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**Animal Consciousness:
A Neuro-Anthropological Perspective**

by

Tracey L. Spack

**A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfilment of
the requirements for the degree of**

(Master of Arts)

Department of Sociology and Anthropology

**Carleton University
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Animal Consciousness:
A Neuro-Anthropological Perspective

submitted by Tracey L. Spack, B.A.
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the degree of Master of Arts

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August 28, 1996

ABSTRACT

Questions pertaining to the nature of consciousness remain highly debateable, with the question of whether or not nonhuman animals are conscious the most controversial of all. However, if we are to understand the evolution of our own consciousness, from where and how it evolved, we must address the question of nonhuman animal consciousness. Using a biogenetic structuralist approach, this thesis examines the roots of various perceptions, attitudes and questions pertaining to nonhuman animal consciousness. It is concluded that consciousness can be ascertained in nonhuman animals through the presence of homologous structures in the brain and central nervous system that are known to mediate consciousness.

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evolution, the ancient semantic origins of consciousness and cross-cultural knowledge. This perspective links consciousness to the functions of the brain and central nervous system in interaction with the external environment.

The most essential methodological tool in this study comes from the theory of evolution. Chapter two will review the question of consciousness within the context of evolutionary thought. The evolutionary processes involved in the production of consciousness will be emphasized. Being consistent with the employed theoretical framework, the evolution of consciousness will be explained in terms of the interaction of the central nervous system with the environment in which the organism lives.

Chapter three will link observations about animals in the field and lab to theoretical claims about nonhuman animal consciousness and the evolution of consciousness. Methods already used in various disciplines will be examined in order to measure their compatibility with the theoretical framework outlined. Questions that will be addressed include: How is consciousness produced? Is spoken language a necessary prerequisite for consciousness? Are animals capable of thought and is thought required for consciousness? Are self-reflection, deception, symbolism, communication and learning

controversial question of all.¹ Yet, if we are to understand the evolution of our own consciousness, from where and how it evolved, we must address the question of nonhuman animal consciousness and try to understand if, and to what extent, it exists. Such a question can not be answered without first attempting to understand what consciousness is and this is precisely where the problem lies.

The problem is that consciousness is a phenomenological concept relating to an individual's experiences and their own experience of self. This experience (to a large degree) can easily be communicated among humans through spoken language and thus it is easy to conclude that humans are in fact conscious. However this experience is very difficult to translate in nonhuman animals with whom we cannot verbally communicate. The only reasonable way to alleviate this problem is to develop objective criteria by which to measure consciousness - without such criteria any claim to understand animal consciousness is rendered mere speculation. One effective way of developing such a model is to provide a structural basis from which questions

¹ Griffin (1976) devised a chart showing the progression from relatively safe to taboo subjects in animal behaviour - consciousness was considered the most taboo of all. Even Konrad Lorenz and Niko Tinbergen, the two leading researchers in animal behaviour, would not address the question of animal consciousness in their studies.

pertaining to nonhuman animal consciousness may be more reasonably considered. Biogenetic structuralism provides this basis and it will be employed in this thesis in attempts to argue for the consciousness of nonhuman animals as a product of the evolutionary process. In order to deal with this issue various problems and questions must be addressed including: What is consciousness? What factors influence our understanding of consciousness? How is consciousness produced within the context of neurophysiology and evolution (is it distinct from, or epiphenomenal to the brain)? And why has our culture historically denied the presence of nonhuman animal consciousness?

This thesis consists of four chapters. In the first chapter the various uses and theories of consciousness that have and are being employed will be reviewed, along with a discussion of the problems involved in defining consciousness. It is suggested that anthropology can better inform this exercise as the definitions of consciousness naturally result from cultural influences that structure the development of our understandings of consciousness. Within this chapter the Cartesian mind-body dualism approach that views consciousness as a product of mind "stuff" will be rejected. A more integrated perspective will be described that is consistent with the information available from physical

evolution, the ancient semantic origins of consciousness and cross-cultural knowledge. This perspective links consciousness to the functions of the brain and central nervous system in interaction with the external environment.

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definitive characters of consciousness?

Various scholars (i.e. Davidson and Noble, 1992 and 1993; Dennett, 1991 and Vandervert, 1995) define consciousness according to specific criteria in order to argue that consciousness is what distinguishes humans from other nonhuman animals - but how do these scholars define their criteria of consciousness? And what are their underlying premises for certain beliefs about consciousness? Chapter four will address how our cultural institutions reinforce our underlying attitudes and beliefs towards nonhuman animals ranging from science's persistent denial of nonhuman animal consciousness to Christianity's reverence for the dog.

CHAPTER 1

HOW IS CONSCIOUSNESS DEFINED?

...every attempt to understand consciousness is itself an expression of consciousness...

Neil Rossman, Consciousness 140

INTRODUCTION

Curtis Smith (1990) distinguishes between a "stipulative" definition and a "real" definition of a concept. A "stipulative" definition, he explains, does not claim to define the essence of a thing as does a "real" definition, only that it will be defined from a certain point of view. Due to the subjective nature of the term, consciousness has always been defined using stipulative definitions to fit the paradigm that the academic discipline (see Baruss, 1990; and Baruss and Moore, 1992) and/or cultural mindset is operating from.

A paradigm, a term first coined by Thomas Kuhn in The Structure of Scientific Revolutions (1970), is used to refer to the dominant theoretical framework or set of assumptions which underlie any particular "science". A paradigm is a historically created and sustained model of reality (Straker, 1985) that conditions the way a scientist thinks, theorizes and interprets experimental observations. Once a paradigm is accepted, it is seldom questioned and as a result at any given time scientists will ignore or bypass information that does not fit within the prevailing paradigm. Sometimes, however,

of passion and therefore provide no behavioral evidence of thought. Utterances, to be conscious, must be appropriate and not made merely out of passion, as dictated by Descartes' "language test" (see Radner and Radner, 1989: Chapter 2).

Critics of Descartes' position argue that evidence of unconscious mental states and the unreliability of introspection discredit his theory (Radner and Radner, 1989; and Churchland, 1983). Furthermore, Descartes attributed all conscious thought to one very complex form of consciousness - thinking about thinking, so to argue that animals do not think one would simply have to argue that they lack introspection. What we know today from current pre- and perinatal research contradicts this. We know that the newborn human baby thinks and is aware but does not, so far as we know, self-reflect (Bower, 1989). Descartes himself declared that he would not think that babies had minds if he had not seen that they grow to be adults (Descartes, 1970:251).

It is clear that Descartes' theories were developed in the context of his time with a definite political agenda. Descartes' theories of the mind-body split arose during a period in time when scientific studies on the body were becoming increasingly important to people doing research in science and medicine. Descartes' mind-body dualism freed religion from the responsibility of

of consciousness is what Jerome Barkow (1989) has termed a "vertical integration" of theoretical constructs. By vertical integration it is meant that all bodies of theory must be consistent with one another. If they contradict each other something must be wrong with one or all of them. For example, if a school of anthropology states that all conscious experience is based in history and culture this would contradict the findings of the neurosciences. If, on the other hand, a school of neuroscience says that all conscious experience is based on computational and linguistic processes then this would contradict what we know about consciousness from the evidence provided in anthropology.

The purpose of this chapter is to review many of the definitions and uses of the term "consciousness" within various academic disciplines and cultural perceptions. This will lead into a biogenetic structuralist understanding of the concept of consciousness, the only theory thus far that incorporates anthropology, psychology, neurology and evolution into the study of consciousness providing the most holistic understanding we have to date.

RENE DESCARTES' CONSCIOUSNESS

René Descartes was the first modern European philosopher to discuss and analyze in depth what it is to be conscious and is thus considered the primary exponent of the conventional concept of consciousness. According to Descartes, consciousness is a uniquely human characteristic that is produced by the mind. The mind was described by Descartes as a special substance that is acquired directly through God.² This substance as it were, is capable of existing on its own and does not require the use of the brain or the central nervous system for its functioning. In fact, all that it requires are thoughts (Radner and Radner, 1989). However, argued Descartes, in order to have thoughts one must be conscious of having those thoughts at the time that they are being thought, so by the very nature of thinking one was conscious. Descartes argued that if you are thinking of *X* then you are conscious of *X* - the two are not separate acts, the only act is the act of thinking of *X* (Radner and Radner, 1989). In a sense, "I think I am conscious, therefore I am conscious" or consciousness equals thought. So if all thinking requires reflection on one's

² The soul, which Descartes equated with mind, was said to be seated in the pineal gland which he believed only humans had - incidentally, it is now known that not only is the pineal gland unrelated to the production of consciousness, but it is present in all animals and in fact in some nonhuman animals it is far more developed than it is in humans (Asimov, 1994:102).

own mental states, then any being that failed to think about its own thinking would fail to think at all - in other words, it would be mindless.

