment over time, learning will be regarded in the more general non-Lorenzian fashion indicated above. That is, a characteristic of life down to at least the protozoan level.

The phylogenetic and ontogenetic modification and acquisition of knowledge are processes whereby species adapt to their environments. They are complementary processes operating to ensure a fine degree of ongoing adaptation between organism and environment. The differences in learning capacity and mode of learning for the various species are themselves, as stated earlier, a product of evolution. The stock of knowledge peculiar to the members of the various species appears always to consist of just the right proportions of innate and learnt elements to ensure survival. Species which are virtually totally equipped for the vicissitudes of their life by their stock of innate knowledge generally have as little capacity for learning as corresponds with their small need therefor. Other species, by contrast, which may be judged to be ill-equipped by their stock of innate knowledge for the vicissitudes of their life are nevertheless genetically endowed with learning schemas sufficient to acquire the knowledge necessary for successful adaptation. Each species may thus be viewed as having evolved via the method of trial-and-success (see Lorenz 1977; 1969), what may be called an "adaptation schema". The adaptation schema operates to ensure the survival of the species and it is characterised, as just suggested, by generally sufficient symmetry between innate endowment, capacity for learning and environmental variation.

The learning schema

All learning may be considered to take place as a result of the operation of a "learning schema". Such a schema is a sub-system of the more general adaptation schema just referred to whereby a species as a whole is capable of

self-regulation and survival. Since the term "learning" is being used in the broad and inclusive way discussed earlier, it is useful to note that the learning schema is responsible for all those processes of knowledge acquisition listed before. That is, the learning schema involves assimilatory, accommodatory and equilibratory processes. It involves selection, construction and creation. It involves development and maturation. It involves generalizing, synthesizing and abstraction. It involves storing and rearranging.

All acts of learning consist of environmental inputs and organismic inputs to some extent. Learning has both a motorially passive, information receiving and assimilating dimension and a motorially active information generating and teaching dimension. The broad meaning of "learning" is understood to include both the learning dimension, implying the processes which serve to extract knowledge out of experience, and the teaching dimension, implying the processes which serve to create the experiences out of which knowledge can be extracted. The ambiguity of the word "learning" seems unavoidable. Some writers, like Lorenz (1969, 1977), actually speak of "teaching mechanisms" as part of an organism's learning armoury but in this study to avoid the semantic and theoretical pitfalls which result from opposing "learning" and "teaching" I have opted to use "learning" to imply "teaching" as well.

The innate learning schema

An organism's ability to assimilate information is itself, in the first instance, not something which is acquired by the organism through learning. All ontogenetic learning is grounded in and takes place by virtue of the innate properties of the organism. It is for this reason that it has been said that the most important act of phylogenetic learning was learning how to learn. Before any specific learning can take place it is logically necessary to assume an organism with certain characteristics, one of which is the ability to learn the item in question. This applies as much to the most rudimentary forms of learning as it does to the higher forms. As Piaget (1971:252) states,

"... every kind of knowledge at the higher level presupposes the intervention of (an irreducible biological component), whether as innate framework or as starting point or, going back to biological roots, as a necessary and continuous functioning, outside of which no sort of structuration is possible." For this reason humans cannot, like birds, learn to fly just as birds cannot learn calculus. Such a basic observation has led Lorenz (1965, 1969, 1977) to speak of the innate as being that which must be in existence before all learning in order to make such learning possible. He regards this innate A PRIORI as constituting a structure in terms of which learning takes place. In short, all learning is innately programmed in the last analysis (Lorenz 1969:21).

In terms of the concepts being developed in this study we may say that all organisms which are able to learn do so by virtue of, and in accordance with, the operation of an "innate learning schema". By innate learning schema is meant a genetically inherited system of knowledge (learning know-how) which functions to determine what information the organism assimilates, how is assimilates it and what "lessons" it draws therefrom. Under certain circumstances acts of learning affect the contents and mode of operation of the innate learning schema itself. It is thus necessary to consider this schema as open to modification by the very processes it is responsible for (see Gibson 1969; Flavell 1977). For the reasons cited above, the innate learning schema should also be considered to consist of a teaching and learning dimension and to refer to knowledge processes other than learning in the strict sense.

The teaching dimension

The innate learning schema initiates learning, it biases attention towards certain stimuli and away from others, it constructs relevant information out of the variation in the environment, it motivates learning activity. All organisms capable of learning appear to be to some extent self-instructing. This characteristic is linked to the matter of survival and economy; organisms do not have the time nor energy that a random approach to knowledge acquisition would

require. Instead, organisms appear to have systems whereby they home-in fairly quickly on the important information available and from this extract the knowledge essential for survival. Such organisms it seems not only know innately how to learn but also know something about what to learn. Most surprisingly they also know innately something about producing the kinds of experiences which will generate the types of information out of which the important lessons of life can be assimilated. This self-instruction points to the teaching dimension of the innate learning schema

As already noted, Lorenz speaks of organisms as having "innate teaching mechanisms". He provides an example of such a mechanism in operation when he writes of the young chicken: "Even in the most primitive kind of trial-and-error learning the animal does not run, scratch, or peck indiscriminately in all directions but, by virtue of some taxis or other, possesses a measure of 'insight' that quite considerably improves the chances of success" (Lorenz 1969:57). In a later work Lorenz (1977:89) says of the innate teaching mechanism that, "Unless one believes in supernatural factors, such as a pre-established harmony between the organism and its environment, one has to postulate the existence of innate teaching mechanisms in order to explain why the majority of learning processes serve to enhance the organism's fitness for survival."

The innate learning schema functions in such a way that rather than being passive learners, organisms seem to be fundamentally active. "Even without external stimuli", writes Von Bertalanffy (1969:208), "the organism is not a passive but an intrinsically active system. Reflex theory presupposes that the primary element of behaviour is response to external stimuli. In contrast, recent research shows with increasing clarity the autonomous activity of the nervous system, resting in the system itself, is to be considered primary." Nunn (1920:28) was one of the earlier investigators to argue for the recognition of a general exploratory tendency in all healthy organisms, a tendency especially marked in the higher vertebrates. Ashby (1951:218) has remarked that, "The higher organisms have sensitive skins,

responsive nervous systems, and often an instinct which impels them, in play and curiosity, to bring more variety into a system than is immediately necessary." This tendency does not proceed, though it sometimes appears so, in a totally random or haphazard fashion, as noted above. It seems to be directed in internally determined directions. What is more, it reveals on close inspection a clear teleonomic or anticipatory character.

The striving after knowledge characteristic of life is due, suggests Von Bertalanffy, to the fact that organisms are autonomously active systems. "The living system maintains a disequilibrium called the steady state of an open system and is thus able to dispense existing potentials or 'tensions' in spontaneous activity or in response to releasing stimuli; it even advances towards higher order and organization" (Von Bertalanffy 1969:209). Spontaneity, the tendency for organisms to behave in the absence of any external stimulus sufficient to account for such behaviour, appears to be a common characteristic of life and is regarded by many as the most primitive form of behaviour (Von Bertalanffy 1969; Lerner 1976). Hill et al. (1971:192) state that, "The nervous system, especially in the higher animals, does not necessarily wait for stimuli and then act to cancel their effects, but may also initiate action in the absence of stimuli." Experiments by Von Holtz (1973) have revealed that certain motor cells are spontaneously active and that what non-activity consists of is often the inhibition or containment of this dynamism by a higher level controlling structure. Spontaneity is seen in the first movements of embryos and foetuses. It is also found in brain functions, in psychological processes and in natural behaviour ranging from exploration, play and ritual in animals to the creative cognitive activities of humans (Von Bertalanffy 1969:209).

Drive theories suggest that organisms have a "learning" drive or need as powerful as many of the other drives. While the drive to learn may be seen as an obvious expression of the learning schema, this schema also takes in the operation of the other drives. McCandless (1967:203) has suggested

that the energizing function of drives is probably innate and that drives serve the organism by increasing its activity, usually in a direction determined by and functionally linked to the drive. Drive motivated activity generates drive related information as well as behaviour. Thus, for organisms able to take advantage of it, drives apart from leading to drive satisfaction also provide a wealth of information from which important lessons may be learnt and which can benefit future drive behaviour. For example, the hunger drive can lead to the acquisition of knowledge related to food acquisition, production and preparation. It can also lead to a detailed knowledge of what is edible and what is inedible and can massively expand a creature's range of foodstuffs. Similarly, the other organic drives may also generate teleonomically relevant information and thus play a part in the development of knowledge while enhancing adaptation.

Available evidence supports the view that organisms, especially the more advanced organisms, have a learning drive. This drive is sometimes also referred to as the "curiosity" drive or the "activity" drive. (The terms "learning drive" and "curiosity drive", denoting as they do an internal information seeking tendency, seem to me preferable to "activity drive" which denotes something too random and unspecific.) Hebb (1972) spoke of organisms seeking optimal stimulation and Glanzer in his 1958 review of the literature on curiosity suggested that organisms need a certain amount of stimulation per unit time. A shortfall of information leads to disequilibrium and is sufficient to motivate certain creatures to seek and generate information. Conversely, an overabundance of information at one time may cause an organism to act in such a way as to reduce the available information to a manageable level. This can be accomplished in many ways. The organism's own sense organs and nervous system may shut out surplus information thus closing "the doors of perception", the organism may act upon the sources of information directly to quieten some of them, the organism may flee to a more tolerable information environment, etc., etc.

The learning drive is well illustrated by the powerful tendency exhibited by many organisms to play and explore. These activities are also illustrative of the teaching dimensions of the innate learning schema. Play and exploration generate information, often teleonomically functional information, and in this way enrich an organism's stock of knowledge in a life enhancing fashion. While, as has been noted, most drives can produce knowledge, this production is incidental. Not so in play and exploration. Here learning of one sort or another appears to be the prime objective and learning constitutes its own reward (Lorenz 1977:149).

The evidence provided by Glanzer (1958) indicates that a rich informational environment to which an organism has accommodated itself serves to enhance its learning capacity and it comes to need stimulation in advance of members of its kind living in normal or impoverished environments. This kind of evidence provides the ground for a possible reconciliation between those theorists who postulate an innate learning (or curiosity) drive and those who see this drive as the result of the positive reinforcement of accidentally explorative behaviours. The two are not necessarily mutually exclusive and may be viewed as working in unison to produce strong explorative behaviour. The very fact that some forms of "accidental" learning are reinforcing points to some, even if minimal, innate structuration.

The knowledge of skills and the knowledge of facts which result from play and exploration of necessity involves a certain amount of redundancy when judged from the perspective of the knowledge a particular animal actually employs in its life-time activities. Yet this very redundancy-in-retrospect is a necessary ingredient of the stock of knowledge of exploratory animals since it facilitates their successful adaptation to the contingencies of their lives. The animal cannot know exactly what may befall it in the future. Its strategy seems to be to prepare itself for a wide range of possibilities by developing an open and flexible stock of knowledge. This enables the animal to combine bits and pieces of knowledge in a creative synthesis to suit the requirements of new situations. The bits and pieces may have

been learnt but not the new synthesis and application -- it is for this reason that the behavioural approach to learning is misleading, as noted earlier. Lorenz (1977:147) regards exploratory behaviour as objective behaviour. It is the seeking of knowledge for its own sake. He writes (p 147), "The raven that investigates an object has no wish to eat it; the rat that examines the nooks and crannies of its territory has no wish to hide; they both want to know whether the object in question can be eaten or used as a hiding place."

Refutation of equipotentiality thesis

In the early years of S-R learning experimentation the principle of "equipotentiality" was formulated. This principle, essentially a form of null hypothesis, held that any discriminable stimulus could become associated with any motor response an organism was capable of. This principle has now been rejected following numerous demonstrations that organisms generally reveal a tendency to associate certain stimuli with certain responses. Often, in experiments, the responses most likely to be associated with a given stimulus as dictated by the equipotentiality principle have been found not to be so associated. Instead, responses less likely in terms of the equipotentiality principle but biologically more likely have been found to be associated. (For further details see Seligman 1970: Seligman and Hager 1972; and Hilgard and Bower 1975.) Seligman (1970) and Seligman and Hager (1972) have proposed that the now empirically refuted equipotentiality principle be replaced by a "preparedness to associate" principle. In terms of this principle, animals are recognised as being genetically endowed with discriminatory tendencies which direct them to associate certain stimuli with certain responses. These genetically endowed discriminatory tendencies may be viewed as important components of the innate learning schema. The "preparedness to associate" principle is readily supported by observations of the ease with which animals learn certain things while other things are learnt with great difficulty and still others not learnt at all. For example, the experiments conducted by Garcia and others (see Garcia and Koelling 1967; Revusky and

Garcia 1970) reveal that rats have a tendency to associate states of experimentally induced nausea, vomiting and diarrhoea with certain nutrients and not others as well as with nutrients rather than other factors. Such experiments serve to confirm the preparedness to associate principle. As Hilgard and Bower (1975:574) state, animals seem to possess innate "connector mechanisms" which induce them to connect some stimuli and not others with a particular effect. The authors say of the rat that, "It 'knows' innately" that it is looking for a taste stimulus in the recent past to hook up to the illness. The rat's association procedures appear, these authors argue, to be governed by some kind of "natural fittingness" principle rather than equipotentiality. It seems that rats have a tendency to look to the food they have eaten rather than any other external factor for the "cause" of digestive ailments. A strategy, from the perspective of medical science, which would more often under normal circumstances lead to a successful diagnosis than a strategy biased, say, to non-nutrient factors as causes. The specific preparedness to associate principle and the more general notion of the innate learning schema receives additional support from the work of Seligman (1970) who has proposed that there exists a difference between "biologically prepared" learning and "biologically unprepared" learning. The first, as can be expected, is more easily achieved and is retained longer by the organism than the latter. Certain forms of learning are biologically impossible for certain species, an obvious point perhaps, but one often lost sight of in over enthusiastic discussions of learning. (See, also, Bolles 1970; 1972).

Wilson (1978:65) sums up the equipotential debate by writing, "... the underlying assumptions of simplicity and equipotentiality in learning have crumbled. In their place has emerged a picture of the existence of many peculiar types of learning ... The learning potential of each species appears to be fully programmed by its brain, the sequence of release of its hormones, and, ultimately its genes. Each animal species is 'prepared' to learn certain stimuli, barred from learning others and neutral with respect to still

others." Wilson provides several examples of the genetically structured nature of animal learning. One example is that of the adult herring gull which quickly learns to distinguish between its newly hatched chicks and other chicks but never between its eggs and other eggs which are just as visibly distinct.

The innate learning schema could be further described in the foregoing general way and further examples and substantiation provided. However, it seems appropriate to move now to deal directly with humankind's innate learning schema. This will allow us to link up the discussion of innate knowledge and the innate learning schema with the process of socialization and the many products of human learning and socialization which constitute the subject matter of sociology.

CHAPTER SIX

HUMANKIND'S INNATE LEARNING SCHEMA

> The young baby is actively interested in his surroundings. He shows by his behaviour a knowledge of the existence of the external world which he cannot have inferred from his own experience. He is guided by what is best described as his innate knowledge.
>
> Popper (1977:116)

Human society more than any other organic collectivity requires of its young that they rapidly and successfully assimilate a great deal of information if they are to become adequately functioning adults. During the years in which a child develops into an adult, the child must not only, as less gregarious creatures do, create for itself a world of understanding out of the morass of stimuli in which it is enveloped, but it must also equilibrate its understanding with those it discovers around it. Socialization provides part of the answer to the question of how the young child comes to develop into an integrated and functioning adult member of society. The other part of the answer, perhaps the most obvious but also the most neglected, is provided by the fact that human young are human young in the first place. A chimp cannot be humanly socialized. Human socialization cannot be understood apart from the humanly socializable nature of the human infant. Similarly, human culture cannot be understood apart from the capacity of human infants to both acquire and produce culture. It is the purpose of what has preceded and what is to follow to elaborate upon these obvious but neglected points.

Lorenz (1977:171) has expressed the view that the learnt knowledge of even the most intelligent ape represents only "... an infinitesimal fraction of the information stored in

the genome of its species". And adds, "Even the knowledge contained in the sequences of the nucleotides in the lowest of living organisms would, indeed does, fill many volumes when expressed in words." The ratio of learnt knowledge to innate knowledge in humans in comparison with the higher primates is of such an order that Lorenz feels that humans constitute a wholly other form of life. Though this judgement may have to be modified in the face of the rapidly expanding literature on primate learning, especially language learning, the essential point being made by Lorenz seems unchallengeable: Because of language and writing humans have so increased their stock of learnt knowledge that their ratio of innate to learnt knowledge is totally unlike that of any other organism, including the higher primates. Because humankind's capacity for language and writing seems to be a species specific characteristic, the emphasis on the biology of knowledge in this study makes it necessary to qualify the previous statement and to assert that the human young, even at birth, is already a unique form of life since it possesses the physical and intellectual attributes which enable it, under the necessary conditions, to develop into a "feral man", an "ape man", a "business man", or a "space man". No other creature has this potential. One of the features which helps account for the wholly other life lived by humans is their peculiar innate learning schema which operates to facilitate and direct learning along particular world opening lines.

The idea that humans are born with an innate learning schema is inspired and supported by the writings of many scholars drawn from a wide variety of disciplines. Reference to Piaget, Popper and Lorenz on this score has already been repeatedly made. Sullivan (quoted in Lorenz 1977:187) came to the conclusion that, "A child is born with the capacity to learn, and will learn by itself, provided the necessary external stimuli are present." According to Lewis (1977:54), "An infant is an active participant in his world, constantly testing himself and others, picking and choosing from the vast amount of information he receives." A baby rather than being a blob of malleable clay or an assembly of reflexes or

an organism only capable of random movements is more accurately viewed as a "... being with considerable powers to gather and process information from his surroundings even in the earliest weeks of his life, and though his capabilities are obviously limited by adult standards his orientation and responsiveness to the environment are nevertheless a marked feature from the beginning of life", writes Schaffer (1975:167). The evidence which is cited in the following discussion is intended to substantiate the foregoing ideas and validate the claim that the human infant is (1) motivated to learn, (2) knows how to learn, (3) knows how to teach itself important lessons, and (4) knows to some extent what to learn. It is further argued that, in the first instance, these observable abilities are representations of the operation of the human infant's innate learning schema.

The innate learning drive

Attention was drawn earlier to the role which the physiological drives play in increasing the amount of information available to an organism and in this way promoting learning. The human infant, via the energizing and activating effect of drives may, like other life forms, also be considered as enriching by this means its informational environment. The neonatal informational environment is further enriched and structured by its repertoire of reflexes which, besides, like drives being schemas serving specific and immediate purposes, can also be viewed as schemas which generate information. Thus, we may regard drives and reflexes as constituting important components of an infant's self-educating system.

But besides the "physiological" drives and reflexes, more specifically "epistemic" drives and reflexes can be identified. These are obviously core elements of the innate learning schema. When the assimilative aspect of the infant's learning schema is considered it appears that the infant is as hungry, if not more hungry, for knowledge as for food. Observers of infant learning have repeatedly been struck by the keenness and spontaneity of early learning; learning which appears to take place in the absence of more

typical extrinsic motivators and reinforcers. Influenced by Rousseau's ideas regarding the innate competence and goodness of the child, Froebel in 1887 and Pestalozzi in 1895 drew attention to the self generated activities of children. In 1900 Dewey wrote of the child's "intrinsic interest" in the world around it. The child educationalist Montessori (1909) founded her system of education on the idea that children have a spontaneous interest in learning. She emphasized the important element of intrinsic motivation inherent in the learning of the very young when she spoke of their capacity for "spontaneous learning".

Dating from such early observations is the realization that humans are born with some sort of drive or instinct to learn. Fox (1975:43) claims, for example, that, "Man's greatest instinct is the instinct to learn." Some refer to the "curiosity drive", others to the "explorative drive". The name is of little importance. What is important is the realization that human infants find learning intrinsically rewarding and actively seek knowledge. Behaviour which cannot be satisfactorily accounted for in terms of conventional empiricist learning theories. The available evidence indicates that the innate learning schema includes motivating and rewarding routines which accelerate knowledge acquisition in the early years of life. (See also Kendrick 1943; Mittleman 1954; Hunt 1972; Bower 1974; Lorenz 1977.)

One illustration of the learning drive is an infant's tendency to strive to accomplish certain ends and its tendency to repeat certain activities almost endlessly. Young babies, if unrestrained and under normal conditions, will often spontaneously attempt to reach a nearby object, they will strive to sit up, later they will strive to crawl, and later yet, they will strive and persist in striving to stand up and eventually to walk. Piaget's reports on the cognitive development of his children and other children is replete with examples of children repeatedly trying to accomplish some task or, having mastered a task or made an interesting discovery, to repeat the activity over and over again. Any parent will have experienced their children's demands to do certain things "again", "again", "again" until adult patience

is exhausted but the children's is still keen. Bower (1974: 238) reports how one of his daughters spent a large part of one night placing small objects in his hand, closing his fingers on them, moving the hand to a new location, and then opening the hand to see if the objects were still there. She kept this up until nearly 4 a.m.! Striving and repetition are activities obviously related to the acquisition and consolidation of knowledge and both are to some extent endogenous. Through striving new information becomes available for assimilation and through repetition a fuller and more permanent assimilation is achieved. Apropos the last point, by repeating specific learning activities, the infant indicates that it has some innate knowledge of an important pedagogic principle: the repetition of learning activities and the recall of memory traces is essential for the acquisition and preservation of knowledge.

Intrinsically initiated and motivated learning is exhibited by humans even in the womb. There seems to be considerable agreement now that it is in the nature of many schemas to exercise themselves repeatedly, especially when first acquired. Such exercise is self rewarding and such schemas operate spontaneously (see Flavell 1977; Hunt 1969; Furth 1969; Piaget 1972). Piaget employs the phrase "spontaneous activity" to refer to an organism's tendency to luxuriate in the structure and potential of its being. It is the expression of life. The spontaneous activity of the newborn reveals itself in rythmic, global movements. These serve through contact with the environment and through the internal cues they occasion, to provide the infant with a steady stream of information.

Though, as will be indicated, the learning of neonates and infants is responsive to external stimulation and is highly structured, it is important not to overlook the "structured randomness" which results from some spontaneous activity. Such structured randomness constitutes for the infant a faculty for making happy discoveries by accident. It is its serendipity system. There is obviously a clear connection between spontaneous activity, structured randomness, play and serendipity.

Play is generally a self-initiated and self-sustained activity which combines elements of exploration, exercise and practice. It not only generates information of a predictable sort but, because of its characteristic element of randomness, it also serves the purpose of serendipity. This serendipity may occasionally lead to unique discoveries. More commonly, however, because of the structured nature of much of the randomness generated by play together with the structured nature of the innate learning schema and the shared features of most human environments, it leads in one way or another to most children achieving the kinds of universal knowledge discussed in Piaget's works. Infants and children cannot help but discover such things as the permanence of objects, number, reversibility, basic rules of logic, and so forth, in the course of normal living and play. Writing specifically about the acquisition of the knowledge of objects, Bower (1974:238) states, "... the infant can hardly help discovering the problems posed by objects in the course of his everyday activities. ... In any normal environment, there are moving objects; objects do disappear incomprehensibly; things are placed in containers, and the containers are moved away." He proceeds to make the important observation that it is the vicarious nature of cognitive development -- the fact that the same knowledge may be achieved in different ways -- which argues most forcibly against a behavioural approach to such development.

The importance of play as a road to knowledge has been commented on by many writers, though it remains true as Bower (1974:238) observed that it has been little systematically studied for the light it can shed on cognitive development. Shotter (1973:47), for example, sees the intellectual growth of the child taking place, "... essentially in the realm of play. For the essence of play is that it is apparently unnecessary activity ... (which is) appropriate for later use in the conscious and deliberate pursuit of serious ends."

Besides the "accidental" acquisition of knowledge through play, young infants seem also to be inwardly motivated and capable of more systematic approaches to learning.

They seem often to explore their own bodies "purposefully". They seem also to "experiment" and to formulate "hypotheses". Some of this behaviour may be viewed as blind trial and error learning but often it seems more like conjecture and refutation because the infant seems to be varying its behaviour systematically and to anticipate particular results. Bower (1974) reports the outcome of a series of infant learning experiments which though undertaken on the assumption that infants commence life with few intellectual capacities led in fact to the converse conclusion. One series of such experiments revealed that the nature of the reinforcement used in the experiments was of little importance to the infant. What was important was the reinforcement schedule. It seems that it is this that often intrigues infants. As Bower (1974:8) writes, "... the schedule can pose problems to the infant, and the problem solving is the true motivation for human infants in a learning situation." He adds that though problem solving seems a most unlikely form of motivation to attribute to infants, there is evidence that makes this conclusion inescapable.

Bower refers, as an example, to the illuminating experiment conducted by Papousek (1969). In the experiment infants of two to three months of age were found to be motivated to discover what sequences of left-right head turns would switch on a light. These infants seemed to be testing hypotheses to determine what sequences would work. When the appropriate sequence for a particular trial was discovered, it was repeated a few times and then dropped. If, before it was dropped, it was discovered to no longer work, the infants again tried various combinations of head turns to discover the correct sequence. It seems that the light is not the motivating factor, it is "... the pleasures of problem solving" (Bower 1974:9). (See also the experiments of Lipsitt and Siqueland (1966).)

Why problem solving PER SE should be rewarding poses an interesting question for genetic epistemology. Part of the probable answer to this question has already been touched on in the previous chapter. That is, species with a large capacity for learning appear to create problems for

themselves even in the absence of any "real" problems such as hunger, danger or the need for shelter. Speculating on the evolutionary emergence of "non-essential" problem solving and the apparent intrinsically rewarding nature of this behaviour, it would seem that it is linked to the innately unspecifiable forms of knowledge which certain animals have evolved to utilize in adaptation. Creatures which make the unproblematic problematic obviously expand the range of information available to them and thus expand their stocks of knowledge. In addition, by more actively and self-motivatedly seeking knowledge, they learn more about the methods of acquiring knowledge. Thus, they make themselves more knowledgeable and more intelligent. Furthermore (a nod to the behaviourists) some "unnecessary" learning may lead directly to material rewards thus further stimulating and channeling the drive to acquire "knowledge for its own sake".

The innate attention schema

Evidence regarding the many features of humankind's innate learning schema has been accumulating rapidly over the past two decades. There is now so much information available in this regard that it is impossible to summarize it all here. One feature of this schema for which there is much evidence is its role in structuring the infant's perceptions. It seems that neonates have some inborn knowledge as regards what to look at and what to listen to in their environment. They have some notion of where to start learning, what to learn and how to learn it. The studies now to be referred to reveal that human infants are born with and rapidly elaborate an "attention schema" -- a sub-schema of the encompassing learning schema. The attention schema serves to systematize the neonate's learning. Certain fairly predictable things are looked for and attended to first, certain "problems" are attended to before others, in short, humans seem to be born with a kind of relevance hierarchy.

A truly archetypal tendency among many forms of life is the tendency to attend to novel stimuli at the expense of other available stimuli. This tendency obviously has great

does not take place. On the contrary, the persistence of the stimulation leads to greater and greater attention being paid to it. For example, very loud sounds are not habituated but lead instead to discomfort while sounds of more moderate volume are habituated. Many parents have probably wished they could habituate to their child's crying, but find this impossible to do. The biological categorization of stimuli into those that are habituated and those that are extremely and increasingly arousing is a further indication of the highly structured nature of the human neonate's innate learning schema. The stimuli which cannot be habituated are a compelling variety of information, ensuring that all infants will learn something about how to get food, water, comfort and so forth. In habituation, the stimuli is not changed, only the infant's attention to it. For stimuli that cannot be habituated, the stimuli itself must be changed through some action on the infant's part.

In its phenotypic form and operation the innate learning schema reveals considerable variation. Such variation is noticeable, for example, among infants in the differences they reveal as regards attending to novel information and assimilating it to the point of habituation. Some infants seem to have trouble becoming habituated, too much is novel and demanding. Their attention is continually being distracted so that the process of habituation cannot proceed normally. This condition is termed 'hyperactivity' in children and it seriously affects learning capacity since few things are attended to long enough or sufficiently directly for learning to be 'completed'. At the other extreme is the apathetic, severely retarded or unresponsive child in whom the tendency to be attracted by novelty is weakly manifest or perhaps totally absent. Some retarded children seem unable to habituate because they find one thing novel all the time. Such children will do the same thing day after day seeming never to grow tired of the activity. Their minds are imprisoned by the hold one learning situation has on them. Too rapid and superficial habituation is also a problem. For as Pribram (1976:71) states, "If we habituated in every recurring situation we would never be able to

horizontal rhythmical eye movement. A further rule instructs it in cases where there is light to search in the light horizontally and rhythmically for edges or contrasts. Such built-in "rules" might help to explain why, for example, movement, colour, contrast and complexity should have such power over an infant's visual behaviour. In place of Haith's "rules", Hebb (1972) speaks of "reflexes". For example, the baby's eyes shortly after birth tend to follow a bright light "reflexively" Hebb (1972:222). Whatever terms one chooses, what seems undeniable is the unlearnt nature of many learning "strategies", "reflexes", "rules", "programmes" or "schemas". Fagan et al. (1971) have analysed this issue comparing premature with full term babies. They found that the structuration of learning activities is due more to maturation than to experience. In the same vein, Bower's studies have led him to the conclusion that, "Learning seems to depend on very elaborate mechanisms that are not themselves the result of learning" (Bower 1974:14).

"Complexity" is one of the characteristics of objects which seem to attract an infant's attention. It has been found that babies only one day old will look longer at a patterned surface than a plain one. Fantz (1965) performed some of the first experiments on babies regarding visual attention to different forms. One thing he discovered was that newborns attended more to patterned than to homogeneous grey stimuli. In a study that suggests that newborns look for the densest information nodes in the objects they attend to, Salapetek and Kessen (1966) found that newborns sought and paid attention to contrasts and complexity as expressed, for example, in the corners of a triangle.

Though complexity has an attracting effect, the degree of complexity that infants attend to most strongly varies as they develop. Hershenson (1964) found that two to three day old babies look longer at objects of moderate brightness or complexity than at those too bright or complex or those too dull or simple. In a later study, Hershenson et al. (1965) found neonates to have a preference for shapes of intermediate variability. These findings taken together with such findings as that of Brennan et al. (1966) that the

preference for more complex stimuli seems to increase with age is consistent with what Piagetian theory leads us to anticipate. That is, the newborn is attracted most by objects that are easily, but not too easily, assimilable. The infant is structurally prompted to tackle manageable tasks as stepping stones to more complex tasks. This is a further example of the uncanny pedagogic wisdom of the human baby.

Neonates and infants attend closely to moving objects. A moving object has a greater attraction for them than does an identical stationary object or most other stationary objects (McCall 1975). A five day old infant who is sucking a pacifier has been found by Haith (1966) to stop its rhythmical sucking if a light moves across its visual field. Kagan (1972) reports that a two day old baby is more attentive to a moving light than to a stationary light.

Studies have shown a high degree of selectivity in neonatal and infantile attention to aural stimuli. As an analytic point, it is impossible for the ear not to be selective to some degree; structure of necessity implies selectivity. The more complex the finer the selectivity. It is obvious that the human ear and nervous system even in the newborn is no simple structure and we can thus expect to find a high degree of selectivity in its functioning. (This observation applies, obviously, to all the senses.) According to Eisenberg (1970) there is evidence which indicates that the newborn is selectively most responsive to sounds in the frequency range of the human voice (200 - 500 cycles per second) and to sounds of moderate length ($\pm$5 - 15 seconds in duration). Spezzano and Waterman (1977) report findings which suggest further that the neonate has a preference for high-pitched female voices rather than male voices. In an experiment in which newborns were able to control aural stimuli through sucking, Butterfield (1968) found them to behave so as to produce and vary the aural stimuli.

As regards the sense of smell, taste and touch, there too we find fine degrees of innate discrimination and preference. Learning in terms of these senses is thus also initially highly innately structured. Infants find certain

tastes and smells pleasant and others unpleasant. Sensations from its skin, muscles, bones and internal organs are interpreted by the neonate in an intelligent fashion and it adapts in terms of this information. This is accomplished through movements on its part, for example, or via the mediation of another person with whom the infant communicates using its own unlearnt sign system.

Innate learning coordinations

Piaget's psychology stresses the importance of learning through doing. The hands are humankind's chief instruments of acting on its world and of coming to know it. This is equally true of infants; they discover the nature of the world to a large extent through the use of their hands. Hands are themselves objects of learning as well as instruments of learning. As an object, the child learns about its hand by looking at it, by exploring it orally and by using it. As an instrument of learning the hand is used to do many things rich in information. It is used to feed, reach, touch, hold, release, explore, hit, signal, stack, empty, rearrange, hide, break, bang, lift, push, measure, count punch, prod, scratch, tear, insert, extract, find, etc. etc., the objects which compose the infant's world. The learning experiments conducted by Piaget and those inspired by his work emphasize the tremendous importance of the hands as learning and teaching instruments.

Anthropologists and psychologists seem agreed that because the hand is both a sense organ and a motor organ of the most delicate and flexible sort, it has played and continues to play a crucial role in the evolution of knowledge at all levels: phylogenetic, sociogenetic and ontogenetic. An equally crucial factor has been the refinement in humans of the close hand-eye-brain coordination found more generally in the animal kingdom. This refinement has been achieved in particular by the evolution of the human hand, the freeing of the hands through the evolution towards bipedalism and the evolution of the human brain. The close adaptive interrelationships between hand, eye, brain, tool, knowledge and environment are obviously important in accounting for the

path which human evolution has followed and still follows.

Closely associated with the hand-eye-brain coordination is the coordination between ear and eye and, in noisy manual activity, between hand, eye, ear, and brain. In a simple activity like cooking, sensations from the hand, mouth, ear, nose, eyes and internal organs might all be mentally co-ordinated. It seems most accurate therefore to regard the coordinations found between the various senses and the brain as expressions of the body's overall coordinations. Though it is true that many coordinations are learnt, these co-ordinations are superimposed upon the presuppose coordin-ations which were discovered by the genome and which have evolved to make the human organism an effective actor in its environment and an efficient and highly competent learner. The coordination of motor and sensory organs in the newborn greatly advances its rate of learning. More information is available per unit time because of coordination and, because of the unity of time and place of the actions and sensations, the newborn cannot help but learn about various associated aspects of the things it attends to. These coordinations provide, from the start, a multidimensional rather than a one-dimensional knowledge of objects and events. Infants do not have to put many of the pieces of their world together because they assimilate them together. The cooordinations of the body are thus reflected in the rapidly achieved order and accuracy which characterises the knowledge of the young infant. Because genetically derived cooordinations play such a vital role in the acquisition and genesis of knowl-edge, they must be seen as an important feature of the innate learning schema.

Human infants exhibit a number of coordinated sensory-motor behaviours which can be interpreted as accelerating and structuring learning. One such coordination is seen in the visual attention behaviour of babies which enables them to some extent to move their eyes and heads in unison with a moving object. Another simple coordination is the touch-grasp reflex. (I have seen an infant grasp a thorny rose stem and rather than release it because of the pain, she grasped it all the tighter -- screaming louder and louder as

she did so.) An obviously important learning coordination of the hand-eye-brain type is the see-reach-grasp coordination. Bower (1874:154-157) has found that newborn infants will reach out and grasp objects under specific conditions (they must be supported so that their arms are free to move). When these conditions are met, Bower found that newborns will reach out and grasp visually presented objects. Furthermore, he found that their reaching had a hit rate of about 40 percent with more than half their misses landing within a hand's width of the target objects. His observations seem to indicate that in reaching the infants sometimes anticipated grasping as their hands opened before contact and then closed on contact, but too quickly for the contact to have caused the hand closure. An interesting observation made by Bower is that the young infants do anticipate the tactile consequences of reaching as is evidenced by the upset they reveal when reaching for illusory objects.

The hearing and seeing of neonates seems also to be initially innately cooordinated. Wertheimer (1961) reports that neonates are not simply attracted by sound, they characteristically search for the source of sound with their eyes and by turning their heads. Bower (1974:169) reports the case of a blind baby girl who was observed to "look" for the sources of sounds she heard. In an experiment conducted by Bower and Wishart (1973) results were obtained which suggest that human infants have innate auditory-motor and visual-motor coordinations. That is, young babies will turn to look at visible objects or, if they are in the dark, will turn towards the position of a noise-making object. The experiment showed that visual localizations were more accurate than auditory ones. (See, also, Bower 1974:20-33.)

Bower (1974:164) refers to the work of Freedman (1964) and Urwin (1973) as providing evidence that initial aspects of the hand-eye-brain coordinations of the neonate are innate. All infants apparently go through a stage of looking at their hands as they wave them about or move them in front of themselves. Freedman and Urwin report that blind infants also track their hands with their unseeing eyes. Such

evidence seems to rule out a learning explanation. As Bower (1974:165) concludes, this type of coordination "must be built in" for it to have occurred at all in a blind baby. The fact that this coordination degenerated and disappeared in time seems to support this conclusion further.

The ear and the hands are also coordinated to some extent in infants and Bower refers to Urwin (1973) who observed the behaviour of an infant born without eyeballs. At 16 weeks of age this infant could reach out and grasp noise-making objects. This ability disappeared by the age of six months, writes Bower, despite considerable reinforcements and practice and did not reappear even by the age of ten months. Finally, research also reveals that infants can localize olfactory stimuli. Infants turn away from unpleasant odours. This coordination of smelling and turning has been observed even in the first hours of life leaving little doubt that it is innate (Bower 1974:19).

In summing up, it seems that humans are born with fairly complex sensory-motor coordinations. While, as has been found, many of these disappear in the weeks and months after birth or become incorporated in learnt coordinations, it seems inescapable that the innate coordinations play an important part in structuring and facilitating early learning and adaptation.

The innate learning schema and social knowledge

Up to this point the focus has been primarily on innate characteristics and tendencies in the newborn human which lead it to a primordial knowledge of its physical world. What is considered next are innate factors which help the newborn discover its social and cultural worlds and acquire the knowledge necessary to enter those worlds as a participating member.

As a social creature, the human infant needs not only to learn from its own activities but it also has to learn from its conspecifics. Its ability to do this is obviously aided if it has some innate knowledge of what its conspecifics are and if it finds learning from them rewarding. Fulliam and Dunford (1980:6-7) suggest that it would be useful for a

young learning machine to be built with the instruction: "Imitate those older than yourself".

In the case of humans and some other social animals, there is no exact genetic instruction as regards who or what to learn from but there are a range of minor "instructions" which, under normal circumstances, cause the newborn to pay particular attention to its mother and others of its own kind. It is not simply, as will be indicated, that the mother and its own kind are near that leads the newborn to learn from them (though this is obviously a necessary condition), it is also because it is genetically structured to learn from the kind of teaching objects they are.

As partly noted above, infants are strongly attracted by objects that are novel, that move, that are complex, that have colour, form and three dimensionality, that stimulate more than one sense organ, that smell good, that feel warm and soft, that are comforting and reassuring, and so on. It takes little imagination to realize that in terms of what turns little babies on, its mother (or her surrogate) occupies the prime position. Furthermore, there can be little doubt that as far as initial social and cultural learning is concerned, the mother represents probably the most important teaching object in the neonate's immediate environment.

Empirical support for these ideas can be found in works already cited and in others. There is evidence that a human face is more interesting to a newborn infant than is an inanimate object. Brazelton (1974) has argued that infants are genetically programmed to attend to the human face. He has also established that as early as one week of age, newborns will react to certain "mothering cues", thus indicating a readiness for reciprocal interaction. Is it just accidental that though newborns have a limited ability to focus their eyes, their eyes are fixed to see objects most clearly that are within 9 - 12 inches of their faces? This is the distance, strangely enough, which mothers tend to keep between their faces and those of their babies when they look at them intensely. Also, it is roughly the distance between the mother's face and the baby's when the baby is at the

breast (see Spezzano and Waterman 1977; Bowlby 1976). It has been suggested by Fantz (1961) that the neonate's apparent innate preference for pattern as compared with colour is probably related to the greater survival value of pattern recognition over colour recognition. This suggestion has been taken further in the work of Richards (1974a; 1974b). His investigations led to the discovery that the human infant's biological structure ensures that it focuses not only on the adult, but on those adult anatomical features most heavily involved in the process of communication. He found that infants tended generally to attend selectively to the adult face, paying most attention, probably for reasons cited above, to the mouth, lips and eyes, and also the hands. The child is clearly biologically biased so as to home-in quickly on the components which operate to constitute human speech and non-verbal communication. Richards regards this infantile characteristic as a biological pre-adaptation for socialization since the adult face and voice are such rich sources of information.

Apart from having some knowledge of who and what to imitate, the newborn also appears to have some knowledge as regards how to imitate. Lorenz (1977:203) is among those who feel that humans have an "inborn capacity for imitation". In a carefully controlled experiment it has been found that infants from 20 days of age will not only look carefully at their mother's face or that of another adult, but will imitate such facial actions as pouting the lips, opening the mouth and putting out the tongue (see Meltzoff and Moore 1977). This discovery of imitation in the very young provides strong evidence that the innate learning schema serves to encourage and facilitate primary imitative learning. The importance of imitation in its many forms to human learning need hardly be stressed but what is often overlooked is the complexity of the process. An infant putting out its tongue in response to a similar action by an adult must somehow have an internal schema which corresponds to the visual input. Since, as a rule, an infant does not close its eyes when an adult puts out his or her tongue, it seems that the basic correspondences and actions involved in imitation are

not learnt but innate. This internal structuration is also expressed in the observation that certain things are imitated more readily than others. The motivations and satisfactions involved in imitation seem also to be, initially, internally generated. The genetic nature of imitative behaviour is further suggested by the fact that such behaviour appears to develop as much as a result of maturation as it does through learning and exercise. No sooner does an infant gain control over a particular part of its anatomy than that part comes into play in imitation. The complexity of this later behaviour is again apparent. The child may see its parent clap hands, the imitation clapping hands is the motor equivalent of the visual impression. To imitate, the child has to 'translate' what it sees or hears into what it does. That this is accomplished so seemingly easily underlines the possibility of the operation of complex non-learnt structures. (See, also, Popper 1974:161; Lorenz 1966:47).

Though Piaget seems not to have noticed any imitative behaviour in the very young baby, he has made an important contribution to our understanding of the development of imitative behaviour, showing in particular the importance of internal structuration, maturation and learning. What his observations make clear is that though infants are exposed to different environments, their imitative skills go through specific stages and reveal similar characteristics. Piaget (1954, 1952) has recorded how imitation begins with a form of "pseudo-imitation" some time between the first and the fourth month after birth. An example of this early imitation is an infant copying someone else's copy of one of its actions. It may put its hand in front of its mouth and then take it away. If an observer then does the same, the infant may "imitate" this imitation. From such simple beginnings the infant progresses step-by-step to the complex imitative skills of older children (for a good summary see Flavell 1977). The richness and the diversity of the knowledge involved in acts of imitation is apparent when one observes the play of children which involves them pretending to be persons or things they have seen, heard of, read about, or imagined. Appreciating the part played by innate factors in

imitation provides further insight into the contribution made by the innate learning schema to the acquisition and development of social and cultural knowledge.