Descartes placed restrictions on possible causal relations, "From where I ask could the effect get its reality from if not the cause? And how could the cause give it to the effect unless it possessed it?" (in Wagner, 1993). According to Descartes, nothing comes from nothing so the reality of an effect must preexist and be communicated by a cause. This effectively rules out causal interaction between the mind and body because the essential difference between the two makes impossible their possession of the same modifications (Wagner, 1993). While Descartes admitted that the mind and body do sometimes interact he also claimed that one can not know how this interaction occurs, nor is it important for one to know this (in Henry, 1993).

Descartes believed that the body was simply a machine made of earth that functions without thought or mental processes. For example, the mind has nothing to do with motion, it is simply a function of the body or machine (Haldane and Ross, 1967). This line of reasoning led Descartes to conclude that language was the only certain sign of thought and thus indicative of a mind hidden in a body (the proverbial "ghost in the machine"). According to Descartes, animal sounds are made solely out

of passion and therefore provide no behavioral evidence of thought. Utterances, to be conscious, must be appropriate and not made merely out of passion, as dictated by Descartes' "language test" (see Radner and Radner, 1989: Chapter 2).

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demonstrating that its facts were consistent with its values. This thinking desacrilized the body so at death dissections and autopsies could be performed. Because the body was only a machine, this resulted in the study of the psyche as separate from physical functions (Rollin, 1989). Descartes' theories were essentially used to justify the growing interest in physiological research being performed on animals (not to mention children, the mentally ill, members of certain disadvantaged socio-economic groups and races) in a time before anaesthesia was invented or well-understood (see Rollin, 1989: 131-133). The idea that animals were simply machines with no feelings, thoughts or capability to experience pain allowed the researchers to continue their work that included live vivisection with a clear conscience.

Descartes' theories of consciousness have been satisfactorily argued against both philosophically (for the most thorough critique see Radner and Radner, 1989) and physiologically (i.e. Asimov, 1994; and Savage, 1977). Furthermore, Descartes' ideas contradict the evolutionary premise that we need the animal mind to place the human mind (see Darwin, 1871; Romanes, 1882; Jerison, 1973, 1985 and 1990; MacLean, 1990; Armstrong, 1990; Griffin, 1984, 1985 and 1992; and Chapter 2 of this thesis).

Despite all this, Cartesian thought can still be

detected within consciousness studies today. While animals have been shown to have more skill than humans in some areas, the fact that they demonstrate none at all in others proved to Descartes via his "action test" (see Radner and Radner, 1989: Chapter 2) that they behave without reason. This conclusion is still held today as the action test has taken the following new forms: 1. To determine whether an animal is acting consciously or mindlessly, alter the conditions so that the behaviour is no longer appropriate; and 2. If the animal does not change its behaviour or adapt it to the new circumstances, then it is concluded that it is acting mindlessly (Radner and Radner, 1989:173). Descartes' influence is further seen today from his role as the originator of the mind/body dualist trend that has plagued consciousness science ever since.

BEHAVIOURISM

Much of the current dissatisfaction with the concept of consciousness stems from the Cartesian belief that the only viable definition of consciousness is in terms of introspective availability which many argue is impossible to ascertain. As a result, this argument has been used to validate the long reign of the behaviourist school within psychology, allowing them to conduct research as though consciousness were not important.

Behaviourism, which until recently predominated in psychological theory and research has, since its inception (see Watson, 1929), tried to avoid making so called "value judgements" (see Rollin, 1989: 100-113 for review). The move to behaviourism was intended as an effort to bring psychology out of the private sphere and into the public sphere. Behaviour was considered to be the proper subject matter for psychology and this implied that concern should be strictly focused on those activities which can be observed (Court, 1984a). It was Watson's intention to broaden psychology to include the study of the mental functioning of animals, children and "disturbed" people. He believed that if they were capable of introspection at all, it was impossible to ascertain because it is unexplainable by the physical world and is therefore not open to scientific investigation. Because researchers no longer had to address the question of consciousness or introspection the result was what Watson had intended - an increased attention being paid to the mental functioning in animals, children and "disturbed" people - but by the same conditions the focus of study was too narrow to gain any sort of satisfactory understanding (Hilgard, 1980).

A secondary effect of behaviourism was the adaptation of those who based their psychology on another philosophy to behaviourism through operationism - simply

COGNITIVE ETHOLOGY

While philosophy currently largely rejects positivism, science concerned with animal behaviour is still conducted within a positivistic framework. In fact, strict behaviourism is most strongly defended by those involved in animal learning studies. Court (1984a:135) maintains the reason for this is that within animal learning studies,

the case for objective rating of behaviour is good and there is no justification for postulating the higher mental processes seen in man. In that setting, the position is entirely logical and appropriate.

Within such an academic climate it is difficult for science to reach a comprehensive understanding of animal mentation. However, the discipline of cognitive ethology has sought to address this very problem.

The discipline of ethology began as the study of animal sounds as communication and has today formed two very general traditions. The first was made famous by Konrad Lorenz (1970) and involves personal interactions between ethologists and their subjects, including the hand-rearing of animals. The second tradition was made famous by Niko Tinbergen (1962) and involves observation of wild animals in their natural habitat. As far as the study of animal communication is concerned, the latter has made the greatest contribution because animals communicate best with one another in situations where

and continual influence in the area of neuroscience concerned with animal studies of brain substrates of behaviour. While developments in neuroscience have made it easy to discount the claims of the classical behaviourists, contemporary behaviourists who have not been opposed to the study of neurobiological substrates of behaviour, remain influential. However, any behaviourist who claims that the animal only behaves and that we cannot imply anything from its behaviour make it impossible to detect consciousness as such a position is inherently dualistic (as Griffin points out 1992:234-236; see also Bunge, 1980). Such a position further denies the fact that all behaviour in higher animals is produced by activities in the nervous system, and therefore ignores entire domains of mental processing. As a result, behaviourism has done little to bring us closer to understanding the mental functioning in either animals or humans.

The emergence of cognitive psychology marked the return of consciousness to the discipline of psychology. Cognitive psychology usually talks about consciousness in terms of beliefs that produce certain emotions and behaviours which have resulting experiences. However, cognitive psychology is not necessarily a conscious psychology. It has merely relaxed the boundaries of behaviourism allowing the consideration of introspection

(Hilgard, 1980:9). Nevertheless, the emergence of cognitive psychology allowed the old problem of consciousness and the brain to resurface, as the mind/brain problem could no longer be ignored as it had during the behaviourist reign (Hilgard, 1980).

COGNITIVE SCIENCE

Cognitive science is an interdisciplinary effort drawing on psychology, computer science, artificial intelligence (AI), neurobiology, linguistics and philosophy. It is functionalist in that it takes the view that people behave according to knowledge made up of symbolic mental representations. Cognition consists of the manipulation of these symbols and psychological phenomena are described in terms of functional processes (Edelman, 1992:13). Such processes allow for the potentiality of interpreting items as symbols in an abstract but well-defined way, according to a set of operational rules. Such a set of rules constitutes what is known as syntax, the exercise of these syntactical rules is a form of computation (Edelman, 1992:13). As such computation is assumed to be unrelated to the structure and the method of development of the nervous system.

Daniel Dennett, one of the more popular proponents of the cognitive science position on consciousness, claims that consciousness is characterized by a sense of

being something. He argues that functionalist accounts can explain the subjective nature of consciousness (Dennett, 1991) however, since functionalist accounts do not deal with intentionality, Dennett has not been able to provide a conclusive argument for that contention (Baruss, 1990).

Essentially, the cognitive scientists have fallen back into the behaviourist trap of trying to describe the mind without the brain. The lack of consideration given to the biological foundations it claims to explain have made it possible for the discipline of cognitive science to argue that a computer could be used to model human cognitive functioning (i.e. Lycan, 1987; and Dennett, 1991).¹ Furthermore, Dennett argues that the only real difference between human and animal thought "lies in humans' ability to use words/sentences to give artificial precision and determinacy to mental contents" (in Clark, 1990:142).

The position put forth by the cognitive scientists has had and continues to have a huge influence within consciousness studies today, as noted by Edelman (1992: 14): "I cannot overemphasize the degree to which these ideas or their variants pervade modern science. They are global and endemic."

¹ This topic is discussed further in Chapter 3.

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the case for objective rating of behaviour is good and there is no justification for postulating the higher mental processes seen in man. In that setting, the position is entirely logical and appropriate.

Within such an academic climate it is difficult for science to reach a comprehensive understanding of animal mentation. However, the discipline of cognitive ethology has sought to address this very problem.

The discipline of ethology began as the study of animal sounds as communication and has today formed two very general traditions. The first was made famous by Konrad Lorenz (1970) and involves personal interactions between ethologists and their subjects, including the hand-rearing of animals. The second tradition was made famous by Niko Tinbergen (1962) and involves observation of wild animals in their natural habitat. As far as the study of animal communication is concerned, the latter has made the greatest contribution because animals communicate best with one another in situations where

their signals have a definite use (see Timberlake, 1993).

Cognitive ethology first developed as a reaction against the behaviourist school which, as argued above, effectively banished both human and nonhuman animal consciousness from scientific respectability. Behaviourism arose when little was known about the functions of the brain and the nervous system but with our present knowledge, the cognitive ethologists argue, it is our responsibility to address the question of nonhuman animal consciousness (Griffin, 1991). While behaviourists are interested in learning, the ethologists are interested in the fact that learning is a change in something. Unlike the study of ethology, cognitive ethology attempted to reach beyond the surface study of animal communication in order to understand the mental processes behind it.

Cognitive ethology is rooted in psychology but uses a lot of material from biology. It is interested in evolutionary and adaptive explanations of behaviour, something psychology has essentially ignored. Donald Griffin, often referred to as the father of cognitive ethology, strongly believes that animals are capable of at least elementary forms of consciousness. He bases this belief on the law of mental continuity. Obtaining food, avoiding predators, seeking mates and raising young, among other things, are all present in the everyday lives

of the brain, with little or no room left for an individual's world of subjective experience which cannot, by its very nature, so it is alleged, be examined objectively.

This creates the intractable problem of either completely abandoning the scientific study of consciousness (as suggested by the behaviourists and eliminative materialists) or treating only those things that can be observably applied to the scientific method as evidence of the existence of consciousness. However, any reductionist position (i.e. behaviourism) is antithetical to the verticle integration approach as it takes only one explanation as key instead of trying to incorporate knowledge from as many sources as possible (see Barkow, 1989:3-5).

The scientific study of consciousness is problematic in that one is faced with the fundamental epistemological problem that consciousness is a phenomenological concept relating to one's experiences and their own experience of self. This can be demonstrated by everyday occurrences within our own culture. For example, scientists continue to search for the "gay gene" that would provide a biological explanation for homosexuality. Western science requires this tangible link to explain why someone would behave in a manner that contradicts scientific reason (based on the assumption that the purpose of sex is for the reproduction of the species). Experience, preference and emotion are therefore rendered meaningless (see

information from current perceptions, memories and anticipations of probable events including the anticipated results of the animals own actions. Making mistakes in judgement and rational decision making can also be adaptable for the animal because learning can result from these mistakes (Griffin, 1991).

Griffin (1985 and 1994) maintains that in dealing with the question of nonhuman animal consciousness it is best to stick to the more elementary forms, i.e. perceptual consciousness, defined as thinking about perceptual objects and events and making rational choices such as choosing actions an animal believes will obtain what it wants or avoid what it dislikes or fears. However, Griffin's focus on the more simple conscious processes of animals has received much criticism. For example, Gordon Gallup (1983) has criticized the cognitive ethologist's position as "providing little conceptual or empirical leverage that can be brought to bear on issues of more complex cognitive processes in animals" (239). Furthermore, Gallup questions the scientific verifiability of such a position:

Griffin's claim that the experience of inter-related mental images promises to be particularly useful as "a working definition" of conscious awareness - leaves one without the faintest idea of how to go about devising an objective test of this capacity in animals (1983:239).

However, neither Donald Griffin nor cognitive ethology as

a discipline have claimed objective scientific verifiability of their information. In fact, in her review of Griffin's edited book Animal Mind-Human Mind Claudia Thompson states:

This book represents the growing general argument that perhaps the scarcity of evidence reflects a failure to examine the right situations in the right ways, rather than a total absence of such processes in animals (1983: 250).

Rather, the cognitive ethologists argue for animal consciousness based on their assumption of the phylogenetic continuity of mind, the idea that even complex processes such as consciousness can be translated into neurological mechanisms and that once these neural correlates are understood different behaviours of different animals can be compared (for suggestions see Griffin's 1982 edited book Animal Mind-Human Mind). Furthermore, cognitive ethology emphasizes the importance of the natural environment to an explanation of mind.

PHENOMENOLOGY

The western scientific bias creates a situation where the problem of consciousness is directly related to the fact that only that which is empirically observable and physically present, is accepted as a valid source of information. According to Baruss (1990:13):

On the basis of such an account, mental phenomena are reducible to, or explained by, observable physical properties and correlates

of the brain, with little or no room left for an individual's world of subjective experience which cannot, by its very nature, so it is alleged, be examined objectively.

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Abramson and Pinkerton, 1995; and Symons, 1995), despite the fact that homosexuality has been shown to vary from species to species (Pattatucci, 1995; and deWaal, 1995), culture to culture (Court, 1984b), individual to individual (Hooker, 1965; and Ford and Beach, 1965) and throughout the life span of an individual (Patterson, 1994).

The phenomenological study of consciousness sees the incorporation of the actual subjective experience of an individual as absolutely necessary to understanding consciousness. Phenomenological accounts of conscious mental acts are always characterized by intentionality as consciousness is always of or about something (i.e. Natsoulas 1992; and Laughlin et al., 1992). Without a phenomenological understanding of consciousness, science remains ignorant of the potential development of states of consciousness, the experiential properties of states of consciousness, and the conditioned limitations of ones' own range of consciousness (Laughlin, 1995:18-19).

Husserl (1859-1938) is one of the first and the best known advocates for a phenomenological foundation to scientific knowledge, arguing for an approach he calls phenomenological reductionism (see Husserl, 1931). Husserl used the term apodicticity to refer to any kind of experience as being real in exactly the way one

experiences it (see Laughlin, 1994).⁴ Apodicticity creates a feeling of absolute certainty within the individual as it is a form of pure, intuitive knowing: "the essential intentionality of my consciousness is not a matter of empirical confirmation; it is an apodictic truth" (Laughlin, 1994:119). Experiences are universal but the ways of describing experience varies cross-culturally as the definition of the experience immediately after it is had is dependent on ones' construction of their experience which is always influenced by the individual's perceived reality. Therefore, apodicticity presents a problem in the defining of consciousness within a western scientific framework as any description of an experience cannot be standardized or empirically measured (Laughlin, 1994).

Likewise, William James (1976) has argued for what he calls a "radical empiricism", an approach to studying consciousness that claims that in order to know the mind one must first experience the mind which necessarily requires inner observation of one's own mental states. Furthermore, since knowledge is generally gleaned from experience, all knowledge within science and elsewhere should be grounded within experience.

A phenomenological approach is necessary to gain a

⁴ This is similar to the Buddhist conception of *dhammas* (Laughlin et al., 1992: 29).

full understanding of consciousness, but it does not come without its problems. For example, in Baruss and Moore's (1992) survey on consciousness and reality, the matching of consciousness and experience is always fuzzy because of the difficulty encountered in trying to represent people's experiences. It is this ambiguity that leads western science away from phenomenological accounts of consciousness as within the prevailing positivistic paradigm they are not considered empirically testable. The preoccupation within western science with what is referred to as "objective" over that which is considered "subjective" is a stereotypical trait of the "monophasic" society in which we live.

"Monophasic societies" are those which disregard experience other than the "normal-waking consciousness", believing that introspection (intuition, meditation, etcetera) is an invalid way of learning about consciousness (see Piaget, 1971b and Lyons, 1986 for examples of monophasic thinking). This is contrasted to "polyphasic societies" which recognize a broad range of states of consciousness which can be informed and/or influenced by such things as dreaming, meditation, psychotropic drugs, rituals, etcetera (Laughlin et al., 1992:293-295). However, all experience, whether had by people in monophasic or polyphasic societies is meaningful as it occurs (Laughlin, 1995). The privacy of experience poses

a large problem for the application of the scientific method to the study of consciousness - namely, because it is monophasic and therefore attempts to apply the "objective" methods of science to the subjective nature of consciousness.