It was noted in a previous chapter that values can be regarded as a form of knowledge and that humans and other organisms have complex innate value structures. Babies have obvious likings and dislikings that are not learnt. The structures which these represent can naturally be considered as part of the innate learning schema since by establishing the baby's initial system of positive and negative reinforcers, they play a vital role in determining the content and direction of cognitive and social development. "Learning seems to require reinforcement", writes Fuller (1978:111), "and we must ask why soft words, a smile, or a touch of the hand are reinforcing." By referring to an experiment he had conducted with young puppies, Fuller argues that it seems to be the case that humans and other animals have a genetically inherited value system which encompasses more than values related simply to the most basic physiological needs. He writes (p 111), "I am convinced that these reinforcers (soft words, gentle contact) are as primary -- as genetic, if you will -- as hunger and thirst, even though we cannot define them in terms of the reduction of peripheral physiological imbalances."

If it is indeed the case, as it appears it is, that human infants are genetically disposed to respond positively to the human voice, soft words, a smile, human contact, human warmth, the human face, and so on, then this too can be regarded as an expression of the human innate learning schema. The infant's mother and other humans are thus for it more than the major objects of learning. They are also major objects of reinforcement. An infant's innate learning schema thus endows the humans it is in contact with with a special power to determine the nature and direction of its intellectual development. For this reason, infants under normal circumstances are inexorably bound to acquire some of the social and cultural knowledge made available to them by their fellow humans. Some forms of such knowledge are by the nature of things inevitably assimilated.

Language and the innate learning schema

Language, implying as it does symbolically objectivated, communicated and acquired knowledge, is generally regarded as humankind's most important distinguishing feature. The emergence and development of language in children, as many agree, presupposes a particularly genetically evolved capacity for language. This being the case, it may be claimed that humans are human because they have the kind of innate learning schema which makes language possible.

Cassirer (1970), Chomsky (1957, 1966, 1968, 1972) and Lenneberg (1964) are among those who have argued that the uniquely human capacity for grammatical speech is innate and that this capacity develops according to environmental influences and innately structured stages of unfolding. "Whatever evidence we do have," writes Chomsky (1972:102), "seems to support the view that the ability to acquire and use language is a species-specific human capacity, that there are very deep and restrictive principles that determine the nature of human language and are rooted in the specific character of the human mind." So strongly are humans genetically disposed to culture and to language that Fox (1973:251) has gone so far as to hypothesize that an unspeaking couple living in total isolation and capable of reproducing physically normal offspring would be the founders of a human society which would come to possess all the things now characteristic of societies in general. Among these things would be language and this language would be familiar in its structure to all presently known languages. Rose (1976:175) has summed up this type of argument by saying, "We are committed to speaking because we are human."

The idea of humans having the capacity to re-create language and culture because of their genetic dispositions for these, suggested by Fox, is an idea more fully developed later. But it is worth noting at this point, as McNeill (1966:34) writes, that, "On the basis of fundamental biological characteristics (of which only slight understanding is presently available), each generation creates language anew." Too little is conveyed through what passes as the learning process to account for the acquisition of language.

There is some evidence to suggest that language is as much an invention of the language learner as it is something learnt from language acts and objects. That at least a small part of language is spontaneous and innate is suggested by the babbling behaviour of babies and the "proto-languages" developed by twins and children who have been exposed to little or no spoken language. Some indication of what human infants contribute to language learning is provided by the attempts which have been made to teach apes to speak. (For a recent overview and evaluation of this work, see Savage-Rumbaugh et al. 1980.) The great disparity between the linguistic performance of apes and young children suggests that there are major differences in the learning schemas which each species applies to the linguistic information provided. The comparative ease with which most children learn language irrespective of whether or not they are "formally" taught is further evidence of the important contribution they make to such learning. Our limited knowledge of how language is learnt by children partly demonstrates the extent to which language is a creation of the child and society, rather than being primarily something society imposes on the child.

Babbling, it can be argued, seems logically connected with the development of speech. Minimally it represents the exercise of the organs later to be employed in speech. More importantly, it can be seen as a self generated exercise to discover the correspondence between specific sounds and specific vocal actions. Even more importantly, it may lead to early self-discovered associations between specific sounds, specific vocal actions and specific effects on adults and the environment. That is, it might lead to the discovery of the signalling effect and meaning of specific sounds and vocal acts. That babbling is innate and emerges as a result of maturation is demonstrated by the observation that deaf and normal infants begin to babble around the age of five months (Bower 1974:144). This primary babbling of deaf and normal infants is initially indistinguishable and continues for about ten months when it starts to disintegrate and disappear in the deaf infants while it gradually metamorphoses

into speech in the normal infants. "This evidence would seem to show conclusively," writes Bower (1944:144), "that audition is not necessary for the establishment of this phase of babbling and that auditory feedback is not necessary for its maintenance." According to Bower the secondary babbling phase leads on in the normal infant to speech and it requires auditory input for its initiation and maintenance. An earlier study by Lenneberg et al. (1965) found that infants of both deaf and hearing parents produce similar early vocalizations. They concluded from this that crying, babbling and cooing in infants up to four months of age is independent of environmental stimulation.

Attention was devoted earlier to that category of knowledge which is not learnt in any simple or direct fashion but is abstracted from such learning. This abstraction is something the learner does and yet it is not something that is itself learnt in any obvious way. What of the very early acts of abstraction and construction? Though ascribing these to innate factors might appear to be avoiding the issue, ascribing them to learning without accounting for how they are learnt could equally easily be said to be avoiding the issue. The unproblematic, stage-like and universal fashion in which infants and young children abstract similar knowledge from specific items of socially transmitted knowledge suggests that the growth of knowledge through abstraction and construction involves genetically inherited capacities. Capacities which lead the young learner to readily associate certain items of knowledge and to abstract from these or, using these, to construct the rules, grammars, logics, generalizations, meanings and categories which form part of the human stock of knowledge but which are not generally directly taught. Indeed, some of these things cannot be directly taught but only discovered.

The work of Chomsky provides grounds for the assumption of the existence of the innate learning schema. His work also sheds light on how this schema operates to permit and facilitate the human child's acquisition of language. According to Chomsky, empiricist theories of language learning do not adequately explain how it is possible for a

child to unconsciously construct for itself out of the relatively small number of utterances it hears the grammatical rules of its language. "It is the child's inborn knowledge of the universal principles governing the structure of human language that supplies the deficiency in the empiricist account of language acquisition" is how Lyons (1970:106) summarizes Chomsky's counter to the failings of empiricist language acquisition theories. Chomsky (1972:192) says himself that in the light of the evidence currently available, "... there is no reason why we should not suppose that the child is born with a perfect knowledge of universal grammar, that is, with a fixed schematism that he uses in acquiring language." Humans are born with an innate know-how for the acquisition of language. It is this inborn knowledge, according to Chomsky, which makes the rapid acquisition of language among children possible even though they are socially provided with a selective, inadequate and often degenerate sample of language from which to construct the rules which structure language. Chomsky (1972:37) speaks of the "innate human FACULTE DE LANGAGE" and also of the innate language acquisition system. This faculty or system is one of the faculties of the mind. "On the basis of the best information now available," writes Chomsky (1972:59), "it seems reasonable to suppose that a child cannot help constructing a particular sort of transformational grammar to account for the data presented to him, any more than he can control his perception of solid objects or his attention to line and angle."

An important operation of the innate learning schema as this applies to language acquisition is that it directs the human infant to pay close attention to the human face and the human voice. The strong innate bias human infants have in favour of looking at the human face has already been noted. In addition to this, infants seem also biased to attend closely to the human voice (Eisenberg 1967, 1970; McCall 1975; Menyuk 1971). Condon and Sander (1974) confirmed that babies are especially responsive to the human voice. They found that babies as young as 12 hours old move their bodies in rhythm with human speech. They did this to

the sound of either English or Chinese but did not do so to discordant vowel sounds or to tapping. The investigators suggest that from the first day of life the newborn may be preparing for speech. Eimas (1975) provides evidence which suggests that human infants come into the world with the ability to make the kinds of perceptual discriminations necessary for the acquisition of language. Eimas found that infants from about one month of age categorize consonatal sounds. This behaviour and other related behaviours reveal that young infants perceive speech categorically. That is, as discrete sound units rather than as a "blooming, buzzing confusion". It seems, further, from Eimas's work that infants are born with a perceptual bias in favour of specific linguistic features just as they have a bias towards specific visual features. Finally, Eimas is of the opinion that without these innate structures and biases, the acquisition of language would be difficult if not impossible (see, also, Flavell 1977:164-167).

Richards (1974a; 1974b) has drawn attention to the functionality of the infant's apparently biologically rooted preference for attending to speech-like sounds. Like Eimas, Richards feels that infants seem to possess a rudimentary knowledge at birth regarding what sounds are important and which are unimportant. Richards argues that this biological pre-adaptation implies that the infant does not have to begin from scratch when classifying the sounds around it, nor (it may be added) does the infant have to develop the classificatory schema from scratch. Instead of proceeding entirely randomly or haphazardly, human infants seem to have an inborn inkling regarding the teleonomic value of particular sounds. Richards also suggests that human infants seem to be biologically endowed with a rudimentary sense of timing which is a pre-requisite for speech development. He states, in response to those who opt for the view of the infant as a TABULA RAZA creature with a few reflexes and otherwise random movements, "Observation of the environments of infants provide no evidence that parents systematically respond to their children in the ways that are required by learning theory. No, the infant must play a major role in

structuring and organizing his own environment and learning particular things about it, and clearly he is endowed with a biological nature that makes this possible." (Richards 1974:237). Gardner and Gardner (1975) have noted in connection with the pre-adaption of infants to acquire speech, that recently developed techniques for recording the behaviour of neonates have revealed that the human infant is responsive to characteristics of adult speech, such as segmentation and the distinction between phonemes, within a month of birth.

The innate learning schema is itself something that develops through maturation. The inborn learning capabilities of the foetus are different from those of the newborn whose capabilities are again different from the one-year old. The unfolding of the innate learning schema has implications for the development and content of the individual stock of knowledge, playing a decisive role in determining what information is assimilable at any moment of development. Penfield (1969:141) has drawn attention to the fact that the developing human brain appears to have in it a "biological clock of learning aptitude". He points out that while a mechanical computer can be programmed to a new task at virtually any time and any existence programme extensively modified within the limits of its 'meta-programme', this is not the case with the human brain. Penfield, along with such writers as Piaget, Bower, and Chomsky, views all human learning as inextricably linked to physical maturational factors. The human brain seems, says Penfield, to be programmed to be optimally programmable for a specific range of learning activities at a given point in its temporal development. Imprinting Provides the classic example of learning under the control of an innate schema with a strong temporal developmental factor. Human language acquisition appears also to provide a further though more complex example. According to Penfield (1969:141) the human brain appears to be optimally linguistically programmable at a certain point in time. Many linguistic studies confirm that the tremendous facility which young children have for acquiring language seems to be genetically and maturationally determined to a

large extent. Language learnt at an early age is learnt differently from language learnt later and these two varieties of language reveal important differences in terms of how they are stored and function. Lenneberg (1967) points out that children in different cultures not only start developing language at roughly the same age but they go through very similar stages in their learning of language. He argues that this observation provides evidence for an innately determined sequence of language development. There is a critical period for language learning just as there is for walking.

The existence of uniquely human genetic structures in the human ability to acquire language is demonstrated by the general failure to teach higher primates to use language. Lenneberg's (1964) arguments imply that attempts to teach animals language are doomed to failure. He has even gone so far as to demonstrate that the ability to acquire and use language does not depend on being intelligent or having a large brain, it depends on being human. Though these observations were made before the explosion of efforts to teach language to apes, Lenneberg's main thesis seems to have been confirmed by these efforts. While apes appear capable of acquiring and using certain items of protolinguistic knowledge, such as is represented in asking for certain things or in "naming" certain objects, they do not seem to be able to acquire or use linguistic knowledge proper. In concluding their carefully reasoned answer to the question, "Do apes use language?", Savage-Rumbaugh et al. (1980:60) state,

> Apes, then, like children, learn to use symbols as part of social-interaction routines. They are able to discern various sets of circumstances in which the production of particular symbols is deemed appropriate and results in obtaining a goal. They, like children, also learn to initiate these social interaction routines by producing symbols. Unlike children, however, apes do not seem to have moved beyond this point. To date, there is no evidence that Washoe, Sarah, Lana, Koko, or Nim achieved symbolization proper.

They conclude,

> Thus, it appears that chimpanzees, even with intensive linguistic training, have remained

> at the level of communication they are endowed with naturally -- the ability to indicate, in general fashion, that they desire another to perform an action upon them or for them when there exists a single unambiguous referent.

As the evidence stands at present, it seems possible to say that if very particular biological and, hence, genetic, factors did not play a part in language acquisition, then apes should be able to be taught language. Their failure to learn language, even specially devised and adapted languages, is a partial vindication of the innatist thesis. As Pribram (1969:2) has pointed out, we seem to "... inherit something that structures our communication and that other creatures do not share".

The careful studies of Lenneberg (1964) indicate that the ability to learn language is so deeply rooted in humans that children learn it even in the face of dramatic handicaps. It is so difficult to suppress language that handicaps such as blindness and deafness do generally not preclude its acquisition. The case of Helen Keller, born blind and deaf, provides powerful evidence for the idea of an innate schema serving to facilitate language learning. Lorenz (1977:189) states that the manifest impossibility of such an achievement as that of Helen Keller when viewed from the perspective of conventional learning theory is for him unshakable proof of the correctness of the innatist thesis.

Knowing how to learn

This discussion of the innate learning schema would be incomplete without some attention being given to the learning process itself. That is, to those operations which produce knowledge out of the information available. Obviously, because this is a vast and multi-disciplinary topic, it is only possible to make a few cursory observations here.

While human adults may be considered, to some extent, to teach children such things as language and social behaviour, it must nevertheless be admitted that they do not teach children in any appreciable fashion how to learn these things. As a logical point, even to teach someone how to learn presupposes that the person already knows how to learn

how to learn; at every instance of learning an A PRIORI learning structure and learning ability must be assumed. Human infants in every instance of learning are partly responsible for what is learnt (and what is not) and the earliest acts of learning are largely a consequence of the functioning of the innate learning schema. As Piaget (1971: 150) states, "... there is no cognitive impression without the intervention of some organizing function, conserved from previous situations, which can be traced back to innate reactions." Even in adults, since they know how to learn and this knowledge is similar in terms of its representations to that of children, it can be assumed that much learning is still largely acquired as a result of innate factors.

Though certain functions and routines of the innate learning schema are more open to modification through experience than others, some are not. Thus, even the learning schema of an adult will have many relatively unmodified innate elements. The role of the sense receptors in selecting and translating stimuli into information provides an example of such a relatively fixed element. The way in which the physiology of an organism serves to constitute the information available to it has been described by Lettvin et al. (1972) in the case of the frog. In their work on the vision of the frog, these investigators discovered that the eye serves not simply as a T V camera, relaying impressions of all the light rays which enter it and to which it is sensitive, but also acts as a device for selecting specific visual stimuli out of the range available and transmitting these to a higher information processing level. As they phrase it, "... the eye speaks to the brain in a language already highly organised and interpreted, instead of transmitting some more or less accurate copy of the distribution of light on the receptors" (Lettvin et al. 1972:135). Evidence such as this suggests via extrapolation that human senses operate to constitute to some extent the content of consciousness and the material of thought. White (1972:xi) has pointed out that humans are biologically placed in a state of sensory repression and that this is functional because sensory processing is the initial stage in the

biological construction of reality.

Because of the built-in nature of sensory selection, it seems that one of the effects of the newborn's learning schema is to simplify the informational environment and make it more manageable. In the light of this observation and the foregoing discussion, it seems thus that William James was mistaken when he wrote that the newborn's world was a "blooming, buzzing confusion". It is adults, projecting their world on the newborn who make the mistake of supposing the ignorant little baby must be overwhelmed and confused by the world. But there is no the world in any perception. We tend not to project such confusion on young animals, nor, for that matter, on grown animals living in the human habitat. The available evidence suggests that because of the structure of its sensations, perceptions and cognitions, the newborn's "doors of perception" are only slightly ajar and this is highly functional. It has fewer things demanding its attention and these, as has been noted, are ranked in some way. There is much that is "invisible" to the infant. Much that is too far away, moves too slowly, is too small, is too dull, is too quiet, etc., is, for example, not seen. Just as obviously, the problems that occupy adult minds are not the ones with which infants concern themselves. Each organism not only lives in its own world, each age of organism and each organism with a different stock of knowledge has its own world. An infant's world gradually expands as its knowledge develops and is from start to finish seldom if ever unmanageably incoherent or cacophonous. The world of the teenager is, existentially speaking, no more confusing or disorderly than that of the university professor. This approximate equilibrium between information and knowledge is a result of the fact that knowledge plays a role in determining information. Infants see less because they know less. The blooming, buzzing confusion is only visible in the imagination of adults, even to them it is invisible in reality. Evolutionary theory suggests that this equilibrium between information and knowledge is a necessary phylogenetic achievement. An organism that is ordinarily overwhelmed by stimuli would have great difficulty in learning and adapting.

It is highly unlikely that such a hypothetical sensitive and vulnerable organism could exist or continue to exist.

Besides the filtering, selecting, interpreting and information constituting activities just referred to, the innate learning schema also functions to store, integrate and maintain knowledge in memory. Perception and cognition involve the fusion of previously acquired knowledge with the stimuli of the moment. Though these activities develop, they are not learnt in any obvious way. They are expressions of the functioning of the nervous system as much as the expression of particular stimuli. Dreaming and imagining are also activities which, while they contribute to the assimilation and development of knowledge, are not learnt. The emergence of the various kinds of "abstracted" knowledge indicates one way in which the developing mind appears to work on the knowledge at its disposal. It abstracts from specific items of knowledge general principles and axioms which are not given to consciousness in any direct fashion.

It was Heraclitus who claimed long ago that "strife fathers all things" (Stikkers 1980:10). Knowledge is a child of strife. As was pointed out when the equilibrium process was discussed, Piaget's theory of cognitive development is basically a conflict theory and is compatible with various other cognitive dissonance theories. Conflict, non-balance, dissonance, contradiction, disequilibrium, disharmony, incompatibility, are all words describing the condition which serves to propel cognitive development. But what is it in the young infant or in the adult that makes cognitive dissonance disequilibrating? Why should logical inconsistencies or incoherences bother us? Why should we we seek to resolve these? The answer seems to lie in the fact that the motivation to equilibrate dissonant ideas, thoughts and feelings is an expression of a more general tendency fundamental to life. This is illustrated, for example, in Piaget's consideration of the genesis of logico-mathematical and scientific knowledge. He argues that these are outgrowths and expressions of the self-regulatory and adaptive character of life. The thrust of life is always towards better adaptation. The equilibration of the conflict

between two scientific theories which is generally achieved by judging one superior to the other marks an advance in adaptation. If the one theory is indeed empirically superior to the other it should extend not only humankind's theoretical knowledge but also its power over its environment. Though there seems little biological need to equilibrate religious, literary, musical or artistic knowledge, it seems that the habits, tendencies and structures expressed in equilibration are generalized to these "non-vital" fields of life and knowledge.

What this boils down to is the idea that we have, as part of our innate learning schema, a tendency to recognize and to be disturbed by perceptual and cognitive dissonances, and, furthermore, to be inwardly propelled to seek their resolution. As this can usually only be accomplished through the rearrangement of existing knowledge, the acquisition of further knowledge or the abstraction of higher forms of knowledge, it is easy to appreciate why theorists like Piaget see cognitive tensions as the motor of cognitive development and epistemic evolution.

Before concluding this chapter it should be pointed out that the innate learning schema, though it serves to structure the development of knowledge, does not do so as rigidly as some interpretations of the word "innate" might lead one to suppose. Epistemogenesis involves much more than simply the operation of the innate schema. In addition, it has been found that this schema is extremely flexible. Flavell (1977: 237) interprets Piaget (wrongly, I submit) as having argued that relatively specific, usually manual, sensory-motor manipulations of concrete objects are necessary for normal cognitive development in infancy. Flavell (1977:237) and Boden (1979:48) both point out that if this is indeed Piaget's argument then he is mistaken. Flavell and Boden refer to the work of Jordan (1972) and Kapp and Shaperman (1973) which provides evidence indicating that the more orthodox types of sensory-motor manipulations are not the only avenues to the attainment of Piagetian and other types of knowledge. Jordan's work discusses the case of a middle-aged woman who had never had any functional use of her limbs

but who nevertheless developed a stock of knowledge normal enough to allow her to pass as a lively and intelligent person and one able to help others complete their income tax forms. Kopp and Shaperman (1973) report the case of a baby born without limbs and fingers but whose acquisition and development of sensory-motor knowledge kept pace with other infants of the same age. Bower (1974:237) provides additional evidence on this point through referring to the work of Gouin-Decarie (1965) who had studied the cognitive development of limbless thalidomide infants. These studies revealed that the sensory-motor intelligence of these severely physically handicapped infants at two years of age was more or less normal. Unlike Flavell, Boden sees such cases as confirming rather than contradicting Piaget's ideas. The versatility of the human learning schema is expressed by the fact that not a <u>specific sort</u> but <u>some sort</u> of sensory-motor experience is necessary for the growth of knowledge. Whether a child is forced to use its head and mouth to achieve the kinds of manipulations and discoveries that are more usually achieved using the hands and feet seems to make little difference as regards the knowledge finally abstracted from such acts. The relative immateriality of exactly how the information is provided underlines both the structuring power and flexibility of the innate learning schema. Boden (1979:48) sums up this matter by concluding, "Our biological endowment of intellectually relevant structures is apparently rich and flexible enough to enable human intelligence to mature even without the manipulative experiences that are so important to the normal baby." We achieve the same knowledge via a million different paths.