Science is generally understood as a way of empirically testing the accuracy of claims made about the external world, but not the inner world of experience. But as argued by Husserl, James, and biogenetic structuralism all we know about the external world is by means of our inner experience. Scientific methods can be used to explain experience and consciousness, but science, like any other way of knowing, can never produce the total and complete account of anything - to claim that it does is to commit the fallacy of "scientific imperialism". Science follows the same three steps as all other ways of knowing namely, injunction (you want to know "this",); exploration (you do "this" and have the resulting experiences); and communal agreement (talk to others that did "this" and had the same experiences and see how far the experiences and ideas agree) (see Wilber, 1984; or Laughlin et al., 1992:340-341). Therefore, all science can explain is experience and phenomena within one's field of experience and so science, like any other way of knowing, is either necessarily about experience or it can be about nothing at all.

CROSS-CULTURAL DEFINITIONS OF CONSCIOUSNESS

As argued by Nagel (1974), phenomenal experience is necessarily from an individual point of view and so the reality of our experience is, in principle, subjective in nature. In his "What is it Like to be a Bat?" (1974) he argues that when everything that there is to be discovered about neuroscience is discovered we will still never know what it is like to be a bat - what the bat experiences, feels and thinks about. Likewise, although to a lesser extent, the same problem exists in trying to understand the thoughts, feelings and experiences of another human being.

Scientific research tends to ignore the knowledge available in nonwestern societies because of the fact that often alternative knowledge systems deal with human experience which is considered by many western scientists to be outside the scope of scientific inquiry. Instead, the Euro-American conception of consciousness focuses primarily on the role of language in the process of knowledge production, is heavily based in mind-body dualism and is ignorant of the phenomenology of its members, whereas within most other cultures there is no defined separation between consciousness and reality (Laughlin, 1995). However, when the scientific method proves unsatisfactory, more and more we look to alternative knowledge systems to provide us with vital answers

and consequently, we become receptive to a paradigm shift.

Laughlin (1995) documents various cultural beliefs about consciousness and reality. For example, among the Navajo terms like *ahashya* meaning "to be aware" or "to realize", *ntseskees* meaning "thought", *ahani* meaning "concentration", and *ihoosh'aah* meaning "to learn" or "to know" all describe aspects of consciousness without labelling the semantic field connotated in by the English word. These terms that relate to consciousness are associated with the "Holy Wind" that within Navajo cosmology pervades everything (see McNeley, 1981). Consciousness, for the Navajo, resides "within one", it is not permanent or discrete and at death it dissolves into the universal "Holy Wind" of which it has been a part during life (Laughlin, 1995:6).

The word "consciousness" is part of the English language and brings with it a Euro-American cultural and communicative loading (see Winkleman, 1994). Many of the ancient English meanings of consciousness emphasize this notion of knowledge, one thinks and acts with knowledge of what one has done (Winkleman, 1994; and Laughlin, 1995). Baruss (1990) states that the original meaning of consciousness comes from the Latin "*conscientia*" meaning participation in a shared plan. Over the years the meaning has shifted from something in the public domain

to referring to that which is most private and difficult to define (Baruss, 1990: 40; also Toulmin, 1982). In fact, Baruss (1990) maintains that the word consciousness has been transformed into an umbrella term referring not only to private mental events but to a number of topics within psychology. As a result, in English, we use the one word "consciousness" to mean many different things, while within many other languages there could be several different words each describing a different state of consciousness (i.e. in Sanskrit there are 20 different words for aspects of consciousness), some representing concepts with which we in the west are barely familiar (Laughlin, 1995).

Baruss (1990) suggests that, since the original meaning of "consciousness" has been lost, the original term "conscientia" be used to refer to a mutual understanding or joint knowledge of a number of agents in a shared plan (40-41). However, within the Spanish language consciousness is still understood as conscientia, implying a strong moral loading as the basis for the relationship between the individual and the community. In Spanish, both "conscious" and "conscience" share the same word "consciencia" which gives it a moral connotation as it necessarily involves a communal dimension of socially shared knowledge, requiring the capacity to recognize the difference between good and bad and the capacity to be

aware of one's own existence, motivations, sensations, thoughts and surroundings (Winkelman, 1994; Baruss, 1990; and Laughlin, 1995).

The word "conscience" is based on the Indo-European root of consciousness which is *skei*, the extended root from *sek* which means to cut or divide which implies knowing through making differentiations (Winkelman, 1994: 17). This meaning is extended to knowing the difference between right and wrong. Within Christianity "conscience" refers to an internal state whereas "guilt" is used to define one's relations with others (MacKillie, 1984). The Christian view of consciousness refers to an inner voice and since it "commands and forbids" it creates a separation between good and evil and therefore refers to woman's "judgement" of what is good and evil. Consciousness in the Christian sense can only command or forbid because it is personal: "it is an I or an internalized other, probably always to some degree both" (MacKillie, 1984:211). This understanding furthermore corresponds to Freud's view of the super-ego.

Through an analysis of the linguistic origins and definitions of the word consciousness, Winkelman (1994) argues that the concept of consciousness provides evidence of physical, personal, social and interpersonal dimensions. By uniting dictionary definitions and linguistic origins (including Latin, French, English,

Spanish, and German) Winkleman demonstrates that consciousness represents a wide range of denotations ranging from biologically based organismic capabilities (thought and awareness) to a culturally derived reference, learning and experience (self- and social-awareness) to elaborate forms of identity (knowledge and critical awareness) (1994:16). Of particular importance is the strong evidence provided in the semantic meaning of the morpheme *con* which means *with* or *jointly*. Various roots of *con* and *can* (its more commonly used form) are *gn*, *gen* and *gnosis* in English and *kan* and *kann* in German all of which correspond to the Indo-European roots *gflene*, *gflne*, and *gflno* meaning to know and to beget. These roots provide the basis for many words we know today to be related to consciousness: *gnosis*, *generate*, *progeny*, *generative*, *engender*, *cognition*, *recognize*, *know*, *notice*, etc... (Winkleman, 1994: 18) and illustrate the varying degrees of complexity of the meaning of consciousness. The original interpretations of *con* include the ability to learn, study, acquire knowledge, and respond to the environment in a patterned way which is reflected in adaptation. Furthermore, the auxiliary meanings confirm the meaning of *con* as including reference to ability of varying degrees (Winkleman, 1994: 18-19).

Consciousness can therefore be seen as having a

variety of cultural meanings as it has a variety of meanings within various academic disciplines. However, western academic definitions that claim consciousness is reflected in behaviour and therefore requires activity (i.e. Savage, 1977) or that language is definitive of consciousness (i.e. Dennett, 1991) contradict the teachings of the contemplative traditions who take both an analytical and phenomenological approach to consciousness. The contemplative traditions teach that numerous states of consciousness exist in which language is not present but awareness, knowledge and intentionality, which are considered to be universal properties, are still operating (Laughlin, 1995).

While rationalistic definitions of consciousness reflect only a partial range of the phenomena of consciousness, both Hinduism and Buddhism view consciousness within an evolutionary perspective which consistently holds consciousness as adaptive, functional, and a property of all species with brains that allow experience and cognition (Winkleman, 1994). While Christianity maintains that consciousness necessarily requires a soul which most sects believe exists only within humans, the actual term *nephesh*, translated in Genesis 1 as "living soul", is elsewhere applied to animals (Mackay 1984:48). In fact, the Buddhist scripture *Abhidharma*, using a descriptive philosophy not unlike the scientific method,

defines 89 types of consciousness, 52 elements of consciousness and 7 universal elements (see Laughlin et al., 1990: 80-81). The definitions of consciousness provided by the contemplative traditions are far more developed than the dominant western understanding as they go beyond our definitions and understandings of consciousness, including a broader range of experience (see Laughlin et al. 1992; and Kasulis et al., 1993). Despite the fact that many analytical systems of description of consciousness have been developed in Buddhist and other Asian religious and philosophical systems, their knowledge and insight has seldom been incorporated into the perspectives of western science. This is not to say that the contemplative traditions are not without cultural influence, they too have their belief systems heavily shaped by cultural-religious factors as Coan (1987) has shown through a comparison on the psychic development of the east and west based on cultural-religious factors.