Besides being versatile, the human learning schema is also resilient (Flavell 1977:238). Imprinting is an example of a non-resilient feature of an animal's learning schema. Studies reveal that if the critical period of imprinting passes without imprinting having taken place, such learning cannot be later acquired. The animal's stock of knowledge remains permanently impaired. Following Flavell, and in the light of what is known about the acquisition of different types of knowledge, it seems that the human learning schema

is resilient in some cases and vulnerable in others to the effects of a negative learning situation or a physical handicap. Knowing how to read and write and knowing how to speak and understand a spoken language are both important epistemic achievements. Studies indicate, however, that the acquisition of language can be environmentally more permanently disturbed than can the learning of reading and writing. The latter can be learnt at almost any age, but there is a critical period for the learning of language itself. Though the human innate learning schema is in some respects both versatile and resilient, as has been noted, it is structured to be so and its structured nature is, once again, reflected by the fact, as Flavell (1977:239) notes, that, "Some forms of cognitive development clearly exhibit much more versatility and resiliency than others".

Conclusion

It has often been claimed that humanity's propensity for culture is due to the "bursting of instinct". In a typical statement in this vein, Pulliam and Dunfort (1980:51) write, "The evolution of the vertebrates appears to be characterized by progressively less genetic determination of behaviour". The sociologists, Berger and Luckman (1967:66) are in agreement with Pulliam and Dunfort and provide an example of an oversocialized conception when they speak of humankind's instinctual organization as "underdeveloped" compared with that of the higher mammals. Haralambos (1980: 2), echoing the conventional sociological view, states, "... man's genetic code does not contain specific instructions to behave in a particular way". Though statements such as these convey some truth they are also misleading and partly erroneous. If such statements are interpreted to imply that humans have <u>less</u> innate knowledge than other more instinctively directed organisms, then they are mistaken, I would submit. If the term "behaviour" is interpreted, as I think it should be, to cover learning behaviour as well as other forms of behaviour, then it becomes obvious, in the light of the contents of this chapter, that a vital aspect of human behaviour, and one that influences all other aspects, is

indeed strongly genetically coded. Thus to state as does Haralambos (on behalf of sociology) that humankind's genetic code does not contain specific instructions to behave in particular ways, is patently wrong. Berger and Luckmann's claim that humankind's instinctual organization is "underdeveloped" is misleading. The result of any genetic underdevelopment or aberration is generally disastrous for life. Humankind's genetic organization is highly developed. Certainly, much hinges on such terms as "instincts", "innate", "genetic" and "behaviour" as used by these and other writers, but I nevertheless feel that what is now known about humankind's genetic make-up does not warrant statements, of which the above are a sampling, which imply the absurd conclusion that the creature supposedly at the top of the phylogenetic scale has somehow lost great wads of genetic information.

Such factors as the conserving nature of DNA, the partial recapitulation of phylogenesis by ontogenesis, the fact that the human brain is stratified -- the younger phylogenetic structures imposed on the older, the many cases of reflexive behaviours becoming incorporated into open flexible schemas under volitional control, the selective power of language, tools and culture in forcing human evolution into a biologically unique direction and the many observable manifestations of the innate learning schema -- such as the examples already given, strongly suggest that humankind's tremendous plasticity is the result of the genetic acquisition of <u>more</u> innate knowledge. The genome has had to acquire the ability to learn and this ability is now programmed into the human genes. Thus, it seems that Lorenz (1977:65) is correct when he writes, "All learning ability is based on open programmes which presuppose the presence, not of less but of more, information in the genome than do so-called innate behaviour patterns".

Though newborn babies appear helpless and ignorant, it is only a superficial appearance. An appearance that has beguiled numerous scholars into attributing too much of the newborn's later achievements to the environment and society. Haralambos (1980:2), again echoing the conventional sociological view, states, "To all intents and purposes a newborn

baby is helpless. Not only is it physically dependent on older members of the species but it also lacks the behaviour patterns necessary for living in human society." Far from being helpless or ignorant -- or living outside of society -- the newborn is massively helpful and knowledgeable -- and a participating member of society -- only not in very obvious ways. In its own way, it helps itself to learn and instructs others how, when and what to teach it and how to behave towards it. The newborn is helpless in some obvious ways because its parents are so intelligent and helpful with regard to these. Similarly, its ignorance of so many things is counterbalanced by its innate knowledge about how to learn these things and the existence of the necessary information in the environment and in the stocks of knowledge of its parents and other humans. In short, the "helplessness" and "ignorance" of the newborn represents its accurate foreknowledge of its world and its kind. To take away society from the newborn as a demonstration of its weak instincts, is like taking a tadpole out of water; both will die. The help and knowledge which the newborn brings into society are forms of help and knowledge which society cannot offer and does not have to offer. Society itself would not be possible without these forms of help and knowledge.

The tadpole in water and the newborn in society; neither can help but develop. In the case of the newborn, Flavell (1977:232) comments, "Cognitive development has a sturdy, relentless, inexorable quality to it ... a sense of this intrinsic momentum towards growth becomes especially strong if we try to imagine what we would have to do to prevent a child making any cognitive progress between the ages of 0 and 15 years." He adds that during the period of childhood, human beings are best construed as devices programmed to develop and develop they will given any reasonable opportunity to do so. This point echoes the work of Wohlwill (1973) who feels that early cognitive development is, under normal circumstances, inevitable. From a psychological point of view it should be taken as given rather than as something to be explained. Its explanation lies more in the fields of neurophysiology, genetics and biology. It has been

the mistake of much sociology and psychology to devalue that which is taken for granted. The child's capacity to learn is just as important and as much a part of socialization as is the information society makes available to the child. An adequate understanding of socialization or learning must encompass both.

CHAPTER SEVEN

BIOLOGY AND CULTURAL KNOWLEDGE

> It is the capacity for returning reductively to the use of universals, to the "materials" that furnish human beings with the power to create imagery, that inspires adult creativity. In childhood this behaviour is innate and spontaneous, the normal process a child employs when fulfilling his basic appetite for knowledge.
>
> Edith Cobb (1977:95)

In this chapter and the one to follow attention is devoted to topics of direct and indirect relevance to the sociology of knowledge and to sociology in general in order to indicate some of the value which the kind of genetic epistemology developed has for these disciplines. It should be apparent from the earlier chapters that genetic (evolutionary) epistemology, because it combines biological and psychological epistemologies, offers the sociology of knowledge powerful theoretical tools and insights for a fuller comprehension of its subject matter. Genetic epistemology and the sociology of knowledge together seem to offer as complete an understanding of how knowledge evolves from "brutes to man, from child to adult, from primitive to civilized man, from stage to stage within mature cultures" as is currently available (quote from Scheler 1980:33). Some indication of how genetic epistemology can combine with the sociology of knowledge to form a comprehensive theory of knowledge is provided below when such things as biology and culture, socialization, cultural creation and universal knowledge are discussed. In the light of such discussions it should be clear why Scheler urged the sociology of

knowledge to develop and maintain close links with developmental psychology and biology and why genetic epistemology can make a contribution to this field.

One factor which has kept the sociological approach to knowledge apart from biological and psychological approaches is, as was noted, the peculiar conception of knowledge most generally adopted. It is a conception derived from the over-philosophized conception used in philosophy. As a consequence of this, the sociology of knowledge has tended to concentrate upon the social determinants of the reality status of knowledge rather than being also concerned with the equally important question of the social origin and evolution of knowledge. A static rather than a dynamic approach and one which severely circumscribes the nature of knowledge characterizes the sociology of knowledge. It is difficult in conventional sociology to reconcile the macroscopic and the microscopic viewpoints. The messy nature of individual stocks of knowledge seems always to contradict the neat formulae which arrange knowledge and interests, for example, at the macro level. Forms of knowledge for which the truth/false distinction is of little or no relevance (e.g., skills) are neglected. These factors combine to contribute to the sterility which characterizes much of the sociology of knowledge today.

It is a contention of this study that the sociology of knowledge can benefit by adopting the kind of conception of knowledge proposed here. By defining knowledge as assimilated information, the sociology of knowledge will be in a position to continue its traditional concerns while at the same time taking into its ambit additional matters which are of sociological importance in themselves and which shed new light on the traditional concerns. Probably most importantly, the conception of knowledge proposed here facilitates the fusion of ideas from many disciplines and encourages an integrated and comprehensive approach to knowledge. It shows the way for the sociology of knowledge itself to become a genetic epistemology. That is, a sociological discipline concerned with the origin and evolution of social and cultural knowledge. By developing in this way the sociology of

knowledge can serve to complete the genetic epistemology of Piaget, which, as was noted, paid little attention to the social dimensions of knowledge.

Biology and cultural knowledge

Though it receives little direct attention and its implications are seldom explored, there is nevertheless a general recognition in sociology that human sociality and culture are the product of humankind's biological nature. The production, transmission and assimilation of cultural knowledge is, as Berger and Luckmann (1967:70) write, "an anthropological necessity". Evolutionary reasoning suggests that culture originated as a response to problems of adaptation. Because of its adaptational advantages, humankind has gradually evolved from a pre-cultural to a cultural stage of evolution. Evolutionary reasoning also suggests that as the advantages of culture made themselves felt, culture itself served to select elements in the genome responsible for culture. Thus, in a curious and as yet poorly understood way, the human genome spawned culture while culture effected culturally advantageous changes in the genome. Geertz (1973) has correctly argued that by saying that a given disposition is innate, one is not necessarily denying that it was also culturally produced. Archaeological evidence reveals that culture predates the appearance of Homosapiens. It is therefore logically consistent to suppose that Homosapiens reflects, as least to some extent, the effect which its proto-culture and early culture had on its genetic material. The socio-cultural environment is obviously as important an environment as regards evolutionary forces as is the natural or physical environment. Though this circulatory is accepted, this study focuses primarily on the movement from genome to culture. Seen in evolutionary time, nevertheless, there was for the homonid line a time before culture and a time when the earliest manifestations of culture would have been more innately determined than is the case with present day culture. In this sense, genes are sociogenetically prior just as they are ontogenetically.

The genome's spawning of culture and culture's effects

on the genome has led gradually to what Piaget (1971:366) terms the "bursting of instinct". Culture is consequently an adaptational imperative for humans. Humans cannot survive without it and, some argue, cannot live without producing it. "Man builds cultures," writes Wissler (1923:252), "because he cannot help it; there is a drive in his protoplasm that carries him forward even against his will. So it follows that, if at any time the continuity of culture were broken, the human group would begin to construct culture anew according to the old pattern." Wissler was one of the early writers to point out that the antithesis between what is innate and what is culturally learnt breaks down when it is recognized (as it must be for logical and empirical reasons) that humankind's "equipment for culture" is itself innate (see, also, Bidney 1970:64-65). Thus, strangely, even though culture probably shaped the human propensity for culture, this propensity is genetically transmitted and not culturally.

Apropos Wissler's hypothesis that if the continuity of culture were broken, it would be constructed anew according to the old pattern, a few remarks are in order. (A similar hypothesis, as noted previously, was recently formulated by Fox 1975:251:253.) If, as has been acknowledged, culture has itself influenced the human genome then it may be that a hypothesis such as Wissler's would turn out, if it could be tested, to be incorrect. What such a hypothesis drawn attention to is the human propensity to produce culture while it neglects the propensity to acquire it. It may be that these two aspects have evolved to be self-reinforcing and interdependent. If there is no culture to acquire then the capacity to produce it might not develop significantly, if at all. The kind of homonid responsible for the origin of culture was not genetically the same as the present day Homosapiens that continue its elaboration and development. The one may have had a greater innate power to get culture going while the other has evolved a greater power for its continuance. Humankind's ancestors can, at least, be supposed to have had a greater resilience to cultural discontinuity than do contemporary humans. Wissler's (and Fox's) hypothesis overlooks the probable impossibility of

humans -- even very young ones -- existing without the imprint of culture. Regenerating culture from scratch would require many human generations but such an experiment, as the one implied by Wissler, would probably never get going. Though innate drives and tendencies play a part, culture is also required to direct human copulation, reproduction and infant care. It is required to specify diet and adaptive behaviour. It is required to specify social relationships and social behaviour. In opposition to Wissler and Fox, I would submit that though what they say may have been applicable to some of humankind's distant relations, humankind is today an innate cultural animal, one that cannot survive without culture and, hence, a species that would probably become extinct if the continuity of culture were ever totally extinguished. History reveals that cultures do develop and disintegrate, but what is not found is the total loss of culture while its earlier carriers continue living. The living in historical times have always had a rich culture, sufficient in opportune times to generate the massive cultural edifices of the great civilizations of the world.

Though culture is an expression of a biological imperative as just noted, it is itself part of an older and more pervasive biological imperative. That is the one which constitutes the structure of human sociality. This deeper biological imperative is also recognized in sociology. Mead (1972:203), for example, writes,

> All social interrelations and interactions are rooted in a certain common socio-physiological endowment of every individual ... These physiological bases of social behaviour ... are the bases of such behaviour precisely because they themselves are also social; that is, because they consist in drives or instincts or behaviour tendencies, on the part of the given individual, which he cannot carry out ... without the co-operative aid of one or more other individuals.

The minimal cases of sexual reproduction and parenting spring most immediately to mind but the biological structuring of sociality goes far beyond this. Humans actively seek to interact with others of their kind and to learn from them, they are, as already noted, biologically disposed to do so.

It is through human sociality that cultural knowledge gradually emerged and accumulated. Because human sociality endures it provides the vehicle whereby the miniscule cultural creations of millions of individuals could be preserved, elaborated and compounded into the massive stocks of cultural knowledge of contemporary societies. Humankind's enduring sociality and cultural existence is a correlate of its biological continuum and the way in which the genome has expressed itself through the millenia. "There is cultural continuity," writes Bidney (1970:65) "because man is by nature equipped for and impelled to culture building and cannot help inventing culture forms according to predetermined patterns; cultural continuity is not an accident of history, but a direct consequence of the psychobiological nature of man."

The thesis that human sociality precedes cultural knowledge and provides the grounds for its emergence and evolution supports the arguments put forward by such early sociologists as Comte, Durkheim, Spencer and Tylor that such knowledge is essentially social in origin. The fact that cultural knowledge is a social objectivation, a facticity, which transcends individuals and constitutes a new phenomenal order has led sociologists and anthropologists to regard it as super-organic. Popper's (1973) "World 3", the world of intelligibles, or ideas in the objective sense, provides an example of cultural knowledge seen as super-organic. So too does Durkheim's (1976) "collective consciousness". For Durkheim this referred to the body of beliefs and sentiments common to the average members of a society. He rightly pointed out that these beliefs and sentiments have a life of their own -- as Popper also argued in the case of his World 3. It is the fact identified by "cultural super-organicists" that cultural knowledge constitutes, to some extent, a separate realm that provides the RAISON D'ETRE for sociology and anthropology. But where many sociologists and anthropologists go astray is in exaggerating the separateness and autonomy of culture and even inverting the actual relationships which exist between human biology, psychology and sociology.

It might be useful for analytic purposes to regard culture as a reality SUI-GENERIS and something to be explained in purely socio-cultural terms (as did Durkheim) but to mistake this for a description of reality is to seriously distort reality. Super-organicists maintain that culture is an autonomous realm, that humans are its carriers, that culture is independent of the psychic and biological nature of humankind, that culture determines psychic life and the expression of biological drives, and that culture is a closed system which can be explained adequately in terms of other cultural phenomena. But these are only partial truths. They obscure as much as they illuminate. One of the things that such "truths" render problematic is the origin of culture. As Bidney (1970:65) writes, "To insist upon the self-sufficiency and autonomy of culture ... is not to explain culture, but to leave its origin a mystery or an accident of time." Another question not satisfactorily answerable in terms of such "truths" is how it is that culture develops. For if humans are simply the carriers of culture, having only buckets for minds, then the whole matter of cultural creativity and production remains as a mystery. The universal and enduring nature of many cultural features is a further problem left unresolved. So too is the matter of the discrepancies between culture as energy, as stimuli, as information and as knowledge. It is only by incorporating biological and psychological explanations that sociologists and anthropologists can provide a proper account of how it is that culture as an object in the world, that is as pure organized energy, can ever be assimilated as knowledge and so structure the thoughts and actions of the millions of minds that constitute human societies. It is worth noting, as the many views on culture demonstrate, that this reality is sufficiently rich and complex to sustain many points of view. The fact that each can be empirically validated to some extent is obviously not a sign that they are all correct, but a sign that the phenomenon studied has not yet been adequately grasped.

A fault of many discussions of the relationship between biology and culture is that they proceed at too general and

abstract a level. Furthermore, many such discussions rest their entire argument on one or two empirical cases. While such cases often do validate an argument about one or a few aspects of the relationship between biology and culture they cannot validate, or even illustrate, all the aspects of this relationship. Biology and culture refer to too many things and relationships. For this reason, the investigation of the connection between biology and culture is no simple matter.

Consider, for example, the relationship between the genome and dietary knowledge versus religious knowledge. Both are culturally transmitted and have been culturally developed. Nevertheless, it seems to me, they stand in a different relationship to the genome. Though it does not determine exactly what humans eat and what meanings they attach to what substances, the genome plays an easily demonstrable role in dividing the edible from the non-edible and the good tasting from the bad tasting. Rituals of eating too must obviously include a point at which the food is consumed. How does the genome determine religious knowledge? The bioepistemologist is obviously faced here with a more difficult, if not a different, question. It is, I submit, partly by reconsidering socialization theory and the problem of cultural creation that I think a more accurate understanding of the relationship between biology and cultural knowledge can be achieved.

Socialization and humankind's constitutional creativeness

Many of the ideas dealt with in this dissertation make it necessary to reconsider socialization theory and the kinds of learning theory it presupposes. The distinction drawn between information and knowledge implies that society, parents, peers, etc., are, in their relation to the person being socialized, the transmitters of information <u>not</u> knowledge. This distinction is crucial for it immediately draws the activities of the person being socialized into the socialization process. It is the person being socialized, and only that person, who can transform the information available into elements of his or her own stock of knowledge.

A person's stock of knowledge is thus always idiosyncratic, their own creation to some extent. The idea of socialization as a process for the production of cultural clones has no basis in fact.

Until fairly recently, as Schaffer (1975:165) points out, the notion of primary socialization was understood as essentially a one-way process -- from socialization agent to the child as the object of socialization. The child was "moulded" and "shaped" to fit society. The child had a bucket for a mind, or a TABULA RASA, which society filled and in this way programmed the child. Such a view is unsatisfactory because, as the present study tries to show, the child is partly responsible for his/her own socialization. The child is both an agent and the object of socialization. He/she is co-responsible with society for making himself/herself a member of society. As discussed earlier, babies and children modify and control the behaviour of socializing agents. They thus exert some control over the information available to them. Babies and children are guided as to the kinds of information they seek by the relevance hierarchies which develop out of their innate learning schemas and their various cognitive and physiological needs. Thus, while it is true to some extent that children learn what their parents and others want them to learn, it is equally true, though often overlooked, that they also learn to some extent what they want to learn. Because of the reciprocity which often exists between child and parent, the child often wants to learn and is ready to learn what the parent wishes to teach it. On the other hand, as every parent and teacher will attest, there are also many occasions when the child does not wish, or is not ready, to assimilate what is being offered. Similarly, there are many instances in which the child is seeking knowledge but is frustrated in this search by its parents and teachers. The reciprocity between agent and pupil is not perfect. It is for this reason that the child has little alternative but to fill in the many gaps in its stock of knowledge by its own activities; through searching for knowledge or by creating it out of the resources available. Children invent 'culture' as they go along just as

much as they have it imposed on them. An essential part of socialization consists of the child equilibrating his/her own inventions with the existing culture. Culture, it is obvious, cannot prescribe for every contingency, even as a blue-print it often has pages missing. No parent can prepare a child for every life situation. Life involves many ad hoc solutions. Human life is essentially creative. It is the construction of an adequately functioning stock of knowledge out of the information available.

The idea that socialization -- indeed all learning -- involves the creation of knowledge out of the information available, opens a way for dealing with a topic avoided by sociologists and anthropologists. That is the topic of the creation of cultural knowledge (see Langton 1979:292; Kunkel 1970:257). Sociologists and cultural anthropologists make a great deal of the fact that humankind is a cultural animal and that it is culture above all else which most clearly distinguishes humankind from the other animals. But though they devote a lot of attention to the study of culture, both sociologists and anthropologists have displayed only a partial and selective interest in cultural creation. The neglect of this topic in sociology and anthropology is paradoxical because social existence as we know it is most directly the result not simply of culture (as is too often simplistically argued) but of cultural creation and re-creation. By seeing culture rather than cultural creation as central to social life, sociologists and anthropologists are biased towards seeing culture as a fixed entity (which it is not) and have difficulty in dealing with internally generated cultural change. In addition, the notion of culture in contrast to cultural creation leads easily to such dualisms as nature/culture, innate/learned, culture/society and individual/culture. Approaching culture from a concern with cultural creation soon reveals that it is artificial and misleading to oppose nature and culture, innate and learned, culture and society and individual and culture. It is the genetic approach to culture which I feel can best improve our current understanding of culture and correct some of the errors that result from thinking of

culture as something "out there" which, by being put "in here" (our heads), makes us social beings. In the genetic approach to culture, the topic of cultural creation is obviously paramount as such creation is the fundamental process by which culture develops.

Various reasons can be advanced as to why the topic of cultural creation is largely neglected in sociology and anthropology. The stability of culture and the "traditional" character of social life in, especially tribal societies of yore, is obviously a factor which has encouraged anthropologists particularly to view culture as relatively stable and cause them not to pay too much attention to cultural creation. In the main they seem to see (erroneously as genetic epistemology suggests) the duplication through imposition of cultural items in generation after generation of the peoples they study.

Another probable reason why cultural creation has not received the attention it merits in sociology and anthropology stems from the complexity of the creative act itself. Thought and consciousness are large enough puzzles for the human mind and cultural creation, since it involves both these processes in an original form, is probably the most mysterious and awe-inspiring of all cognitive and social processes. There is much that is involved in the creative process that is hidden not only to our eyes but to our consciousness as well. Tchaikowsky writes of "... that supernatural and inexplicable force we call inspiration ..." in describing his 'method' of composing music (Tchaikowsky 1878; quoted in Vernon 1978:55). Mozart is even more explicit about the mysteriousness of the creative capacity. He writes:

> When I am, as it were, completely myself, entirely alone and of good cheer -- say, travelling in a carriage, or walking after a good meal, or during the night when I cannot sleep; it is on such occasions that my ideas flow best and most abundantly. Whence and how they come, I know not; nor can I force them.

(Mozart c 1789; quoted in Vernon 1978:55.)

Though the matter of human creativity is neglected in

sociology and anthropology, it is not neglected in genetic epistemology. The idea that humankind is constitutionally creative is a central thesis of genetic epistemology. Piaget (1971:203) writes in this connection:

> To identify the two most essential characteristics of life, one can say, with all other writers, that life is "the creator of forms" or that it is "invention", which incorporates, as a necessary condition the idea that it is always extending its conquest over environment ... these are also the two most central characteristics of every kind of cognition and ... they epitomize the mechanisms common to life and knowledge ...

Humankind's constitutional creativeness is intimately linked to its "world openness" (Berger and Luckmann 1967). Humankind's survival hinges on its great creative capacity. Humans have evolved to be the Earth's most creative inhabitants. Humankind's innate learning schema, as has been discussed, leads to curiosity and playfulness and to a strong drive to explore and to know. Curiosity and play in kaleidoscopic fashion generate information which ensures that individual stocks of knowledge are never mere impositions or replicas of existing knowledge. But, as already noted, humankind's constitutional creativeness is even more deep seated than this. The assimilation process itself is a source of originality because it is a creative act. Cultural creations, rather than being special phenomena, are, it seems, more accurately seen as the products of a general human capacity. Every person creates his or her own stock of knowledge, there is no way this can be injected fully formed. Every person is potentially a source for the items of knowledge which society recognizes as significant and which become incorporated into its culture.

The will to know, to understand, to organize, to overcome, to survive, are all motivators which stand both before knowledge and after it. In standing after it they produce the spiral of cultural creation. Man, as Lorenz (1977:222) states:

> does not lose his urge to explore and play when he attains sexual maturity. This, in conjunction with his predilection for self-exploration, makes man constitutionally

> incapable of ever submitting entirely to the force of tradition.

What is for Lorenz the power of tradition is for other writers the power of socialization or the power of ideology. By recognizing humankind's inherent creative capacity many of the shortcomings of ideas on tradition, socialization and ideology can be overcome. Genetic epistemology reveals that a great deal stands between tradition, culture and ideology as information and the knowledge which individuals derive from these. As regards certain problems raised by the conventional approaches to ideology, for example, Perkins (1979:136-137) has argued that by recognizing humankind's inherent creative capacity, sociologists will be better able to deal with the problem of the emergence of counter-ideologies. In illuminating this problem, Perkins (p 136) asks, "How can we explain protest groups such as women and gays, if the only way they can understand the world is through ideology?" The answer, obviously, is that all individuals have much knowledge, including non-social knowledge, beside ideology for understanding the world and even the "ideology" they have is their own version of official ideology. Appreciation that every individual's stock of cultural knowledge is essentially open and partly unique because it is to some extent a self-construction and that it consists of items which are difficult, if not impossible, to equilibrate, leads to the important insight explored by Cobb (1977). She saw "... each individual as becoming, in a metaphoric sense, a species in him or herself, the source of new evolutionary changes in human consciousness, creators of essential discontinuities" (Mead, in Cobb 1977:11). According to Polyani, language and writing have vastly expanded humankind's creative capacity and thus increased its range of potential thought. Of this he writes (Polanyi 1967:91):

> It is the image of humanity immersed in potential thought that I find revealing for the problems of our day. It rids us of the absurdity of absolute self-determination, yet offers each of us the chance of creative originality, within the fragmentary area which circumscribes our calling. It

> provides us with the metaphysical grounds and the organizing principle of a Society of Explorers.

If we grant, as I think we must, that humans are constitutionally creative, it is necessary to say something about why this creativity, though it is a source of cultural change, paradoxically, like DNA, operates primarily conservatively, leading generally to the same ends. A state of affairs that obscures the complexity of human learning and encourages empiricist theories of learning and socialization. The reason for the conservative performance of human creativity, as has been repeatedly noted, is that humans everywhere have similar innate learning schemas and thus tend to solve problems in similar ways and to assimilate the same kinds of knowledge out of comparable information. Thus, though humans are creative, they tend to be creative in the same way because of their shared biological nature and informational environments. Thus, too, despite being constitutionally creative, true cultural advances are few and atypical of the species. Human creativity is primarily employed in re-creating what has already been created. This incredible redundancy is necessary because it is the only way each generation can reach the point of development attained by the previous generation. However, since each original cultural creation can add to the social stock of information and such information can provide the clues necessary for the re-creation of cultural items as part of any individual's stock of knowledge, re-creation is "easier" than original creation, despite being a similar process. Hence, the accumulation and transmission of cultural information does allow succeeding generations to transcend preceding ones. Some cultural progress is possible and does occur.

Cognitive universals and universal knowledge

It is a basic thesis of genetic epistemology that all humans, because they are members of the same species, have more or less the same innate capacity for acquiring knowledge ontogenetically. A corollary of this thesis is that to the

extent that human environments are similar, experiences will be similar and similar individual stocks of knowledge will be developed. Now it is obvious that human environments differ enormously and that such differences do have an effect on culture, cognition and knowledge. They might even have a slight cumulative effect on innate cognitive structures. What is, however, often overlooked is that despite mankind's apparent conquest of environment, every human environment, especially those in which the reproduction of the species takes place, is, and must be, similar in many ways. Biological constraints and the bondedness of human life to certain fairly uniquitous physical and natural elements implies that all human environments and experiences must be similar in certain fundamental ways. As Fontana and De Water (1978:102) point out, "The human body, with its many basic needs and desires, and the world in which the body must exist are basically the same the world over." In the same vein, Bronowski (1976:157) has drawn attention to the universality of the "cross-wires" of the visual field; "... gravity is vertical and the horizon stands at right angles to it". The universality of gravity, for one thing, and its structuring influence on so much cognitive and somatic knowledge is often overlooked. Gesell (1945:46) is among the few scholars who have paid some attention to this basic and universal structure of the life world. He writes, "The foetus is a growing action system ... Its first and foremost function is to adjust to the ceaseless pull of gravity." The experience of gravity permeates a great deal of behaviour and knowledge, though its presence may be difficult to detect because it is so much part of that knowledge and behaviour (see, also, Cobb 1977:41-44).

All human environments are filled with physical and natural objects leading to such universal concepts as "object", "life", "living", "dead", etc. All human environments have objects which move leading to such concepts as "movement", "speed", "distance", "causation", etc. All human environments have objects which can be counted, moved, lifted, dropped, weighed, compared, arranged, categorized, seriated, piled-up, etc. Such actions and objects give rise naturally

to a large range of universal concepts and other forms of knowledge. All environments have materials which change or can be changed in one or more ways: materials that can be moulded, poured, sharpened, broken, bent, twisted, stretched, etc. All objects everywhere are arranged spatially and some can be spatially rearranged by humans. The passage of time is signalled in every environment by numerous changes. All environments have liquids and solids, temperature differences, light contrasts, colours, smells, sounds, and a myriad of other common ingredients all giving rise in members of the same species to similar experiences and items of knowledge.

The social environment too has its universal features. Piaget points to a few when he writes (1972:35),

> Whether we study children in Geneva, Paris, New York or Moscow, in the mountains of Iran or the heart of Africa, or on an island in the Pacific, we observe everywhere certain ways of conducting social exchanges between children, or between children and adults, which act through their functioning alone, regardless of the context of information handed down through education. In all environments, individuals ask questions, work together, discuss, oppose things, and so on; and this constant exchange between individuals takes place throughout the whole of development according to a process of socialization which involves the social life of children among themselves as much as their relationship with older children or adults of all ages.

Knowing what we do about the human innate learning schema and the importance of "others" in cognitive development, it is not surprising to note, for example, as Piaget (1972:12) points out, that object permanence, which includes the knowledge of the permanence of one's own body, is partly achieved through the observation of the bodies of others and the latter are among the first, if not the first, objects to be known as permanent. Not only are people universal features of the social environment but so too are many of the things they do. People everywhere are born, grow up, grow old and die. They eat, sleep, drink, work, rest, excrete, copulate, give birth, etc. They experience pain and pleasure, joy and sorrow. They speak. The existence of other people

leads everywhere and inevitably to the discovery by each person that they are a "self" and that others are not self.

Certain movements, gestures, expressions, behaviours and actions seem to be universal and these are assimilated into individual stocks of knowledge as universally shared images. It would be hard to deny that humans everywhere deeply assimilate the human image even though it is known that certain people do not acknowledge strangers as "people". Every social environment is characterized by a stock of cultural knowledge which includes, what we call, language, religion, art, science, practical skills, domestic science, and so forth. The ubiquity of much of cultural knowledge ensures that individuals everywhere come to think symbolically and thus develop a form of consciousness shared by all normal human adults. The presence in all human settlements of tools, utensils, vessels, fire, language and other common cultural objects, leads people everywhere to certain shared ideas. The idea of fire, the idea of tools, utensils, vessels, shelter, language, morality and so on. Thus, despite cultural differences, when we see someone making or using a tool, for example, we can at least be assured that we and they have an idea of tools and toolmaking. Such shared knowledge can and does serve as a point of entry on the part of one person into the culture of another.

If we bear in mind the fact stressed by Piaget that knowledge is a construction and that certain of these constructions have little direct relationship with the exact nature of the objects and activities from which they arise, it is easy to appreciate why apparently diverse environments may be functionally equivalent as far as the acquisition of certain forms and items of knowledge are concerned. (Recall Piaget's distinction between empirical and logico-mathematical knowledge. Empirical knowledge is bound to specific objects and their nature; many objects can be acted upon to yield logico-mathematical knowledge (Piaget 1972:50-51).) In this connection Opper (1977:120) makes the valid point that:

> Intellectual development does not depend upon a specific type of object with which to

> interact. What is required is an environment containing a variety of objects upon which the internal processes can act. Environments with a degree of diversity are a universal feature, which would explain the apparent universality of certain types of mental operations described in the present research.

The many commonalities of the human environment and humankind's common innate learning schema suggest the hypothesis that people everywhere will acquire many similar items of knowledge and that the stages of cognitive development will be similar in all societies. Because of the contingent, arbitrary and unique elements in all cultures, it can be further hypothesized that the more fundamental items of knowledge and the earlier stages of cognitive development will be the most universal. Aspects of these hypotheses have been investigated in numerous studies over the past fifteen years and the evidence supports them. (For summaries of this research see Lloyd 1972; Dasen 1977; Berry and Dasen 1974; Warren 1980.)

Though society and culture are implicated in ontogenesis from conception, their influences on cognitive development are not the same at every stage. It seems that biology and epigenesis, taking in universal aspects of the human environment, are primarily responsible for the core elements of early knowledge and early cognitive development. Scarr-Salaptek (1976) has reasoned that the sensory-motor pattern of knowledge acquisition evolved earlier in our primate past than the other patterns of knowledge acquisition. I have argued in this study that all human infants are born with a similar learning schema which structures the mode of acquisition and content of early learning activities. For reasons such as these it is to be expected that earlier Piagetian stages and the contents that go with these are likely to be more universally attained, more panhuman, than later stages or contents (see Flavell 1976:116, 233). Because of genetic and environmental commonalities, Scarr-Salapatek (1976) has argued, normal human beings everywhere are virtually certain to complete the sensory-motor stage of cognitive development. As she states (p 186), "For the development of sensorimotor skills, nearly any natural, human

environment will suffice to produce criterion level performance."

Piaget's studies of the genesis of the categories and basic concepts contradict Durkheim's theory of knowledge. (Durkheim's theory is considered in the following chapter.) Piaget's work implies that cultural knowledge is more deeply affected by human biology and psychology than most sociological theories allow for. Following Piaget it can be argued that the concepts of the object, time, space and causality, as these are reflected in culture, are related to and sustained by the elementary concepts of time, space, causality and the permanency and nature of objects as these are developed by all normal infants in the early years of life.

The shared nature of the human innate learning schema is evidenced by the similarities in infant learning behaviour the world over. All infants, it seems, are attracted by the human face and pay attention to the human voice. They explore objects and do similar things with the same objects. They are strongly attracted by novelty, etc. Since the initial operations of the innate learning schema are reflex-like, it is interesting to record that Konner (1972) found the reflex repertoire of Bushman newborns to correspond precisely with that of their European counterparts. Similarly, in a study of African and European newborns, Warren and Parkin (1974) found both groups to exhibit exactly the same set of 45 test responses and reflexes. Dasen (1977b) reports on a longitudinal study he conducted in rural Baoule (Ivory Coast) using Baoulese infants aged 5-33 months. He found when using tests developed in France that (p 9),

> Almost no adaptation of the test materials was found to be necessary: whereas most of the objects were unknown to the subjects (toys such as plastic cars and dolls, plastic rakes, etc.), they handled these very efficiently. The usual sequential order of stages was found.

Dasen also notes that even at this early stage cultural influences on learning are already apparent and that the often commented on precocity of African babies as regards motor development was also found in this study. An interesting example of infants of different race and culture applying

similar learning schemas to the same objects is provided by Dasen (1977a). He describes how almost all the African and European infants of about a year old he observed would, when given a plastic tube and a chain of paper clips, look for some way of making the chain of clips pass through the tube. The African infants were from a rural area and had never seen such things before yet they explored them in the same way and made the same errors. It can be inferred that they learnt similar things from this small exercise. It is Dasen's (1977a, 1977b) view that the basic processes of cognitive development are universal and his cross-cultural studies of sensori-motor development substantiate this view to some extent. In a review of cross-cultural studies of cognitive development, Warren (1980) notes that such studies concerned with sensori-motor development are scarce. He concludes from the available evidence, however, that (p 295), "... the sensorimotor parallels observed are so remarkably exact, even with objects totally unfamiliar to African babies, as to inspire confidence in the necessarily tentative conclusion that the same broad sequence is followed everywhere as far as the transition to fully operational thought." Warren also notes that Cole and Scribner (1974), in concluding their survey of culture and cognition, point to the unlikeliness of finding cultural differences in basic component cognitive processes.

In Piagetian psychology, the "sensorimotor" stage of cognitive development (0-2 years) is followed by the "pre-operational" stage (2-7 years), the "concrete operations" stage (7-11 years) and the "formal operations" stage (11-15 years). Cross-cultural studies in the Piagetian and other traditions provide much useful data for the validation or refutation of Piaget's ideas and the hypotheses of genetic epistemology. One thing that is repeatedly confirmed is that cognitive development everywhere follows the stages outlined by Piaget, though development within each stage is sometimes found not to follow the same sequences as were uncovered in Piaget's original studies. In addition the rate of cognitive development seems to vary from one socio-cultural setting to another. The evidence suggests that most or all normal

humans in all societies make it at least through the sensory-motor and preoperational stages. Concrete operational reasoning appears to be the form of reasoning upon which human societies and human cultures are constructed. Though this form of reasoning is not individually universal it is socially universal in that the bulk of individuals in all societies studied can reason in the concrete operational fashion. Piaget had supposed that all normal humans would attain the formal operational stage of cognitive functioning. This supposition appears to have been mistaken. The cross-cultural studies reviewed by Dasen (1977), Berry and Dasen (1974) and Lloyd (1972) reveal that even at the concrete operational stage individual reasoning is not consistent to this stage nor is such reasoning fully developed in every direction within the stage. Even less consistency and breadth of development or application is found at the formal operational stage. In a study of the genesis of logical reasoning, Niemark (1975:570) found that, "Logical reasoning, as reflected in consistent performance across a broad class of instances, does not appear until adolescence and even at that age is by no means a universal attainment of all adolescents." Flavell (1977), who refers to Niemark's study, provides a generalization which seems to sum up the current knowledge on this topic. He writes (p 115),

> The generalization is that the higher the Piagetian cognitive stage, the less inevitable its full attainment by normal individuals across all human environments. Full sensory-motor development must be universally completed, one would think. At least some degree of concrete-operational ability might also be universal or nearly so among normal adults, although it is hard to be really certain of even this on the basis of existing cross-cultural evidence. The universality of formal-operational achievements would consequently be even less certain.

The consensus of research findings seems to be that formal operational reasoning, if attained at all, is a specialized form of reasoning in all societies. It is applied selectively in specialized areas of thought and even in industrialized societies does not characterize all adult

thinking all the time. Despite the considerable evidence to the contrary, Piaget (1972) continues to maintain that all individuals reach the stage of formal operations, if not between 11 and 15 years of age, then at least between 15 and 20. He concedes, however, that even within industrial societies, people reach the formal operational stage, "... in different areas according to their aptitudes and professional specializations" (Piaget 1972:10). This concession seems to imply a modification of Piaget's earlier conjecture that formal operations would be universally attained and that they are context independent (see Dasen 1977:6-7). Piagetian studies, especially cross-cultural ones, suggest that Piaget might have attempted to salvage an untenable conjecture by the foregoing type of paradoxical statement. These studies indicate that socio-cultural factors play a more crucial part in the evolution of the higher thought forms studied by Piaget than he originally hypothesized (see Dasen 1974:420-421; Dasen 1977; Warren 1980).

Piaget's genetic epistemology is primarily a theory of scientific knowledge, his main concern being the development of scientific reasoning in the individual, hence his emphasis on the instruments of science -- logic, mathematics and objectivity. This bias, while it is explicable in terms of the dominant values of modern industrial society, is partly justified by evolutionary reasoning. The science, logic, mathematics and objectivity of Western culture are extensions of basic adaptational strategies and are rooted in basic biological behaviour and structures. Since Piaget uses his culture and its standards to construct his "universal" models of science, logic, mathematics and objectivity, it is not surprising that children from urban industrial societies who have been formally schooled and who are literate perform best on his tests. Their education directs them towards the kinds of cognition and knowledge called for in the tests. Other kinds of cognition and knowledge are not tested, or tested only indirectly. Yet despite the considerable situationally induced differences in cognition and knowledge, the fact that people everywhere pass through the same stages of cognitive development and to some extent acquire similar concepts and

items of knowledge and can apply concrete operational or even formal operational reasoning to issues that really concern them, confirms the thesis that basic elements of science, logic, mathematics and objectivity are universal elements of thinking and culture even though they are not elements as cleanly differentiated as in Western culture. The universality of these modes of cognition and items of knowledge is further confirmation of the basic sameness of the genetic structure of the human mind everywhere.

Approaching cultural knowledge from the Piagetian angle leads to a direct challenge of the conception of culture as something essentially arbitrary. It seems that the universals of human biology -- implying universals in ways of assimilating, accommodating and equilibrating knowledge -- and the universals of the human predicament lead not only to the "common human pattern" acknowledged by even extreme cultural relativists, but also to universal non-arbitrary items of cultural knowledge. People everywhere have at least some knowledge as regards logic, measurement, causality, time, space, speed, distance, classification, seriation, weight, mass, volume, and so forth. They share many of the items of knowledge acquired during the sensory-motor period and at least some of those acquired in other periods of cognitive development. These forms of universal knowledge are not only used to think with by individuals but they are basic to social interaction and to the production of cultural knowledge. That such universals have received scant comment from anthropologists and appear invisible in culture is no denial of their existence but merely illustrates the selective perception of students of culture.

Lukes (1973), in a contribution to the sociology of knowledge, has considered the matter of the social determination of truth. In this consideration, he weighs up the arguments of those who favour the relativistic position and those who resist this position. He concludes that the relativists (e.g., Winch, Kuhn, Worf, and Mannheim) provide, "... no satisfactory reason ... for supposing that there are no invariable and context-independent criteria of truth and valid reasoning". The evidence and arguments provided above

scientific mode of thought and to the achievements of the biological, psychological and social sciences. For the first time in history, it would appear, humankind is itself an object of its own consciousness. This is not to imply that in the past humankind did not think about itself, but that because of religious and magical thought, it was not able to see itself clearly. This self-knowledge places humankind on the threshold of being able to make itself more fully cultural than was ever possible in the past. This implies that humankind is on the threshold too of being freer than was ever possible before. One illustration: the advent of genetic engineering is profoundly significant because it marks the point in human evolution where the brain that is the product of human genes now has the power to alter those genes. Whereas before we were largely the product of our genes, from this moment onwards we could increasingly be the product of our minds, in the profound sense that we engineer our biological selves. The genes, as sociobiologists argue, have shaped the values that determine what we do with our new knowledge. It is justice of a kind that our genes will be treated according to the values and knowledge of the life they have created.

Independent creations and the recapitulation thesis

Some indication of the creative capacity of humans, their tendency to produce similar items of knowledge and the shortcomings of conventional ideas about socialization is provided by the many examples of individuals in one culture producing ideas common to other cultures but not their own or achieving knowledge available in their own culture but to which they have not been directly exposed. There are many examples of independent inventions, both within a single society and within societies very different in culture, time, or place.