What we can learn from the eastern traditions is that while language does play an important role in some levels of human consciousness it is not a necessary condition for conscious experience. To say that it is, is both ethnocentric and Cartesian, rendering all experience without language meaningless despite the fact that humans have rituals that are enacted without the use of words

which serve to convey information pertaining to emotions and cultural realities. Furthermore, such an argument claims that neither human babies nor animals are capable of consciousness which is in direct contradiction with the findings of developmental psychology (see Bower, 1989 and Laughlin, 1991).

MIND-BODY DUALISM

Mind-body dualists argue that conscious states exist in some sense as distinct from physical states. Many cultures are dualistic in their understanding of consciousness due mostly to a lack of knowledge regarding the brain and central nervous system. Laughlin (1995) maintains that mind-body dualism is incorporated within most cultures for three reasons: 1. The Empirical Factor - Because we can see that the stomach and lungs move it is easy to understand that they serve the purposes of digestion and breathing, respectively. Since we cannot witness the activities of the brain it is difficult to see how the brain works (only recently have neuroscientists been able to isolate the functions of neural structures); 2. The Existential Factor - Mind-body dualism allows humans to continue to deny that which is feared by them the most - the inevitability of their own death (see Becker, 1973); and 3. The Ontological Factor - Cultures vary in how they understand their experience

within a world of interacting objects and reality. Consciousness is sometimes understood as an object, ego, or collection of objects and so creates a problem of interpreting the interaction of the body-as-object and consciousness-as-object (13-14).

While the mind-body problem is to some extent common to virtually all cultures, western culture polarizes the mental and physical to such an extreme that it draws even institutional distinctions among scientific disciplines, i.e. the physical as opposed to the life (or social) sciences. Many scholars studying the brain and consciousness have struggled with the problem of how the mind and body interact. For example, Karl Pribram (1977) argues that consciousness and the brain are somehow intimately interwoven, but consciousness cannot simply be a brain state or we would be able to replicate the state in a computer that would be conscious. Multiple aspects of identity, he continues, are therefore really multiple realizations of an ultimately understandable biological process. The intrinsic properties of consciousness are those in which structural properties are embodied. Properties of consciousness have a special relationship to the structural properties: they actualize the structural properties, making possible the realization of the structural properties (Pribram, 1977). Pribram uses the example of a Beethoven symphony which is known by its

structure but must be realized in the notations on sheet music, records, etc... we therefore need paper printing, wire recording, vinyl production etc... to reach the final product which has little to do with the symphony itself but is essential its realization (Pribram, 1977). This transcendence as far as consciousness is concerned is made possible by brain organization (Pribram, 1977).

Eccles (1977a) and Sperry (1977) disagree with Pribram's claims stating that they cannot visualize a brain mechanism that readily transforms nerve impulses into subjective experience. They are therefore faced with the converse problem that experience alters brain structure and function (Pribram, 1977:300). What Eccles and Sperry are doing is defining consciousness as a product of mind that influences the body, an essentially dualistic argument.

Eccles and Sperry base most of their understanding of consciousness on Sperry's split brain experiments (see Sperry, 1984) which they claim demonstrates that consciousness occurs within the "dominant" left hemisphere of the brain for 90% of the population and the "minor" right hemisphere for the remaining 10%. This, they explain, is why when the corpus callosum (the nerve fibres connecting the two hemispheres of the brain) is cut people lose consciousness of things performed by the left side of their body, i.e. things held in their left

hand and things seen with their left eye. This has led Eccles to conclude that:

We can regard the minor hemisphere as having the status of a very superior animal brain. It displays intelligent reactions and primitive learning responses and it has a great many skills, particularly in the spatial and auditory domains, but it gives no conscious experience to the subject. Moreover there is no evidence that this brain has some residual consciousness of its own (1974:2).

Eccles and Sperry believe that the higher nonhuman animals have the brain equivalent of the "minor" hemisphere of the severed human brain, despite the fact that all animals have lateralized brains. Eccles (1974) calls the type of conscious functioning available to this half of the brain consciousness-1 which is simple awareness of an object or thing but not consciousness in the "real" sense. Consciousness-2 involves not just awareness of the object but being conscious of it. So if, as Eccles maintains, consciousness-1 comes from the minor brain and consciousness-2 impinges on and comes from the dominant brain, Eccles is left arguing that consciousness-1 and consciousness-2 are two separate brain processes acting independent of each other, essentially within two different brains.

However, Savage (1977) has shown that when a person sees a drawing, for example, certain waves of neuronal discharge are generated in his or her cortex. These waves have relatively low intensity when the subject is not

conscious of seeing the drawing and relatively high intensity when he or she is conscious of seeing the drawing - *it is the same process only modified*. From this we gather that it is some alteration of the same brain processes that constitutes consciousness-1 that can be identified with consciousness-2. This corresponds to the prefrontosensorial principle outlined in biogenetic structuralism. When one establishes a point of view relative to sensorial events under specific conditions of a cognized distinction between subject and object the sense of distinction may be lost under two conditions. The first is called hypointentionality⁵ which occurs when prefrontal involvement in the conscious network is below a certain point of intentionality so that its intentional functions become relatively inactive - this is experienced as a lack of interest or unawareness of the object. The second, at the other extreme, is called hyperintentionality⁶ which occurs when the involvement of concentration of intentional functions rises above a certain point of intensity and is experienced as a complete engrossment in the object (Laughlin et al., 1992:117-119). Thus we can see that what Eccles has termed consciousness-1 and consciousness-2 are not two

⁵ This corresponds to the Buddhist term *thina-middha* (Laughlin et al., 1992:118).

⁶ This corresponds to the Buddhist term *jhana* or *sanadhi* (Laughlin et al., 1992:118)

separate mental acts but a modification of the same process.

Savage (1977) further challenges Eccles' dualistic view of the mind-body issue, accusing Eccles of being a "Cartesian in disguise" - his conscious-self and pure ego being the equivalent of the Cartesian soul. Eccles' (1977b) responds by stating that Savage has simply misinterpreted and misunderstood his argument although he does continue to insist that consciousness is not a function of the brain but of the "conscious-self". While Savage recognizes that human and animal behaviour is caused by neural processes, every one of which is caused by some physical event, Eccles argues that there is no proof of this and that in order to further our knowledge of consciousness science must gear itself to the search for "the seat" of the conscious-self.

In addition to his blatant epiphenomenalism, Eccles further ignores modern neurobiological evidence that consciousness is a product of genetically inherited structures already present in the nervous system and brain. Thus, he continues to enforce the idea of a separate mental entity that is not only unwarranted by the available data and the existing psychological models, but is consistently inconsistent with the most fundamental ideas of modern science (see Bunge, 1980).

As Baruss (1990) in his comprehensive review of

theories of consciousness maintains, dualists, in their belief that there is a mind which is ontologically distinct from the body, are left defending their beliefs rather than giving a theoretical exposition of consciousness (35). Likewise, James (1976) argues that mind is a process and not a stuff and therefore extraordinary processes can and do arise from matter. Edelman concurs taking the position that "mind is a special kind of process depending on special arrangements of matter" (1992:7). Furthermore, mind-body dualism leaves us unable to explain the evolutionary factors involved in the production of consciousness.

METHODOLOGY: BIOGENETIC STRUCTURALISM

The methodology that will be employed within this thesis is that of biogenetic structuralism which will be used as the basis for analyzing claims for and against animal consciousness in Chapter three.

Biogenetic structuralism is an interdisciplinary approach to the study of consciousness. It is the first method to make an attempt at starting up a dialogue between the disciplines in discussions about consciousness and the brain, it "connects all that we know to a neurophenomenological base" (Ashbrook, 1993: 247), its purpose being "to integrate and synthesize structure, function and psychology into one unified concept of

consciousness" (Dell, 1993:218). Biogenetic structuralism maintains that tools from biology and neurology relating to the question of consciousness should be applied to the presentation of consciousness from philosophy, psychology, and anthropology with consistent findings in order to form as broad and accurate a data base as possible.