Anthony (1973:19) notes that it used to be held as a general law of psychology that children in the stages of their mental development followed the developmental stages of the human race. This theory of the recapitulation of the phylogenesis of knowledge by its ontogenesis is now largely

rejected. It is, however, a theory which is difficult to reject totally just as it is a theory difficult to restate in an acceptable form. Part of the intractable problems related to this theory stems from the associations it encourages and legitimizes between the thought processes and knowledge of children and those of "primitive" adults. Psychologists such as Jung, Freud, Hall and Baldwin have all found merit in this theory. More recently, Piaget often admitted that one of his reasons for studying the cognitive development of children was that he felt it could provide some insight regarding the road followed by human epistemogenesis (Piaget 1972:11).

There is much evidence which could be cited to support the epistemic recapitulation thesis. There is also much which could be used to refute it. It is not my intention here to get embroiled in this debate. Rather, it seems to me that this debate does provide some evidence supporting the thesis of this dissertation that humankind's biology plays an important part not only in making cultural knowledge possible but in determining, to some extent, its evolution and its form and content.

The fact that human societies everywhere and seemingly at all times have produced many similar forms of knowledge as well as many virtually identical items of knowledge -- be they religious, artistic, musical, scientific or technical -- provides powerful support for the existence of a universally shared learning schema. A schema which is responsible for the generation and continuance of cultural knowledge. Anthony (1973) provides a wealth of information regarding ideas about death spontaneously produced by children in modern industrial societies. What is particularly revealing is that many of these ideas were similar to those recorded of members of cultures remote from that of the children's. Ideas about which the children were ignorant. Anthony (1973: 31) shows convincingly what she set out to show,

> ... that the young child, ignorant like early man of many facts known to modern adults, capable like early man of logical reasoning, and like him unwilling to accept separation and non-existence, dissolution and decay, is

> led by the same phenomena to similar conclusions.

Anthony omits to comment on what it is that produces for children and people everywhere "the same phenomena" and makes them all capable of "logical reasoning" and unwilling to accept "separation", "non-existence", "dissolution" and "decay" and leads them to "similar conclusions". It is quite clearly the human mind which does these things. All these shared attributes of the child mind and the adult mind, the ancestral mind and the contemporary mind, point to the shared nature of the human mind and its predicament.

It is generally acknowledged that the capacity infants and children have for learning is phenomenal. Humankind's prolonged infancy and childhood imply that a great deal of information is assimilated by every individual through immature schemas. Not all knowledge so acquired is later re-assimilated and equilibrated in terms of mature schemas and knowledge. It seems reasonable to assert that adult stocks of knowledge are composed of items assimilated at various stages of cognitive development and that some items remain to some extent in the state in which they were assimilated. The knowledge acquired in childhood strongly shapes every individual's stock of knowledge and much of it remains central to adult thinking and action, as psychology reveals. If we add to these observations the idea that infants and children, though to some extent socialized, are not yet fully socialized; that, as Cobb (1977:29) says, human childhood is a highly creative, perhaps the most creative phase of every individual's life, a phase shaped and framed by characteristics shared by all people; that childhood is a combination of the uniquely cultural, and therefore human, and the wholly natural, and therefore biological; then the link between biology and cultural knowledge is closer than is generally supposed in sociology and anthropology. Cobb (1977:101) expresses this insight well:

> If we ... observe the growth and learning in childhood as a period of gradual transcendence from level to level, out of biological nature into culturally created worlds, we

> become more conscious of the contributions, in the shape of values and even skills, which these earlier phases of personal history and biocultural development make to the fully adult personality. We then find ourselves in possession of the connection between biological history and cultural history, with individual childhood as the link in the series in time.

In similar vein, Anthony (1973:18) states, "Children ... are nowhere fully acculturated, or perhaps it would be as correct to say that there is everywhere a subculture of childhood." This subculture of childhood bears a greater biological imprint than does the adult culture, so much is clear from the universal contents of much of the subculture of childhood. Adult culture can never escape the influence of child culture though it can distance itself from it more and more through the growth of cultural information, made possible largely through writing. The traces of the child cultures of millions of generations is embedded in contemporary cultures and these cultures are forever confronted by the subculture of childhood. Infants and children bring into culture the demands which the genome makes on culture. It demands, for example, that culture makes sense to the child's fundamental ways of making sense of the world and that it does not do violence to the bio-psycho nature of the child. If adult culture does do these things it will either be rejected by the young and more harmonious alternatives proposed or, if this is not possible, the society and its culture will cease to exist. Describing the child archetype, Jung (1975:162) has written,

> The child motif represents not only something that existed in the distant past but also something that exists <u>now</u>; that is to say, it is not a vestige but a system functioning in the present whose purpose is to compensate or correct, in a meaningful manner, the inevitable one-sidednesses and extravagances of the conscious mind.

Cultural knowledge has, after all, to fulfill certain fundamental biological and psychological requirements if it is to form part of humankind's <u>living</u> stock of knowledge. This is one of the ways in which cultural development is constrained -- at least to some extent -- by its biological ballast.

The fact that most learning is acquired in childhood, that humankind's ancestors did not have as long an adult life as is now the case in many societies, that children made up the largest part of the social group and that the cultural knowledge that could be transmitted from generation to generation was limited before the invention of writing are among factors which suggest that children have played an important part in shaping culture and, possibly, keeping it somewhat "childlike". "Childlike" elements abound in all cultures, even those of modern industrial societies. It is not surprising, in terms of the above arguments and the main thrust of this study, that Piaget, for example, has found reflected in the knowledge and reasoning of children the knowledge and reasoning found in the science, art, religion and philosophy of many ancient and modern (industrial and non-industrial) societies. Such modes of thought as "dogmatic", "egocentric", "animistic", "realistic" and "artificialistic" are encountered in children and are embedded in cultural patterns everywhere. Numerous parallels are found between children's spontaneously developed accounts for phenomena and those offered in cultures different from their own. For example, Piaget (1973:203), after noting that children generally hold that a wall cannot be knocked down without feeling it, a stone cannot be broken without knowing it, a boat cannot carry a cargo without effort, etc., goes on to cite the case of an Indian chief who explained why his men could not succeed in throwing a stone across a ravine by saying that the stone was attracted by the ravine, just as we ourselves might be when suffering from giddiness, and thus lost the strength necessary to reach the other side.

Cobb (1977:85) notes that the ideas and experiences of childhood often herald or echo many great cultural ideas. She notes the case of Pierre Teilhard de Chardin who at six or seven years of age felt himself drawn by matter; by something that 'shone' at the heart of matter. He was led to worship little pieces of metal. This early passion for matter as "itness" started him on his journey into knowledge and remained with him through life as a symbol of his life's search and accomplishments. Human biographies are full of

examples of the significant ways in which childhood thoughts and memories have shaped the cultural productions of adults. The child, it would seem, is, in many ways, the father of culture rather than its child. If this is the case, as I have been arguing it is, then we have one more argument favouring the thesis of the biological construction of culture being advanced in this study.

Empathic knowledge

The universally shared items of sensory-motor and concrete operational knowledge, referred to earlier, constitute a type of common-sense knowledge basic to all people and all cultures. But this is not the only universally shared form of cultural knowledge. From the evidence available it seems that people everywhere share a basic knowledge of the meaning of various facial expressions and that this knowledge is a universal content of culture. Lloyd (1972:88-93) provides a good summary of the cross-cultural research on facial expressions. She notes that there does seem to be an innate link between primary emotions and facial expressions and that the emotional meaning of particular facial expressions is recognized in all human cultures. Nevertheless, learnt display rules do serve to modify the innate connections between emotions and their facial representations. While the evidence can be used, as Lloyd (p 90) notes, to support either a relativistic or a universalistic position, it cannot support an extreme learning position which makes emotional expression unique to every culture and the meaning of particular expressions entirely arbitrary.

Darwin (1872) was one of the earliest writers to note that at least some bodily states are connected with states of mind and have a phylogenetic origin. Humans appear to express grief, happiness, amusement, anger, fear, and so on, in response to particular complex sets of stimuli in fairly predictable ways. These expressed emotions are not solely the result of learning or cultural factors, but are to some extent due to the operation of schemas which appear to have innate components. We do not, in the final analysis, laugh when we should cry, nor do we cry when we should laugh. The

stimulus-response connections seem fairly rigid and learning theory provides no satisfactory account for these things. We may be able to suppress certain emotional responses, be able to weaken or control them as an act of will, but generally it is difficult if not impossible to control our grosser emotions. Through all our emotions, especially the most moving, there appear to run certain innately given patterns. Evidence for this claim comes from the discovery that particular emotions are expressed throughout the world with a remarkable uniformity. Eibl-Eibesfeldt (1970) has recorded and empirically substantiated the widespread agreement in the international language of facial expressions by photographing people in Europe, Japan, Kenya, Tanzania, Uganda, India, Siam, Hong-Kong, New Guinea, Samoa, USA, Mexico, Peru, and Brazil. Ekman and Friesen (1971) in their cross-cultural study of facial expressions and emotions found that particular facial behaviours are universally associated with particular emotions. A finding consistent with that of Eibl-Eibesfeldt. It is also consistent with the earlier studies of blind and sighted children which discovered many similarities between the facial expressions of blind and sighted children (Fulcher 1942; Goodenough 1932; Emde and Harrison 1972; MacFarlane 1977; Freedman 1964).

Findings such as the foregoing may be explained from a number of non-exclusive viewpoints as being due to evolution, innate neural programmes, or learning experiences common to human development regardless of culture (see, for example, Huber 1931; Darwin 1872; Izard 1969; Tomkins 1962, 1963; Needham 1972; Ekman 1973; Eibl-Eibesfeldt 1970). Brown and Stevens (1975:38) have attacked the argument that if a phenomenon is universal among the human population it points invariably to some innately shared characteristic. They argue that the latter conclusion does not necessarily follow from the prior discovery of universality. They argue that certain evident cultural universals may be the result of experiences which are common to all people in all places. But this argument is only a deflection, rather than a refutation, of the innatist argument. Even if there were such things as universal experiences -- and it has been

argued that in a broad sense there are such things -- which do indeed result in cultural universals, the researcher would still have to deal with the problem why diverse and geographically (and even temporally) separated populations respond to similar experiences in the same way. Beside resorting to the argument of "accident", it seems that this line of reasoning returns to the invocation of some notion of basic biological similarity and the operation of such a factor in the account of observed cultural universals. A further point relates to the logical and theoretical problems associated with speaking of universal experiences without assuming the universal nature of the experiencing being. It seems to me, to speak of the former is to assume the latter. One cannot explain cultural universals by referring to similar situations or experiences unless one postulates a common organism in or as an essential part of such a common situation or experience.

According to Eibl-Eibesfeldt (1970:416), "Some of the more complex human expressions can be traced back to the superposition of a few fixed action patterns which do not seem to be culturally determined." He regards as erroneous the view that there are no culturally independent facial expressions and that everything is learnt (p 420). It seems that certain elementary acts of emotional communication can be both executed and understood largely as a result of an innately given "expressive behaviour repertoire" -- or schema -- (Eibl-Eibesfeldt 1970:462). To support his argument even further, Eibl-Eibesfeldt has also drawn attention to the many similarities in emotive expression between humans and animals. Clynes (1974) has developed an entire sub-discipline based on the scientific study of the communication of emotion. He calls this sub-discipline "Sentics". His studies indicate that our emotions are expressed in typical and predictable ways and that these typical expressions reflect part of our genetic inheritance. Like Eibl-Eibesfeldt (1970), Clynes conducted cross-cultural research. His experiments in a number of different societies revealed that people generally expressed many emotions in similar ways and that these forms of expression were of a different kind

to culturally developed signs, symbols, and conventions. Basic forms of emotional expression "are biologically determined expressions that are programmed into us. When we feel anger, we tend to express it in definite 'angry' ways and not in other ways" (Clynes 1974:51). Obviously, as Thouless (1963:43) for one has reminded us, while there seems to be some undeniably innate elements in our emotional responses and expressions, it is particular experiences which determine to a great extent which situational, environmental, and cultural factors come to constitute the things of which we are afraid, to which we react angrily, which make us sad or which make us happy.

The case of infants being successfully reared by members of a different racial and ethnic identity to their parents, provides compelling evidence of the shared nature of the human genetic capacity for acquiring cultural knowledge. Conversely, the relative ease with which strangers to a particular society are able to make sense of its culture provides further evidence for the existence of similar or identical items of knowledge in the cultures of different societies. Strangers, such as anthropologists, tourists, travellers, refugees, slaves, migrants, colonists, etc., are generally able, if they wish to do so, to rapidly develop an approximation to an insider's understanding of the strange culture confronting them. That such understandings are never perfect is probably due to the early impact of culture on ontogenesis and the interference in the stranger's understanding by his own culture.

Strangers, though they have seldom remarked on it, can be logically supposed to initially use their own cultural knowledge to unlock the culture of the people who confront them. It seems logical too that if people of different cultures did not share at least some cultural knowledge, an insider's view of a foreign culture could never be attained. Where would such an understanding begin? It is cultural knowledge that is universally shared that makes entry into strange cultures possible. It seems that, because people do in fact make sense of cultures other than their own and often do so with relative ease, people probably share a great deal

more cultural knowledge than has been spelt out in this study. Like the water that surrounds the fish, this universal knowledge is probably difficult to articulate and hard to recognize, but its existence cannot be doubted.

In anthropology, following Pike (1954) and French (1963), a distinction is made between an Emic approach and an Etic approach to culture. These approaches differ in a number of ways. One of the significant ways in which they differ is that the Emic approach describes culture as the insider sees it while the Etic approach describes it in the "scientific" terms of the anthropologist. The very existence of this dichotomy can be interpreted as a recognition by anthropologists that cultural universals exist. If they did not it would be impossible for an anthropologist to adopt an emic approach or make sense of the "native's" sense of his or her own culture. Thus, no "pure" etic or emic approaches are possible. To some extent, the outsider's view is also, because of shared knowledge, an insider's view. Conversely, an insider's view is always partly an outsider's view, and partly the view of all outsiders. This inescapable interpenetration and overlapping of all cultural stocks of knowledge is implicit in Berry's (1969) methodological discussion. He recognizes that in the study of certain cultural items within a strange culture elements of the etic point of departure may remain even when the approach has become consistently emic. These remaining etic elements, which are thus also emic elements, can be employed as <u>derived</u> etics to study other cultures and in this way cultural universals can be uncovered.

Specific sociological approaches, such as the existential and the phenomenological, maintain that, "... all human beings seem to share some common, general perspective in their understandings of the world -- some common, general forms of subjective experience" (Fontana and De Water 1978:102). It is obvious, claim Fontana and De Water, that humans have a common "horizon of experience" which is wide enough to enable all human beings to understand each other sufficiently to translate many of each other's experiences into their own language. Trade, the exchange of women, diplomacy and other

trans-societal relationships and interactions may be cited as compelling evidence of the extent of shared cultural knowledge present in all human cultures. Because of the multiplicity of shared intra- and inter-cultural meanings, even the outcome of deeply introspective and subjective thought, of creative and original thought, is generally shareable. The science, art, religion, philosophy and music of one culture is, it seems, never totally foreign to the minds of strangers despite many views to the contrary.

CHAPTER EIGHT

BIOLOGY AND LINGUISTIC, MYTHOLOGICAL AND A PRIORI KNOWLEDGE

> Children spontaneously interpret in various ways the objective sources of phenomena ... They offer, in every culture and every generation, a variety of potential foundations for religion, philosophy and myth, relatively independent of the selection made by their own society.
>
> Sylvia Anthony (1973:239)

In the previous chapter the relationship between biology and cultural knowledge was considered in terms of such general topics as socialization, creativity, cultural universals, etc. The present chapter is essentially a continuation of the previous one and explores the relationship between biology and cultural knowledge further by focusing on specific forms of cultural knowledge; namely, linguistic knowledge and mythological knowledge. Finally, because it draws together many of the points made throughout this work, A PRIORI knowledge is discussed. The over-socialized view of A PRIORI knowledge as formulated by Durkheim is criticized in terms of the view drawn from genetic epistemology. The seemingly greater validity of the latter over the former provides some indication of the way in which biological and psychological ideas can help the sociology of knowledge towards more accurate theorizing and thus make possible a more satisfactory general theory of knowledge.

Biology and linguistic knowledge

To be human is to know and use language. Many of those

who have studied language have pointed out its vital role in making humans human. This is not at issue here. A few language scholars have pointed out the equally significant role which human biology plays in the acquisition of language and the role it has probably played in the origin, evolution and structure of language. Humankind's biological propensity to acquire language has already been commented on, what is now to be considered are some ideas regarding biology and the structure of language.

Von Humboldt (1963 [1836]) and Jakobson (1971 [1936]) were among the early linguistic scholars to suggest that underlying all human languages was a basic structure expressive of humankind's common intellectual attributes. Humboldt (1963) believed that if language were analysed in depth, a common form of language would be discovered embedded in all national and individual languages (see Chomsky 1968:71). Humboldt's ideas inspired Chomsky's investigations and have, to some extent, been confirmed by these (see Chomsky 1957; 1966; 1968; 1972). Proceeding in the rationalist tradition, Chomsky maintains that linguistic universals, if such exist, can be logically supposed to provide some indication of the psycho-linguistic and the psycho-biological nature of humankind. As he writes, "... the general features of language structure reflect, not so much the course of one's experience, but rather the general character of one's capacity to acquire knowledge -- in the traditional sense, one's innate ideas and innate principles" (Chomsky 1972:59).

Chomsky (1957), Greenberg (1963) and Hopp (1970) are among those who have claimed to have discovered linguistic universals. Following Jakobson's lead regarding phonetic universals, it has been found that there does appear to be a universal phonetics. The evidence suggests that all known languages compose their vocabulary out of some twenty distinctive phonetic features. In terms of logical possibilities, a relatively few phonetic features suffice, given the various combinations into which they are formed, to account for most of the phonetic segments, and in particular those that carry the heaviest information load, in the spoken languages of the world. Another example cited by Chomsky

(1965:28-29) is the common grammatical structures found in all languages. All languages have rules for structuring sentences and recognize subject and predicate and the relationship between these. All languages also seem to have principles that distinguish the deep or logical structure of an utterance from its surface forms and to have principles that constrain the class of grammatical transformations that relate deep and surface structures (for details of such technical matters see Chomsky 1972). Chomsky admits that the evidence regarding linguistic universals is not that impressive. It is difficult to uncover these and most investigators have been content to concern themselves with aspects of the diversity of the surface structures of languages. Insofar as attention is restricted to surface structures, notes Chomsky (1972:118), the most that can be expected is the discovery of statistical tendencies, such as those presented by Greenberg (1963). A further problem relates to the possibility that languages are not only structured by "universal grammar" but also by other aspects of the human mind and by historical surface factors. The FACULTE DE LANGAGE is but one of the faculties of the mind (Chomsky 1972:37). Despite the obstacles in the path of speaking about and discovering linguistic universals, Chomsky nevertheless feels that such an approach as his promises a better understanding of language than the more conventional empiricist approaches.

Chomsky's view that universal grammar is a manifestation of the human mind and that it constitutes the essence of human language is echoed in the work of other writers such as Saussure and Greimas. Greimas argues that the "elementary structures" of human perception and cognition are "so deep and formative that they ultimately shape the elements of our language, its syntax, and the experiences which these articulate in the form of narrative" (Hawkes 1977:89). Hawkes points out too that Greimas's idea parallels Saussure's notion of the LANGUE which underlies PAROLE and Chomsky's notion of the competence which precedes performance.

Couched in the idiom of this study, Chomsky and the other linguists and semiologists referred to provide further grounds for the thesis that cultural knowledge is genetically

structured. While the earliest languages can be supposed to have been fairly direct genetic expressions, even contemporary languages are constrained to be so and remain so, at least to some extent. The ease with which children the world over acquire the many languages of the world may be viewed as proof of the existence of a close correspondence between their innately directed conjectures about their language and the structure of the language itself. It may also be viewed as proof that the phonetics of all languages correspond with the kinds of sounds humans are comfortably and easily capable of making. The fact that language evolution has not, except in a few minor recent instances, been "artifically" directed offers further support for the argument that language remains articulated with humankind's innate disposition for language. Since language evolves "naturally" it is to be expected that the homologies between universal structures and surface structures would continue to be maintained and that any genetic change relevant to language would come to express itself as a change in the surface structure of language.

Biology and mythology

Chomsky contended not only that humans have an innate competence to acquire language but they also have such a competence to acquire other forms of cultural knowledge. By the same token, the innate structure of the human mind leaves its imprint not only on language but on all cultural creations. This latter point forms a kernel of, and is corroborated by, the work of Levi-Strauss (1972; 1976).

Naming and classifying are essentially arbitrary processes and so too is mythologizing. But this arbitrariness, as anthropological data demonstrate, is belied by astounding similarity. The question therefore, as Levi-Strauss (1972:208), formulates it is, "If the content of myth is contingent, how are we going to explain the fact that myths throughout the world are so similar?" The answer he provides is that these similarities are representations of innate and universal characteristics of the human mind. Myths reveal the primary and universal modes of experiencing the world. They point to the universal human compulsion and

capacity to express and account for experiences in an imaginative and creative fashion. For Levi-Strauss the study of myths and mythologizing is important because in the genesis of myths the mind is reasonably free from empirical constraints. Myths may thus reveal the untrammelled mode of operation and structure of the human mind (see Gardner 1976: 158, 144). Barbu (1976:50) interprets Levi-Strauss as arguing that, "... myths contain the A PRIORI structure, the chromosomes regulating and controlling the process by which man moves from a natural to an artificial, symbolic, or conceived thought-of order in his existence". Myths span the step from nature to culture, they are nature represented and embodied in culture. They are an example of the culturalization of nature. (This idea is from Sahlins 1976: 105.)

The arguments in favour of innate schemas structuring and being reflected in cultural knowledge receive added confirmation when it is remembered that (as Leach 1970:120 observes), working independently of Chomsky, Levi-Strauss has developed a theory of generative and transformational rules for the analysis of myth which closely parallels Chomsky's linguistic theory. Both scholars argue in favour of certain built-in features of the human mind which determine the way in which humans view and classify the world.

For Levi-Strauss the human mind has an objective existence and leaves its imprint on everything humans accomplish. It is also the force and instrument which makes these accomplishments possible. His travels as part of scientific expeditions into the Brazilian jungle in the years 1935-1939 brought him to the realization that, "... notwithstanding the cultural differences between the several parts of mankind, the human mind is everywhere one and the same and that it has the same capacities" (Levi-Strauss 1978:19). The fundamental nature of the human mind is, for Levi-Strauss, reflected in the universal tendency for people to think and organize their world in binary fashion -- they look for and construct contraditions, contrasts, oppositions, relations and associations. People everywhere break the world into "thinkable" pieces and arrange these

according to certain discernible patterns. Humankind is a rule-making, exchanging, exogamous species. Myths everywhere, though their contents are relatively arbitrary, are coded messages with the same basic form hinging on the nature/culture distinction and woven about the eternal problems of mankind. By way of example, Levi-Strauss (1964:60) says of customs,

> The ensemble of a people's customs has always its particular style; they form into systems. I am convinced that the number of these systems is not unlimited and that human societies, like individual human beings (at play, in their dreams, or in moments of delirium), never create absolutely; all they can do is to choose certain combinations from a repertoire of ideas which it should be possible to reconstitute.

Granting the psychic unity of humankind and its limited scope of cultural creation, it should then occasionally happen that very similar, if not identical, cultural items recur transtemporally and transculturally. As noted in the previous chapter, this does in fact often happen. One such example provided by Levi-Strauss concerns a theory in a South American myth that is similar to an idea expressed by Rousseau. The recurrent idea is that it was the development of a neolithic economy, leading as this did to problems stemming from population growth and very large family groups, that defiled the human spirit. Levi-Strauss observes, "... the diversity of the approaches which led Rousseau consciously, and the South American Indians unconsciously, to make the same speculations on a very distant past without a doubt proves nothing about this past, but it proves a great deal about man" (quote from Boon 1972:7). Wallace (1967:172; also, Boon 1972:7) provides another example of a complex set of ideas recurring in two societies. He found that the Iroquois used a type of psychoanalytic theory of mind two centuries before a similar theory was developed by Freud and other Europeans. Since it does not seem possible that the European theory was influenced by the Iroquean, Wallace regards this as a clear and interesting example of independent cultural invention.

Because he seeks to illuminate the deep structures of the mind through a structural analysis of its surface manifestations, Leach (1970:51) says of Levi-Strauss that he is not so much concerned with the collective consciousness of the human mind as he is concerned to discover its collective unconscious. An indication of the importance and neglect of the collective unconscious is conveyed by Levi-Strauss (1972:71) when he asks,

> 'Is it language which influences culture? Is it culture which influences language?' But we have not been sufficiently aware of the fact that <u>both</u> language and culture are the products of activities which are basically similar. I am now referring to this uninvited guest which has been seated during this conference beside us and which is <u>the human mind</u>.

For Levi-Strauss, as Leach notes, there is a major element of mind with an autonomy of its own, operating independently of individual experience and socio-cultural situation. As shall be indicated further on, this is an idea also encountered in the thought of Jung. I interpret this autonomous element of mind (or the collective unconscious) to be synonymous with operating innate cognitive schemas. Levi-Strauss's work thus supports the thesis being advanced that humankind's genetically derived powers and modes of cognition are expressed in cultural knowledge. The way in which such modes of cognition might affect cultural knowledge without our being aware of it is captured by Levi-Strauss when he says, "We are not, therefore, claiming to show how men think the myths, but rather how the myths think themselves out in men without men's knowledge" (quoted in Ehrmann 1966:56; see also Leach 1970:51; and Levi-Strauss 1978:3-4).

A final contribution which Levi-Strauss can make to a study like the present one is his inclusive and generous conception of knowledge. This is consistent with the genetic conception adopted here. He has argued that poems, paintings and musical compositions as well as the myths and symbols of tribal societies should be regarded as expressions of a fundamental form of knowledge, one that all humans have in common. Scientific knowledge is merely the sharpened edge of this knowledge form. (See Staude 1976:303.) Levi-Strauss

also applauds the trend in science to integrate the qualitative and the quantitative, a trend which he believes will lead to the acceptance that, "... between life and thought, there is not the absolute gap which was accepted as a matter of fact by the 17th Century philosophical dualism" (Levi-Strauss 1978:24). Like Piaget, Popper, Lorenz and others referred to in this study, Levi-Strauss feels that the human mind, "... is not something substantially or fundamentally different from the basic phenomena of life itself".

Biology and the collective unconscious

The work of Levi-Strauss resonates in many places with that of Jung. Jung's (1975:6) statement, "... myths are first and foremost psychic phenomena that reveal the nature of the soul ..." is echoed many times by Levi-Strauss. So too is Jung's (1975:6) observation, "Primitive man impresses us so strongly with his subjectivity that we should really have guessed long ago that myths refer to something psychic. His knowledge of nature is essentially the language and outer dress of an unconscious psychic process. But the very fact that this process is unconscious gives us the reason why man has thought of everything except the psyche in his attempts to explain myths."

Jung provides an important contribution to genetic epistemology. Through his detailed discussions of the "collective unconscious" and the "archetypes" he offers significant insights into the ways in which the human genome might affect and have affected culture. Through his varied, ingenious and imaginative investigations Jung was led to the realisation that humankind's unique psychic qualities are not solely the product of individual experience or learning. He came to argue that just as each newborn animal does not create its own behavioural repertoire from scratch but constructs it on the basis of its inherited instinctual patterns, so the human psyche is constructed along the pathways of the collective patterns evolved by the human genome. Jung coined the term "collective unconscious" to designate these innate collective thought patterns.

The collective unconscious is part of humankind's

genetic inheritance. Everyperson's unconscious rests, says Jung (1975:3-4), upon a deeper layer, the collective unconscious, "... which does not derive from personal experience and is not a personal acquisition but is inborn". The collective consciousness is impersonal, universal, genetically inherited and has contents and modes of operation that are more or less the same everywhere and in all individuals (Jung 1975:3-4, 43).

The contents of the collective unconscious are referred to by Jung as "archetypes". They are "archaic", "primordial", "universal" types or images that have been assimilated into the human genome since remotest times. Jung regards the archetypes as a form of innate knowledge analogous to instincts. So close is this analogy, writes Jung (1975:43), "... that there is good reason for supposing that the archetypes are the unconscious images of the instincts themselves, in other words, that they are patterns of instinctual behaviour". Just as instincts compel humans to a specifically human mode of existence, writes Jung, so the archetypes force their ways of perception and apprehension in specific human patterns (Fordham 1973:24). Furthermore, as A PRIORI forms of intuition, perception and apprehension, the archetypes do more than inform, enrich and direct cognition, they also play a part in everyperson's emotional life, structuring their emotions according to a recurring and enduring universal pattern. The universal pattern of human emotions reflects and is causally related to the recurring pattern of human life. This complementarity, for example, helps explain the observed similarities in the structures of joy and sorrow and the causes of such emotions the world over.

A particularly controversial aspect of Jung's theory is the seemingly Lamarckian explanation he advances for the genesis of the collective unconscious and the archetypes. Jung is in agreement with those geneticists who hold that individual experiences modify the genome. He does not intend us, though, to understand "experience" in the narrow sense of brute physical experience. No, humankind's psychic experiences are an integral part of the totality of its experiences. Hence psychic experiences also modify the

genome. This implies that contemporary human nature, humankind's genetic inheritance, is the result of all the experiences of the human race throughout its evolutionary history. Lest Jung be regarded as a crude Lamarckian, it must be added that it is the physiological correlates and sedimentations of actually lived experiences which are genetically transmitted and not the experiences themselves. A great deal is lost from generation to generation but something is retained and genetically transmitted from the experiences of each passing generation (see Fordham 1973:24). What Jung is proposing seems to be a compromise between Lamarckism and Darwinism. Life involves all the faculties and levels of being of every creature. To say that a particular physical attribute was phylogenetically selected is the same as saying that the experiences and behaviours common to that attribute in a given environment were selected. It was the things that Homosapiens's ancestors did, experienced and felt with their nervous systems that shaped the evolution of the human nervous system. Both the positive and the negative experiences of countless ancestors left some residual mark on the human genome. As a rule, we <u>do not</u> experience or act in the world in ways that proved too detrimental to some of our ancestors. Conversely, we <u>do</u> experience and act in the world in ways that proved fairly adaptive. Jung seems to have sound reason therefore for saying of the evolution of the collective consciousness, "Although our inheritance consists in physiological paths, it was nevertheless mental processes in our ancestors that traced these paths." (Quoted in Fordham 1973:24.)

The issue of the transmittability of experience is related to Jung's claim that the collective unconscious has <u>contents</u> which are genetically transmitted and alterable through experience. This claim is also responsible for controversy and has been a source of confusion. Part of this confusion stems from Jung's ambiguous use of the words <u>images</u> and <u>contents</u>. He claims, for example, that the archetypes are a content of the collective unconscious. But he also says that the archetypes are "images". The way in which he explains the term suggests that he means images of images;

images are the forms of images rather than their contents. "The term 'image' is intended to express not only the form of the activity taking place, but the typical situation in which the activity is released" (Jung 1975:78). There is obviously a dialectical relationship between content and form. Contents are not conceivable without forms and forms are shaped by contents. Every form has a content, even if it is the negative one of being without content. The darkness of the unseeing eye is part of the eye's range of contents. Notwithstanding this grey area of comprehension, Jung is insistent that the actual content of thoughts, feelings and actions is not what is genetically inherited nor can it be so inherited. What is inherited are the predispositions and structures (schemas) responsible for such phenomena. The universal nature of these predispositions and structures result, given the necessary similarities in environment and experience, in shared and recurring thoughts, feelings, actions, art forms and so forth. As he states, "The representations are not inherited, only the forms, and in that respect they correspond in every way to the instincts, which are also determined in form only." To clarify this, he refers to the axial system of a crystal which preforms the crystalline structure in the mother liquid (Jung 1975:79). What the collective unconscious and the archetypes are then, in the idiom of this study, are varieties of innate somatic knowledge not innate cognitive knowledge.

Jung's importance to genetic epistemology should be apparent from the above comments. He has also addressed the matter of the categories of mind directly and, like Kant, argues that, "... there can be no empirical knowledge that is not already caught and limited by the A PRIORI structure of cognition" (Jung 1975:76). There is, he says, an A PRIORI factor in all human activities, namely the inborn, preconscious and unconscious structure of the psyche. He recognizes that the genetic predispositions and structures of the human psyche exert a decisive influence on the choice of material, the method of investigation, the nature of conclusions, and the formulation of hypotheses and theories in

human thinking (p 77). He accepts that human cognition and hence cultural creativity is circumscribed, humans only think and do and say as they themselves are (p 77). Like Popper, Jung views the newborn infant not as an empty vessel but as a "... tremendously complicated, sharply defined individual entity which appears indeterminate to us only because we cannot see it directly" (p 77). Those who argue that experience and learning are primarily responsible for the development of the human psyche are likened by Jung to those who believe that the sun which rises in the morning is a different sun from that which set the evening before (p 78).

Just as the members of each plant species becomes and is a plant of its kind, or each insect represents its kind, so too does each human. Despite the diversity of human lives and human cultures, the human pattern is everywhere and every time repeated. The repeated pattern leads scholars to assume that each human life and each culture is shaped by similar genetic forces. This assumption in turn leads to the search within the diversity of biography and culture for the necessary repeated pattern. Jung, Chomsky and Levi-Strauss all exhibit this circularity of inspiration, assumption and justification. As is the case with other innatists, Jung substantiates many of his conceptual and theoretical formulations by using the cultural universals argument. He was particularly impressed by alchemic and mythological universals and, like Levi-Strauss, regarded myths as especially direct expression of the collective unconscious. Besides these sources of validation, Jung also maintained that the existence and nature of the archetypes as intrinsic elements of the human psyche could be inferred from the traces of mythological imagery which appear in dreams and madness. The most compelling evidence in favour of the postulated collective unconscious and the archetypes is provided by those mythological themes and images which occur in dreams and madness but which cannot be accounted for in terms of the chronicle of an individual's actual lived experiences (see Fordham 1973:25-27).

Some other cultural "innatists"

Numerous other scholars have investigated, described, or theorized about biological aspects of the human mind and culture. A few more of these can be briefly referred to; it is not possible to embark on an encyclopaedic discussion.

The resurgence of certain innatist themes and propositions in contemporary social science is partly witnessed by the fact that a writer like Levy-Bruhl, who emphasized innate human qualities, is again becoming academically respectable. A number of his original works have recently become available to the English-speaking world and Needham (1972), for one, emphasizes this change of climate by dedicating his book, "Belief, language and experience", to this misunderstood and misrepresented scholar. The considerable and protracted investigations of Levy-Bruhl (1931, 1949) led him to conclude that the fundamental structure of the human mind was everywhere the same. He succeeded in isolating what he regarded as a fixed element, fundamental and indestructible, in the nature of humankind, which he called "primitive mentality" (1949:187). He writes, "in every human mind, whatever intellectual development, there subsists an ineradicable fund of primitive mentality" (Levy-Bruhl 1931:26-27). This primitive mentality provides humans with an innately structured pre-logical mode of social participation and intellectual understanding. It is characterized by the power it has in allowing individuals to grasp the meaning of symbols intuitively and collectively. From it springs, much as Jung has insisted, human modes of thought, action and feeling. We ought not to wish for the demise of our primitive mentality, argues Levy-Bruhl (1931: 27), "For with it would disappear, perhaps, poetry, art, metaphysics, and scientific inventions -- almost everything, in short, that makes for the beauty and grandeur of human life".

Despite their considerable merit, the works of Levy-Bruhl have, until recently (as noted above) been neglected and he has been unfairly pilloried. The unpopularity of his writing seems to spring, as Needham (1972) points out, from a misunderstanding of, and fixation on, his earlier works. These seemed to convey the impression that modern Western persons possessed one sort of mentality while the tribes

studied by anthropologists -- the colonized peoples -- had another (see Beattie's criticisms 1964:28, 67). What Levy-Bruhl was driving at, as emerged more clearly in his later writing, is that all humans share a primitive mentality, which is part of their nature. He took pains to point out that though this mentality was common to all humans, certain social and cultural arrangements reflect or give expression to this mentality more vividly than others. Humans cannot think or participate in society without employing their fund of primitive mentality. But since the primitive mentality is socially overlaid by differing languages, traditions, modes of thought, images, symbols and other cultural elements, the actual thoughts, actions and feelings of individuals in different societies would, in fact, not be the same. Jung also emphasizes this point. Needham (1972:167) sums up his comments on Levy-Bruhl by noting that his main theoretical achievement was to have taken seriously the possibility that the fundamental identity of human nature was nevertheless compatible with the existence of mentalities differing sharply from one another.

Needham himself confesses to having found inatist concepts similar to Levy-Bruhl's primitive mentality useful and justifiable. He coined the term "natural symbols" to refer to, "... certain phenomenal and conceptual vehicles of meaning that seem to exert an intuitive influence on man's psyche and the regulation of his thought" (Needham 1972:216). In addition he speaks of "primary factors of human experience", a phrase denoting compendiously, "capacities, concepts, images, concerns, and intuitions that appear to be recognised in one way or another in all known cultures" (Needham 1972:216).

Freud's emphasis on the role of the instincts in all psychological phenomena can also be regarded as a contribution, even though indirect, to an understanding of the impact which the human genome has on all forms of culture. An indication of this contribution is conveyed by Freud's (1973: 121-122) definition of an instinct: "An 'instinct' appears to us as a concept on the frontier between the mental and the somatic, as the psychical representative of the

stimuli originating from within the organism and reaching the mind, as a measure of the demand made upon the mind for work in consequence of its connection with the body." According to Freud, humankind's shared instincts do not lead to the same individual expressions nor can they be regarded as resulting in the same cultural productions. Nevertheless, due to the instincts and the universality of certain social arrangements and relationships, there are recurring though not identical experiences. Thus, for example, the Oedipus complex is a common psychological configuration resulting from the operation of the instincts being channelled by a recurring set of human relationships. Relationships which are themselves strongly biologically shaped. Freud and other psychoanalysts may be interpreted as having discovered that humans are likely at particular stages in their development to assimilate certain events and relationships in stereotypical ways. In this way individuals at the same stage of development are characterized by similar acquired schemas and items of knowledge as part of their individual stocks of knowledge.

Like Jung and Freud, the Italian sociologist Pareto also sees forms of innate knowledge underlying mind and society. Pareto calls the actual items of cultural knowledge of society "derivatives". These items are derived from, what may be interpreted as, biological "residues". These residues, writes Pareto, correspond to certain instincts in human beings. For this reason, they are usually wanting in definiteness or exact delineation. "Actually observable in society are certain derivatives, c, that derive from residues, a, by way of derivatives, b" (Pareto 1965:785). As a simple example of the relationship between the residues and derivatives, Pareto refers to the exact objectivation and delineation of temperature in scientific measurement and in scientific theory. This cultural item is derived from the biological and physiological residue which enables humans to make hot/cold and warm/cool distinctions subjectively and makes such distinctions meaningful, in, initially, purely biological ways. Cultural items result, many times, he states, from making residues more exact (Pareto 1965:784).

The concept "innate knowledge" adopted in this study and this discussion of the relationship between the human genome and cultural knowledge has an obvious Cartesian flavour. The ideas expressed by the above writers hark back in one way or another to Descarte's notion of innate ideas as well as to Leibniz's rationalistic premise which held that the human mind is everywhere the same. Like Descarte, Leibniz advocated a doctrine of innate ideas and helped establish a rationalistic psychology. This psychology concerned itself with the forms, limits, and principles that provide (in Leibniz's words), "the sinews and connections" for human thought and knowledge. (Quoted in Needham 1972: 220; see also Chomsky 1972:96.)

In the more recent past rationalistic arguments have been proposed by Bastian (1926-1905) in Germany and Frazer (1854-1941) in England. Both these thinkers held that because all humans belong to one species there must be psychological universals which are reflected in the actions and thoughts of all humans. Bastian proposed a thorough-going Leibnizian theory of innate ideas. For Bastian, the psychic unity of mankind everywhere produced similar "elementary ideas" -- as he named them. These elementary ideas were innately predetermined and they directed cultural development. In addition, Bastian maintained that the elementary ideas were not subject to alteration the way that other ideas were subject to the forces of cultural evolution. Elementary ideas are held by him to be the unchanging bedrock of history and culture. (See Leach 1970; Bidney 1970.)

Others, such as James, McDougall, Cassirer and Gurvitch could easily be discussed but it seems now appropriate to call a halt to this listing. The scholars listed above have all in their own way produced, what Murphy refers to as, "dialectical philosophies". A passage from his book, "The dialectics of social life", provides an appropriate concluding statement for this section.

> One of the key tenets of all dialectical philosophies is that there is a human psyche that has certain inherent and universal characteristics and that is an active element in man's history and not

> a mere passive receptor of an external world.

(Murphy 1972:203.)

Biology and A PRIORI knowledge

Attention was drawn earlier to those forms of cognitive knowledge which cannot, strictly speaking, be regarded as learnt but which nevertheless presuppose learning. One of the first scholars to distinguish some such forms of knowledge was Kant (1724-1804). Kant begins his "Critique of Pure Reason" with the statement, "That all our knowledge begins with experience there can be no doubt". In the next paragraph he introduces the wedge which he is to use to separate "pure" from "empirical" knowledge. "But, though all our knowledge begins with experience, it by no means follows, that all arises out of experience. For, on the contrary, it is quite possible that our empirical knowledge is a compound of that which we receive through impressions, and that which the faculty of cognition supplies from itself (sensuous impressions giving merely the occasion), an addition which we cannot distinguish from the original element given by sense, till long practice has made us attentive to, and skilful in separating it" (Kant [1787] 1969:25).

Kant, by employing his considerable erudition, argued that sensations were insufficient in themselves to produce knowledge. What was necessary were A PRIORI coordinations, forms and categories which, together with sensations, were sufficient to produce knowledge. He writes, "Before objects are given me, that is, A PRIORI, I must presuppose in myself laws of understanding which are expressed in conceptions A PRIORI. To these conceptions, then, all the objects of experience must necessarily conform" (Kant 1969:12). Since genetic epistemology is deeply concerned with the sources of knowledge, Kant may be regarded as having made a valuable contribution to this study when he argued that human knowledge (as he used the term) has only two sources, namely "sense and understanding" (Kant 1969:40). The senses provide the objects of thought while understanding is the process

and form of thought. For Kant, A PRIORI elements of cognition constitute the objects of perception as well as the process and form of thought. Both A PRIORI elements are necessary. "Without the sensuous faculty no object would be given us, and without the understanding no object would be thought" (Kant 1969:62). Kant set himself the daunting task to describe the A PRIORI elements of cognition which made empirical and pure knowledge possible. By describing these A PRIORIs Kant was making empirical, that is, sensible, a form of knowledge inherent in all empirical knowledge but of which the thinker is generally unaware for it is the very thing which makes thought thought. In seeking to uncover the A PRIORIs of human thought and knowledge, Kant initiated nearly two hundred years ago the kinds of searches conducted in this century by Chomsky, Levi-Strauss, Jung, Piaget and others.

One way of looking at the "Critique" is to see it, as Durant (1961:202), does, as a "... detailed biology of thought, an examination of the origin and evolution of concepts, an analysis of the inherited structure of the mind". For example, in addition to his wellknown description of the basic categories of perception and thought, Kant (1969:36), like his distant disciples Jung and Levi-Strauss, finds the human mind everywhere "... urged on by its own feeling of need, towards such questions as cannot be answered by any empirical application of reason or principles derived therefrom; and so there has ever really existed in every man some system of metaphysics". The human mind has, for Kant, a natural disposition to metaphysics.