Because of its interdisciplinary approach, an important aspect of biogenetic structuralism is that it requires a vertical integration of theoretical assumptions. This concept is referred to by the biogenetic structuralists as the "Rule of Minimal Inclusion" (see Rubinstein and Laughlin, 1984) drawing from Piaget's Genetic Epistemology (1970 and 1972) which argues that of all the different logics available no single logic is strong enough to support the total construction of human knowledge (yet when all are taken together they are not sufficiently coherent with one another to serve as the foundation for human knowledge). This, declares Piaget (1970), is the first reason why formalization alone is not sufficient. The second reason is Gödel's theorem which states that there are limits to formalization as any consistent system sufficiently rich to contain elementary arithmetic cannot prove its own consistency. We must therefore recognize the role and influence of human thought within any system since it is from human

thought that logical systems develop and remain intuitive (12). The third reason is that epistemology sets out to explain knowledge as it actually is within the areas of science and this knowledge is in fact not purely formal. There are many aspects of knowledge and genetic epistemology deals with both the formation and the meaning of knowledge in order to explain its development through time (12) (see also Straker, 1985). The fundamental hypothesis of genetic epistemology is that there is a parallel between the progress made in the logical and rational organization of knowledge and the corresponding formative psychological processes. Piaget believes that this can be shown by looking at human history as far back as prehistoric man, but since such information is less than reliable, we can look instead at the ontological development of children. Biogenetic structuralism, in this sense, draws heavily on Piaget's theories of cognitive development.

Biogenetic structuralism maintains that, there are really only two ways to obtain information about consciousness -directly through introspection and indirectly through inferences based upon the experiential reports of others, experimentation on other beings presumed to be conscious, observation of the physical and symbolic concomitants of consciousness (i.e. aspects of the body or artifacts produced by conscious beings) and so forth (Laughlin, et al., 1992:76).

Biogenetic structuralism, therefore, necessarily requires the incorporation of phenomenology for a comprehensive

understanding of consciousness.

Biogenetic structuralism holds that consciousness is an evolutionary strategy for facilitating control over perception and knowledge and therefore must be understood as directly linked to the structures present in the brain and the central nervous system (Laughlin and d'Aquili, 1974; and Laughlin et al., 1992). So in order to understand the evolution of consciousness we must analyze real neuroanatomical-neurophysiological relationships, i.e. the neural organization of the brain, as the basis for the mental structures considered to be universal (Laughlin et al., 1979:13).

The problem with orthodox structuralist approaches to the study of consciousness is that they take a nonevolutionary approach and make no attempt to discuss the evolution of the capacity for structuring, no attempt to relate crucial events in the evolution of the human species to structural phenomena, and no attempt to explain change in structures from simple to more elaborate forms (Laughlin and d'Aquili, 1974:14).

The major strength of biogenetic structuralism is that it explains many of the cognitive-structural aspects of classical structuralism by placing the structures within the context of brain functions combined with an evolutionary perspective which allows for consideration of the evolution of such cerebral structures (Laughlin

and d'Aquili, 1974:14-15). What further separates biogenetic structuralism from other more orthodox forms of structuralism is that it takes an inductive-deductive and empirical approach to the study of structures. Orthodox structuralism, on the other hand, is deductive in that it starts with an observed behaviour (social) and works its way back to the structure (mental) which is often subjective and unconscious and therefore unverifiable (Laughlin and d'Aquili, 1974:10-13). Therefore, biogenetic structuralism is an attempt to found structuralism on a meaningful physical base (Laughlin and d'Aquili, 1974; and Laughlin et al., 1979).

A crucial tenet within a biogenetic structuralist analysis, and one that is essential to the topic of nonhuman animal consciousness, is that it rejects anthropocentric explanations for any phenomenon. This is because anthropocentric arguments render it impossible in principle to study any phenomenon as existing in any species other than *Homo sapiens* (Laughlin et al., 1979). Such arguments are essentially anti-evolutionary for they make it impossible to study the anlagen of structures and phenomena in modern *Homo sapiens*.

Likewise, biogenetic structuralism rejects any form of mind-body dualism (see also Bunge, 1980) as such a position makes it impossible to both understand consciousness in the context of evolution and within

nonhuman animals. Evidence from the fossil record shows we evolve. The neurosciences that look at the evolution of the brain conclude that consciousness is an act or operation of the nervous system (i.e. Jerison, 1990). The combination of paleobiological and comparative neuropsychological evidence give us the best possible picture of the evolution of consciousness (Jerison 1973, 1985 and 1990; MacLean, 1990; and Donald, 1991). Therefore, as in the view of biogenetic structuralism the mind and brain are essentially two views of the same reality, "mind is how the brain experiences its own functioning and brain provides the structure of the mind" (Laughlin et al., 1992:13). The structure of our experience "is that part of the nervous system mediating experience" (Laughlin, et al., 1992:43).

Biogenetic structuralism maintains that the consciousness of any animal is structurally rooted in its *neurognosis*, a term coined by Laughlin and d'Aquili (1974:83) to mean the inherent knowledge available to cognition in the initial organization of the fetal and infant nervous system (see also Laughlin et al., 1992; and Laughlin, 1991). Neurognostic structures are inherited structures that do not need to be learned. However they can and do develop and thus become more complex as a result of learning. Neurognosis accounts for the universal properties of mind across cultures and

across species.

Biogenetic structuralism is an entrainment theory of consciousness, meaning that consciousness is mediated by a complex and dynamic interconnection among models and other neural networks distributed over often wide expanses of cortical and subcortical tissues. This "conscious network" is an ever changing communication among countless cells that interact in a social manner. The conscious network mediating conscious experience in any moment is the actualization of potential entrainments of the cognized environment. Our nervous system, namely the cerebral cortex, functions to construct models of the world. The totality of these neural networks is the cognized environment and the operational environment is both the real nature of the individual as an organism and the biophysical nature of the organism's external environment. Therefore, such models enable the organism to make sense of the continually changing operational environment through the construction of a cognized environment modelled within our brains (Laughlin and d'Aquili, 1974 and Laughlin et al., 1992).

The only problem encountered with the use of biogenetic structuralism so far is the preexisting limits of our knowledge of the functions of the brain and central nervous system - limits that exist within biology, cognitive psychology, physical anthropology, and

the neurosciences⁷. However, as our knowledge within these fields develops, so too will biogenetic structuralism gain a deeper level of analysis of such questions pertaining to the understanding of consciousness.

SUMMARY

Theories and definitions that have been utilized by psychology, the cognitive sciences and philosophy that require language or any other complex manifestation of consciousness as the only sure sign of consciousness (i.e. Gallup, 1979, 1985; Davidson and Noble, 1992 and 1993; O'Keefe, 1985; Eccles, 1977, 1987; and Brown, 1977) are both anthropocentric and ethnocentric. Anthropology can aid in the understanding of the meaning we ascribe to consciousness by revealing how different cultures code our perceptions of consciousness.

Since most cultures have been shown to place a high value on intuition in consciousness, those who reject the existence of any form of consciousness outside the western monophasic constraints (e.g. Dennett, 1991:3-18) are essentially denying the experienced reality of other cultures, as those who argue that either language or ego awareness is the only true form of consciousness not only misrepresent the meaning of the concept but contradict

⁷ See Ashbrook, 1993; and Dell, 1993; for critiques of biogenetic structuralism and d'Aquili, 1993 for response.

the findings of many contemplative traditions including Hinduism and Buddhism that hold ego-loss as requisite for "higher" states of consciousness (Laughlin et al., 1992: 81). From an entrainment view of consciousness, it makes no sense to define consciousness, or any property of consciousness, upon structures unavailable within the neurognostic repertoire of a species, for to do so treats consciousness as a Cartesian "substance" instead of a highly complex, distributed process of entrainment (Changeau, 1995), and thus makes it impossible to understand either the development or the evolution of consciousness, viewing it instead as a sudden unanticipated appearance within the brain having no preexisting biological anlagen (see Jerison 1973, 1990; MacLean, 1990 on this issue).

Consciousness is a form of awareness and is therefore a process and not a *thing*. This process is changing and continuous, dealing mainly with objects independent of itself, and linked to some degree with volition and decision (Edelman, 1989a). Therefore any definition of consciousness must be viewed in light of the biological functions that produce the experience of consciousness. This demonstrates that in order to have consciousness in any of its disparate forms, one must have, as all animals do, the physiological structures that function to produce consciousness (see MacLean, 1990). Consciousness is a

relationship between the organism and its external environment, a complex neurophysiological structural system based upon semantic functions derived from the organism's reflection on the world (Winkleman, 1994:16). So, as argued by Griffin (1984, 1985, 1991), if we can show that a nonhuman animal is capable of direct ordinary perception of the world then this would indicate that the animal is conscious.

There will always be ways of defining consciousness that limit it to humans but such a practice cannot get at the structures that mediate consciousness because we know that the brains of higher mammals are very similar in their structures and therefore in order to understand the evolutionary processes that produced human and other forms of consciousness such definitions are unproductive. And so to deny consciousness and the study of consciousness in nonhuman animals is, as stated by Griffin (1994:17), "a form of premature pessimism that seriously inhibits investigation".

CHAPTER 2

CONSCIOUSNESS IN EVOLUTION

There are no fundamental differences between man and the higher animals in their mental faculties.

Charles Darwin, The Descent of Man 1871.

EARLY EVOLUTIONARY IDEAS

The study of evolution was first made popular by Charles Darwin with the publication of On The Origin of the Species in 1859. Darwin's theory held that evolution was both gradual and continuous, and that all change was of a quantitative sort, meaning that structures increase or decrease in size but do not experience a change in kind. These structures, as it were, could be combined into further structures via the action of natural selection and could, as a result, form new species. Darwin took a monist approach to the relationship between the mind and body, stating that the brain produced the mind as the liver produced bile. Furthermore, since the brain was material, then so too was its cause - the mind. The source of all change, according to Darwin, was naturalism as opposed to supernaturalism and therefore the differences in quantity (not quality) that characterized evolutionary change was evidence for the presence of consciousness within all animal species. Therefore, if humans were conscious, then necessarily animals must be conscious as well, the only difference being in degree (see Darwin, 1871). Darwin's approach was

mechanistic, meaning that he sought to analyze the part-whole relationship in terms of cause and effect, arguing that the structure of the parts causes or brings about the properties of the whole (Blitz, 1992).

Many of Darwin's contemporaries attempted to address what was missing from his theory - namely, what accounts for qualitative novelty in nature and the sudden unanticipated jumps within the evolutionary line for which no "gradual" progression could be found. Herbert Spencer (1820-1903) outlined three levels of reality: the inorganic, being the inanimate before life; the organic, being the biological domain which included mind; and the superorganic, being the social and ethical domain (Spencer, 1880/1988). The second major distinction made by Spencer was between the subject, self and consciousness and the object, nonself and unconsciousness. Spencer's main dilemma was the question of science versus religion as he noted that religious ideas of one kind or another are "almost universal" and that both science and religion deal with the unknown but science as object and religion as subject (Blitz, 1992: 32). Spencer argued that while feelings correspond to the quantity of mind, intellect corresponds to its complexity of organization and both correlated in the nervous system to the quantity of brain and the complexity of notions in the brain respectively (Spencer, 1870). While Spencer maintained

that there was an association between mind and brain he said the definitive nature of that correspondence is ultimately unknowable and that therefore any reduction of mind to brain is merely at a symbolic level (Blitz, 1992: 33-34).

Alfred Russell Wallace (1823-1913), who also developed a theory of natural selection, supported Darwin's theory of the continuity of mind except where the human brain is concerned. Wallace defended natural selection to the point of excluding all other factors - yet differed with Darwin on the philosophical framework of evolutionary theory as he saw the mind as a qualitative novelty, the source of which was to be found outside of nature. He believed this was the only way to explain the vast differences in size and complexity between the brains of human and nonhuman animals (Ornstein, 1991:40).

Thomas Huxley (1825-1895), also known as "Darwin's Bulldog", argued against Descartes' claim that animals are unconscious automata (see Huxley, 1874). He claimed that Descartes was right in saying that animals are automata because bodily functions and activities are the result of reflexes, but incorrect in stating that they are unconscious because this contradicts Darwin's theory of continuity. If humans are conscious and animals not, then Descartes has created an unexplainable gap between

human and nonhuman animals which can only be explained by supernaturalism - a position that Huxley would not entertain. Huxley maintained that consciousness in humans was subject to variance by degree, the lowest of which correspond to types of consciousness in animals since animals have, though in a less developed way⁸, that part of the brain - the cerebral cortex - that was believed to be the organ of consciousness in humans (Blitz, 1992:38). Huxley adopted a reductionist position believing that the progress of science would eventually reduce the properties of wholes to those of their parts.

Huxley's arguments relating to mind-brain causality were influenced by experiments conducted with decorticalized frogs. These experiments found that decorticalized frogs behaved very much the same way as intact frogs. Based on these findings, Huxley argued that consciousness was produced by molecular motions in the brain and therefore no mind-to-mind brain causality occurred. Consciousness, he concluded, is an accompaniment of the functioning of the brain, not an active agent and therefore there could be no reverse or return action (Blitz, 1992:39).

Like Darwin, George Romanes (1848-1894) took a

⁸ Since animals lacked language, Huxley believed that they were only capable of "trains of feelings" and that this type of consciousness preceded "trains of thought" which were made possible by the development of language in humans (see Huxley, 1874).

naturalistic explanation for human evolution. While both materialism and spiritualism claimed causal interactions between mind and body, material changes causing mental changes and mental changes causing material changes respectively, Romanes rejected both. Instead he embraced the monist position which maintained that mental and physical phenomenon are identical. According to Romanes, if mind could not cause physical change then it was useless in the struggle for existence and would never have been selected for and would therefore never have evolved.

Romanes (1882) believed that natural selection was not sufficient to explain species origination and so developed the theory of physiological selection to supplement Darwin's theory. According to this theory, variations in the reproductive system became conditions for the development of new species, as those not sufficiently "fit" would become infertile.

Self-consciousness, which was considered to be manifested through language and speech and appeared to be limited and unique to humans (see Gallup, 1979 and Houser, 1994 for conflicting findings) created a large gap between human and nonhuman mentation and therefore created yet another problem in applying Darwin's theory of the continuity of mind. In order to rectify this problem, Romanes argued for two types of graduations

between consciousness and self-consciousness which he termed "receptual self-consciousness" in nonhuman animals and infants and "pre-conceptual self-consciousness" in older children. "Receptual self-consciousness" is "practical recognition of self as an active and a feeling agent" and pre-conceptual self-consciousness" is "the introspective recognition of self as an object of knowledge and therefore as a subject" (1888:199-200). In arguing for these graduations Romanes was not required to explain a new property of mind.

Romanes believed that consciousness is the basis of all thought and thought provides the organism with an extended existence (Romanes, 1882:72). Romanes claimed that while it appears that all activities that are indicative of choice seem to infer consciousness, this cannot be proven (1882:70-73). When we see a living organism exerting an intentional choice we assume it must be acting consciously as it must consider alternatives and know possible results. However, Romanes argues that physiology denies that all choice is due to mind:

The only distinction between adjustive movements due to reflex action, and adjustment movements accompanied by mental perception, consists in the former depending on inherited mechanisms within the nervous system being so constructed as to effect particular adjustive movements in response to particular stimulations, while the latter are independent of any such inherited adjustment of special mechanisms to the exigencies of special circumstances (1882:17).

What Romanes is saying is that while mental perception needs the "raw materials" (which are inherited properties) "all mental processes must be regarded as presenting physical counterparts" (71). The raw materials for consciousness must be present for consciousness to occur and they can be found, argued Romanes, at "the rise in consciousness", the same period where nervous adjustments and reflex actions are present (beginning with the coelenterates) and terminates with the earliest appearance of the power of associating ideas (the mollusca) (see chart in preface of Romanes, 1882). This corresponds to what we know today of somatic movements, being the motor expressions of the integrated activity of the supraspinal pathways from the brain and many reflex loops, all being realized through the lower motoneurons. The placement of the interneurons within most of these reflex loops adds to the complexity and versatility of the motor control (Noback et al., 1991:125-126).

Romanes contends that time is an important factor in measuring consciousness. By this he means that we can know that consciousness is occurring by the length of time which the organism takes to respond to the fall of the stimulus and not the complexity of ganglionic action alone. We know by actual measurement that the cerebral hemispheres work slower while undergoing those changes which are accompanied by consciousness than is the case

with the activities of the lower centres and therefore the period of time is notably longer if the stimulus has to be first perceived, than if no perception is required (Romanes, 1882:73-74). For example, when I open the door to let my two cats outside my outdoor cat immediately bolts through the door whereas my indoor cat will stop at the door walking in and out, looking up at me as if to think "Should I go outside? What is out there? Will I like it out there?" Surely I cannot know by simple observation that this is in fact what she is thinking but Romanes would argue that I could know that my cat was consciously contemplating the decision by the amount of time it takes her to decide to go outside (responding to the stimulus) and if I were to measure the speed of her cerebral hemispheres' actions this would likely confirm her conscious contemplation. The first cat who just ran outside without a *thought* was acting on reflex but this reflex had to be learned and therefore the cat had to first be conscious of it. Romanes (1882) concludes that it is the cerebral hemispheres that deal with stimuli which, although simple, are so varied in character that special reflex mechanisms have not yet been set aside to deal with them in one particular way and it is the consequent agitation of these highest nerve centres in dealing with such stimuli that is accompanied by the phenomenon of consciousness.