Viewed as a biology of thought or knowledge, the "Critique" has a number of weaknesses. Chief amongst these is the fact that though he describes the nature of human reason he does not provide a natural account of this nature. This judgement is, obviously, a bit unfair for as Bronowski (1979:22) reminds us, the idea of evolution was an idea barely in the head of Darwin's grandfather, Erasmus, in Kant's lifetime. Kant died in 1804 and Darwin was born in 1809. It is thus easy to appreciate that though he asked questions regarding the origin of the mind's A PRIORIs he

nowhere provides satisfactory answers to such questions nor does it even half dawn on him that the relation of man to the animals might provide a clue. Related to this weakness is his failure to provide a satisfactory reason why empirical knowledge should correspond with reality. A further weakness, which actually contradicts the claim that Kant provides a biology of knowledge, is Kant's idea that certain forms of knowledge are absolutely true.

Biological epistemology, as should be clear from this study, is at odds with Kant's claim that some forms of knowledge are absolutely true. Biology instructs us that life is a process of becoming and that knowledge, a life process, is also a becoming. Evolutionary reasoning requires that Kant's claim for the necessary A PRIORI validity of the categories of thought be rejected. What cannot be denied is the A PRIORI necessity of the categories for thought and knowledge. Evolutionary epistemology reveals that the categories themselves are the products of evolutionary processes. They are something which has resulted from the interplay between the genome and environment over millions of generations. In evolutionary perspective, as Campbell (1974:441) notes, the categories can be seen as "... highly edited, much tested presumptions, 'validated' only as scientific truth is validated, synthetic A POSTERIORI from the point of view of species-history, synthetic and in several ways A PRIORI (but not in terms of necessary validity) from the point of view of the individual organism". Campbell acknowledges that he owes this insight to Popper (1969:47-48) who had argued that though we are born with the knowledge which makes thought possible and which structures thought, this knowledge, "... although not valid A PRIORI, is psychologically or genetically A PRIORI, i.e. prior to all observational experience".

Herbert Spencer is one in a long line of scholars who have contributed to biological epistemology. It was axiomatic for him that ultimately all aspects of the universe, whether organic or inorganic, social or non-social, are subject to the laws of evolution (see Coser 1977:90). As regards the origin of knowledge, he argued that it was

necessary to assume in the case of the individual thinker an A PRIORI organization. Where Spencer and biological epistemology part company with Kant is in the discovery that, "What is A PRIORI for the individual is not so for the race" (see Hoffding in Campbell 1974:443). It is a fundamental insight of biological epistemology that those conditions and forms of knowledge which cannot be ascribed to the experiences of the individual can be accounted for in terms of the experiences of the genome. Hence, as many recognize, though the empiricists are generally wrong as regards the ontogenetic acquisition of knowledge, their argument is valid phylogenetically. "Everything", writes Monod (1974: 144), "whether it be the stereotyped behaviour of bees or the innate framework of human cognition, comes from experience; yet not from actual current experience, reiterated by each individual with each new generation, but instead, from the experience accumulated by the entire ancestry of the species in the course of its evolution."

Kant maintained that the categories of thought yield empirical knowledge because the mind imposes its own laws and forms upon nature. But, as Popper (1969) and others have pointed out, such projected knowledge is often found to have been mistaken. Even the categories, though sufficient in general to generate valid knowledge, on occasion produce error or irreconcilable contradiction. What is more, as Popper (1969:48) wryly notes, if the validity of Newton's theory is explained "... by the fact that our intellect imposes its laws upon nature, it follows, I think, that our intellect must succeed in this; which makes it hard to understand why A PRIORI knowledge such as Newton's should be so hard to come by."

Biological epistemology maintains that the categories and other A PRIORIs of the human senses and mind yield valid knowledge (and nonsense) because they have evolved to do so. Campbell provides a long list of scholars who have in one way or another recognized this insight or amplified it in some way. The list includes biologists, ethologists, philosophers, psychologists and sociologists. They are agreed that the A PRIORIs of the mind though not the result of

individual experience are nonetheless the result of the phylogenetic experiences of the genome. They are "working hypotheses" (to borrow Lorenz's phrase) evolved to generate the simple kinds of knowledge which make the basic form of human adaptation possible but from which have gradually emerged, accumulated and spiralled forms of knowledge which have led the human mind far beyond the problems which shaped it in its past. The fact that the A PRIORIs are "working hypotheses" of the species Homosapiens helps explain, says Lorenz, the paradoxical fact that while some of the laws of "pure reason" break down at every step in modern theoretical science, they nevertheless have stood the test of the practical biological matter of the struggle for the preservation of the human species (quoted by Campbell 1974:446).

In their thinking, neither animals nor humans can afford to make certain kinds of mistakes. The penalty is death; is the non-reproduction of the tendency to make those kinds of mistakes. The high development of the faculty for logic in humans is the result, writes Monod (1974:147), "... of an evolution during which natural selection tested the efficacy of the process, its survival value." For this reason, he adds, the innate logical instrument we have inherited is reliable and it enables us to comprehend events in the world around us. The problem of the correspondence between such "pure" forms of knowledge as logic and mathematics -- which appear to owe little to individual experience -- and nature is solved not by asserting, as did Kant, that it is the result of nature being shaped by the mind, but rather by the discovery that nature has shaped the mind that grasps nature as an object. The A PRIORI human mind, states Barash (1980:203), is actually nothing more than the embodiment of experience itself. "In systematically confronting logic with experience, according to the scientific method, we are in fact confronting all the experience of our ancestors with our own" (Monod 1974:148).

In his book "Biology and Knowledge" (1971) Piaget provides a detailed discussion of the genesis of logico-mathematical knowledge, showing how it is related to innate knowledge. By referring to his own studies of the development

of logico-mathematical knowledge in children, Piaget provides insights into the ways in which the environment and the activities of the developing infant are necessary for the, so called, A PRIORI mental structures to emerge. While his studies do not challenge the argument for the genetic evolution of these structures, he does point out the importance of individual experience for their actual operation, the unity between organism and environment is again stressed. Thus, the basics of logic and mathematics are not inborn, as Piaget makes clear, what is inborn are schemas which, given the kind of environment in which they have evolved and the kinds of experiences common to our species, lead eventually -- invariably -- to the attainment of logico-mathematical knowledge. For Piaget all knowledge derives from the most primitive organismic/environmental matrix. At this level, as Furth (1969:65) points out, there is no kind of fast line between the physical and the biological; "... hence it appears reasonable that the biologically derived construct should fit the physical world".

The fact that humans solve many problems more readily than chance allows or more readily than a systematic examination of all possible solutions allows, led the British philosopher Peirce (1957) more than sixty-five years ago to develop his rationalistic theory of scientific knowledge. In this theory he proposed that humans are born with cognitive structures and processes which facilitate the formation and selection of "correct" hypotheses in the face of infinite numbers of possible hypotheses. While such inborn structures and processes facilitate various forms of valid knowledge, they also, logically, limit the things which humans can come to know. Peirce holds that we have innately grounded intuitions or hunches (even feelings) which indicate to us which of a set of hypotheses are correct or possibly correct. These intuitions or hunches pay off more often than can be accounted for by chance. (One has only to think of the road of discovery of the young child.) Hence it seems that we possess a form of prescience which enables us to come to a conscious understanding or knowledge of the world sooner than if we relied solely on the empirical and

logical route to knowledge. This innate property, or adaptation, as Peirce calls it, means that correct hypotheses appear to us as self-evident, simple and natural. Peirce contends that common sense judgements, our everyday type discriminations, should have a greater probability of being correct than purely random judgements because our common sense draws on "quasi-instinctual beliefs" that have been built-up and tested through centuries of experience and which are part of the biological inheritance of all humans. Though, as we have seen, the wisdom of such innate beliefs or knowledge is great as regards certain survival 'musts', it is not very great as regards more abstract and theoretical thought. It seems that in science such innately grounded hunches only give us a slight edge over a purely random construction of reality because the number of hypotheses and theories which appear equally feasible or correct at any moment is still fairly large and our testing of these proceeds generally at a slow and laborious pace.

Sociology and A PRIORI knowledge

By maintaining that the categories of thought are, in a fundamental way, genetically inherited, biological epistemology is at odds with Durkheim's sociological account. An account which evolutionary reasoning indicates is over-socialized. In his writing about the categories, Durkheim sought to avoid the weaknesses of both the empiricist and the A PRIORI approaches by fusing their viable aspects into a predominantly sociological theory of cognition and knowledge. His ideas led him to anticipate that the theory of knowledge would "... unite the opposing advantages of the two rival theories, without incurring their inconveniences". It would "... keep all the essential principles of the apriorists; but at the same time it (would be) inspired by that positive spirit which the empiricists have striven to satisfy" (Durkheim 1976:19 [1912]). Judged with the wisdom of hindsight, Durkheim can be said to have succeeded only partially. Nevertheless, his contribution, properly assimilated in a general theory of knowledge, provides elements neglected by many of the approaches considered in this

chapter. For Durkheim empiricism could not account for the categories of understanding, ideas of time, space, class, number, cause, substance, and so on. On the other hand, Kantian A PRIORISM provided no satisfactory explanation for the origin and contents of the categories. It was no explanation, Durkheim argued, to say that these are inherent in the nature of the human intellect, as Kant did, they must be explained in terms of natural causes (Durkheim 1965; 1976).

That Durkheim, like almost all scholars tackling weighty matters, is ambiguous and sometimes obscure, is obvious from even a brief acquaintance with his work. The charge that his arguments are oversocialized can be rebutted. For one thing, he is occasionally cautious and modest. He writes of his theory of knowledge, for example, "... in the actual condition of our knowledge of these matters one should be careful to avoid all radical and exclusive statements" (Durkheim 1976:16). His claims that "society is a reality SUI GENERIS" and that knowledge is a social product are counter balanced by the warning that "... irreducibility must not be taken in any absolute sense" (p 16). He did not claim, as some suppose he did, that the social realm of being was unconnected with the biological and psychological. As he states of thought and society, "If experience were completely separated from all that is rational, reason could not operate upon it; in the same way, if the psychic nature of the individual were absolutely opposed to the social life, society would be impossible" (p 16). The antitheses in his work are further illustrated when Durkheim (1976:249) concedes to biology and psychology that society exists only in and through individuals. He also states that, "A complete analysis of the categories should seek those germs of rationality even in the individual consciousness", (p 16) and that, "... the relations which they express exist in an implicit way in individual consciousness."

Despite such grounds as the foregoing for rebutting the charge that his theories result in an oversocialized conception of humankind, knowledge and society, I feel, an overall consideration of Durkheim's work supports the charge. In

some instances oversocialized arguments are obviously little more than literary devices, but Durkheim's consistent neglect -- or even denial -- of the impact of human biology and psychology on knowledge and society -- that is, the other half of the dialectic he concentrates on -- provides strong grounds for the charge of oversocialization. His influence on sociology had been both positive and negative. On the negative side, he must be held accountable for at least some of the dominance which the oversocialized conception of knowledge, society and humankind has in sociology.

Studies in epistemology and cognition seem to reflect what may be a characteristic of individual minds. That is, some seem to focus almost exclusively on similarities while others focus on differences. The texture of reality encourages both. Durkheim seems to have been biased in this way towards differences. In considering, say, Arunta thought and European thought, Durkheim saw mostly the differences. Since each thought form came from members of the same species, such differences were to be ascribed to the effects of society and culture. Durkheim was thus led to argue that the categories were social in origin and content. He wrote, "The first logical categories were social categories, the first classes of things were classes of men into which the things were integrated. It was because men were grouped and thought of themselves in the form of groups, that in their ideas they grouped other things" (Durkheim and Mauss 1965: 82). That the categories are the product of social factors is evidenced by, for example, "... societies in Australia and North America where space is conceived in the form of an immense circle, because the camp has a circular form (Durkheim 1976:11). Time can only be grasped, nay only exists, through the round of social activities. "A calendar expresses the rhythm of the collective activities, while at the same time its function is to assure their regularity" (p 10). Durkheim sees wholistic thought as rooted in the perceived unity of society and he offers similar "proofs" for the origin and content of other categories and concepts. As his argument runs, the structures of human relations and society impose themselves on human cognition. They produce

"collective representations" which lead all society members to make sense of their world in the same fashion. These shared representations thus result in shared knowledge, mutual understanding and cooperation -- all necessary factors of social life. Durkheim expresses the functional nature of the categories when he writes that if the members of society "... did not have the same conceptions of time, space, cause, number etc., all contact between their minds would be impossible, and with that, all life together" (in Lukes 1973:442). (If society presupposes the categories then how can society have originated them?)

A comprehensive theory of human knowledge would, because so much human knowledge is social, be primarily a sociological theory. For this reason, Durkheim, by his evolutionary approach and his emphasis on the social aspects of knowledge has obviously made a great contribution. He has, also, like Popper, provided reasons why his sociological theory of knowledge does not imply conventionalism and extreme relativism. Like Popper's World 3, Durkheim's "collective representations" have emerged in an evolutionary fashion from a distant past in which the contents of thought and the objects of knowledge were not as clearly delineated as now. Early man rather than seeing through a glass darkly, thought through one in this fashion. The collective representations evolved to have an objective existence. They are objectivated knowledge; they are socially produced, transmitted and preserved. They are outside the time and vicissitudes of individual life. They are an object in the world and cannot be resisted nor denied. They are more than mere epiphenomena of their morphological base. They are the result of a synthesis "SUI GENERIS" of individual consciousness. Cf this Durkheim writes (1976:424), "Now this synthesis has the effect of disengaging a whole world of the sentiments, ideas and images which, once born, obey laws of their own. They attract each other, repel each other, unite, divide themselves, and multiply, though these combinations are not commanded and necessitated by the condition of the underlying reality." (Recall Levi-Strauss's remark referred to earlier about his thoughts working themselves out in him

without his knowledge.)

It is because the collective representations exist as independent and timeless objects that they are gradually clarified, sifted and tested through succeeding generations that they come to have the type of objective validity they have in society. Furthermore, a good point for biological epistemology, the categories and the other collective representations at each stage of their evolution and whatever form they take socially, correspond with nature where this correspondence is organically, psychologically and socially necessary. The reason for this Durkheim (1976:18) writes, is that society is a part of nature, it is a natural realm which differs from the others only by greater complexity. "... it is impossible that nature should differ radically from itself in the one case and in the other in regard to that which is most essential. The fundamental relations that exist between things -- just that which it is the functions of the categories to express -- cannot be essentially dissimilar in the different realms." (Note apparent contradiction with quote from p 424 above.) He proceeds to note that though the categories are most objectively expressed and analyzable in the social world, "it is nevertheless impossible that they should not be found elsewhere, though in less pronounced form" (Durkheim 1976: 18). Durkheim seems here to be approaching the view, basic to biological epistemology, that if society has shaped the categories, it has employed elements made available to it by nature and according to the laws of nature. Such a view would, if Durkheim had pursued it far enough, have led him to formulate a theory very different from the one he in fact formulated.

Durkheim's theory of knowledge seems to be, on close inspection, two theories rather than one. The one, which is poorly developed, suggests the kind of theory later developed by such scholars as Baldwin, Popper, Piaget, Lorenz, Levi-Strauss and others considered in this study. The other theory, which was more fully developed and for which Durkheim is primarily remembered, constitutes an exaggerated sociology of knowledge. Durkheim did not produce a unified theory of

knowledge because, it seems, he was unable to reconcile his sociological and his individualistic approaches. He might have been able to do this if he had paid more attention to the position of the individual as the producer and vehicle of the collective representations. But he denied himself this possibility by his systematic "derogation of individual consciousness" (Schaub 1973:76). As Schaub (p 175) explains, individuals, even those customarily regarded as epoch-making, are denied any originative activity by Durkheim and he regards all psychological explanations of social phenomena as false. Rather than seeing the contents of individual stocks of knowledge as a creative synthesis of individual and social elements (as advocated in this study), Durkheim regards all mental contents as entirely derived from the social mind of the group. Schaub (1973:176) quotes Gehlke (1915:86) who wrote, "... so far as the individual appears at all in Durkheim's later theory, he has become only a body; he is no longer a soul (AME). His soul is the mind of society incarnated in his body. The social mind is all the mind that exists; and in this sense the social is the only real".

The roots of the categories go deeper than culture and, possibly, even deeper than social life. They represent the outgrowths of an extremely ancient form of knowledge; an organic knowledge possessed by all creatures and used to adapt to the environment. Even a starfish knows "up" from "down" as is demonstrated by its slow half-somersault executed after it is turned on its back. Schaub (1973:179) cites the case of a bird, whose nest is robbed of an egg, being aware, at the very least, of some alteration in respect of the contents of the nest. Thus, he suggests, something quantitative has found a kind of entrance into the animal's mind, in however obscure a form. The hunting behaviour of some predators clearly indicates that they have at least some notion of "one", "some" and "many". Biological epistemology leads one to the view, a view endorsed by Schaub (1973:180) that the categories as described by Durkheim really presuppose the categories. As noted earlier, by calling attention to the fact that social life presupposes

the categories, Durkheim, rather than strengthening his case, was contradicting it. For any individual to be part of a group and to co-operate and communicate in that group presupposes a great deal of non-social knowledge. Any explanation of the origin and genesis of human socio-cultural life would also have to begin with a certain assumed stock of non-social knowledge. Durkheim's claim that the social nature of the origin and content of the categories is demonstrated by those American and Australian societies that conceive of space as an immense circle because their camps are circular in form begs the question as to how it is possible for the members of such societies to know that their camps are circular or even why they should be led to make such an observation in the first place. The answer seems to be that human beings, as Kant argued, organize and categorize experience in spatio-temporal terms because it is in their nature to do so. The circularity (or linearity or squareness or any other shape) of the camp may be seen as a representation of the way in which humans organize their experiences and, through the objectivation of their knowledge, their social world. But the camp, as Durkheim and Popper point out, becomes an object in the world, a facticity which can determine thought and which thought may find good to think with. Thus it is not surprising that, at the level of symbolic thought and communication, social arrangements, which are obviously very 'visible' and important, should become useful <u>metaphors</u>, vehicles of thought, for expressing complex ideas and for assisting people in making sense of their world. Today humans reach for the stars using concepts developed in ancient mythologies and derived, no doubt, from then current social arrangements. Durkheim makes the mistake of mistaking the clothing of intuitions for their essences. And though these are related, they are not identical as anyone who has tried to express the ineffable in language will attest.

The fact that certain categories seem not to have changed at all in human history while others have been extended only in the direction of greater clarity and refinement and that to the extent that any of the categories have

undergone change it has been incomparably slower than the rate of change in social organization seems to contradict Durkheim's arguments (see Schaub 1973:179). Durkheim has also overlooked the fact that the anthropologists who made sense of and reported on the categories of the societies to which he refers could only have done so if their own category systems had found some resonance in the systems of the peoples studied. Because of the trees of human differences Durkheim could not see the earth, wood and sky of their similarities. But this bias is a common one. In the reports of explorers, in the studies of anthropologists and in the journals of travellers, it is most generally the differences between themselves and those that they observe that are recorded (see Rosch 1977). In recent years there has been something of a shift in emphasis from differences to similarities and there is in fact a new emphasis today on psychological universals, writes Warren (1980:290). It seems as if, he adds, humans are more alike in certain fundamental respects than an earlier generation of social scientists, stressing humankind's plasticity, thought. Though it is obvious that there are cultural differences between people, these differences are, states Warren, to some extent an overlay on psychological universals.

Conclusion

In this study I have attempted to accomplish two major objectives. The first was to define the term "knowledge" in such a way as to include the many varieties of knowledge currently excluded by the conventional sociology of knowledge because of its over-restricted definition. The second objective was to develop a "depth sociology" (Staude 1976: 303) for the sociology of knowledge.

The first objective of this study arose from the intuition that by defining knowledge more broadly, the subject matter of the sociology of knowledge could be expanded to include all that functions as knowledge in society and makes each society what it is. This intuition also held out the promise that by defining knowledge differently, a way could be forged which would facilitate the synthesis of the

biology of knowledge, the psychology of knowledge and the sociology of knowledge into a comprehensive theory of knowledge.

The second objective stemmed from the awareness that much sociological theory is oversocialized; that widely accepted theories of socialization, learning, culture, knowledge, social order, etc., are misleadingly one-sided, even erroneous, because they pay too little attention to what is known about human biology and psychology. It was by developing a depth sociology of knowledge that I felt this study could contribute to scholarship in general and to sociology in particular.

It was from Piaget's genetic epistemology and Popper and Lorenz's evolutionary epistemology that much of the conceptual framework developed in this study was drawn. They also provided many of the important ideas, arguments and factual data used to flesh out the conceptual framework into the kind of genetic epistemology developed. A genetic epistemology that goes beyond Piaget's because it embraces social knowledge and is not restricted to scientific and logico-mathematical knowledge. It is a genetic epistemology which not only urges that the sociology of knowledge itself become a genetic epistemology but implies that the sociology of knowledge along with the psychology and biology of knowledge constitute genetic epistemology.

The overarching thesis of this dissertation is that all knowledge, even cultural knowledge, is dependent on and strongly influenced by humankind's biology. A key argument presented was that all humans are born with an essentially similar innate learning schema and that this schema has played and continues to play a vital role in the origin and evolution of cultural knowledge. It is because of the existence of this schema and its role in society and culture that I feel this dissertation has a contribution to make. I hope it shows, as did Polanyi in a different way, that we know more than we know we know and that what we do not know we know is actually part of what we do know.

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