What Romanes is therefore proposing is that conscious action arises out of reflex which we generally attribute to all animals. As the stimuli to be dealt with becomes more complex and varied so the experience of consciousness becomes more intricate. Furthermore, this conscious experience leads to a "conditioned" reflex in both human and nonhuman animals. The conditioned reflex differs from the ordinary reflex in that the cerebrum is involved, but is not completely essential for a deacebreate animal can still be conditioned although not as specifically (Asimov, 1994:345-346). Therefore,

... ejectively considered, the distinctive element of mind is consciousness, the test of consciousness is the presence of choice, and the evidence of choice is the antecedent uncertainty of adjustive action between two or more alternatives (Romanes, 1888:18).

Furthermore, Romanes maintained (as did Spencer) that the physical basis of mind is the brain and intelligence, as such, is linked to brain size, structure and/or complexity.

While our knowledge of evolution has greatly advanced since the days of Darwin, he can still be accredited for beginning the end of the long reigning philosophical idea that animals and humans were somehow separated by a supernatural cause and for making possible the serious study of animal mentation.

EMERGENT EVOLUTION

For the first part of his career, Llyod Morgan's task was to set out an experiential criteria and a "canon" of interpretation to replace Romanes' anecdotal methodology. Furthermore, Llyod-Morgan attempted to remedy the debate in evolutionary theory between Darwin, Romanes, Wallace, Huxley and Spencer which concerned the continuous or discontinuous character of evolutionary change; the role of quantitative versus qualitative changes in that process; the relation between the organic and the inorganic and the natural versus the supernatural; the mind-body problem; and the restricted or universal scope of the evolutionary process. He believed this could be done by attempting to account for qualitative novelty within a continuous, natural, and universal evolutionary process - the result was the theory of emergent evolution (Blitz, 1992:175).

Blitz' (1992) analysis of emergent evolution identified the following thesis as basic to the theory's philosophy: first, evolution is a process of change which is productive of qualitative novelty in all domains of reality; second, qualitative novelty is the possession by a whole of emergent properties not possessed by any of its parts; and third, reality can be analyzed as a structure of irreducible levels, each level consisting of wholes characterized by a new emergent property (175-

176). Furthermore, emergent evolution is monistic in maintaining the existence of only one type of system component and is pluralistic in identifying the existence of many types of novel properties. These new properties are qualitative novelties that have arisen in the course of evolution (Blitz, 1992).

Because of his desire to incorporate all aspects of the preexisting evolutionary theory into one unified concept, Llyod-Morgan created many problems and contradictions throughout his theory of emergent evolution. For example, he saw the mental and physical as correlated aspects of an underlying substance. Llyod-Morgan defended the monist view of mind-body relations in his writings from 1885-1912, he continued this even after his emergent evolution theory was developed - but he took a panpsychism approach claiming that the psychic was present in all forms. This thinking later led Llyod-Morgan to ask of what use would life be as an intermediate stage in the hierarchy of matter, life and mind, if mind appeared within matter without the concurrence or conditioning of life? Finding no satisfactory answer to this question he changed his position to biopsychism (where mind was associated with all life) which was consistent with the theory of evolutionary continuity yet it was still inconsistent with emergent evolution (Blitz, 1992:104-106). As a result, emergent evolution was used in many

different ways - science used emergent evolution to postulate mind as emergent from life, philosophy in the form of dual aspect monism argued that mind was correlated with life as concomitant aspects of an underlying substance, and religion proposed a transcendent mind or God who was the source of all activity, including evolution itself. Llyod-Morgan again tried to unite these three claims but his conviction blinded him to his own inconsistency (Blitz, 1992:106-107). Qualitative novelty was thus explained as the result of emergent evolution but ultimately Llyod-Morgan explained emergence as theological which was considered unsatisfactory to most evolutionary theorists and as a result his theory quickly lost credibility. It was not until the 1950's that there was a reemergence of interest in emergent evolution particularly within biology, as it ventured to make claims for qualitative novelty and levels of reality.

In the later years of Llyod-Morgan's theory he argued that consciousness was present in mammals and birds and to some degree in amphibians and fish but he made a differentiation as to the kind of consciousness. Animals, he argued, were capable of perceptual consciousness whereas humans were capable of conceptual consciousness. This was due to his belief that while animals could choose and are conscious of choosing, humans could also reflect on their choice and imagine alternatives under

the same or different circumstances. The conceptual consciousness of humans allowed them to make reference to self while animals were not capable of self-consciousness. Self-consciousness was described by Llyod-Morgan (1894:321) as:

First, the conception of the subject as distinguished from the object; secondly, the concentration of the net result of all subjective experience into one generalized concept; and thirdly, the further conception of this net result as due to the determinate working of an activity which is synthetic and selective.

Reason, for Llyod-Morgan, was not just understanding things but also their relations. Reason was characterized by a systematic search for a solution and is contrasted with conceptual inference which is trial and error. Children, he maintained, were at the conceptual inference stage whereas animals have never left it.

Llyod-Morgan claimed three relations between human and nonhuman animal minds: 1. a series of new faculties are added at each level of the phylogenetic scale; 2. the faculties are the same, but increase in power at each level of the phylogenetic scale; and 3. new faculties are added or increased in power, combined with a possible diminution of other faculties (Radner and Radner, 1989: 138-139). As a result of this thinking, Llyod-Morgan developed his famous "canon" which states:

In no case may we interpret an action as the outcome of the exercise of a higher physical faculty, if it can be interpreted as the

outcome of the exercise of one which stands lower in the psychological scale (1894:53).

Roger Sperry, a modern proponent of emergent evolution, used the theory to apply to the workings of the brain and consciousness. Sperry used the term "downward causation", claiming that mental phenomena are not found at the neuronal level but were functions of higher level interactions of complexes of neurons (1969). Sperry argued that evolution complicated the universe with new phenomena, new properties and new forces; as a result, older phenomena, properties and laws are superseded but not "lost or cancelled". In a "Modified Concept of Consciousness" (1969), though Sperry argued that consciousness was a "direct emergent property of cerebral activity" and an "integral component of the brain process", his emphasis was on the "top down control" or "directive holistic form of control" which the mind exercised over the brain (532). Sperry concluded that "in this holistic sense the present proposal may be said to place mind over matter, but not as any disembodied or supernatural agent" (533).

The concept of emergence proposed by Sperry is based on Donald Campbell's (1974) evolutionary psychological theories, but applies to all levels, not just the biological, and emphasizes the quantitative rather than the qualitative nature of the process. Sperry (1980) claimed to have solved the mind-body problem by opting

for mind rather than matter (the brain) as the correct monist position. Despite the fact that Sperry denies the dualist charge, defining himself as a mentalist to explain his philosophy (1980), Sperry's position remains both mildly epiphenomenalist and subtly dualistic because of his claim that mind emerged from the brain and therefore controlled it. Blitz describes Sperry's position as holistic and idealistic rather than purely emergentist (1992:161).

Emergentism can be viewed as an ontological claim about the relation between the properties of the wholes and the properties of their parts in the context of the evolutionary process. Emergentism recognizes the autonomy of lower level processes, which can exist in the absence of higher level ones, and whose laws of operation are independent of those of the higher level (Blitz, 1992: 181). Emergent evolution is non-reductionist in so far as it argues that there is at least one property of the whole not possessed by any of its parts and knowledge of the parts and their relations, while necessary, is not a sufficient condition to understand the whole (Blitz, 1992). Emergentism, according to Bunge (1980), is not opposed to reductionism when reductionism is understood as the attempt to analyze the structure of wholes and to explain their properties in terms of those of their parts. When this fails systematically, the unreduced

properties are taken to be emergent. However, philosophically, emergentists recognize qualitative novelty as the natural result of the evolutionary process, and therefore the world is more complex than the one level admitted by the physicalists (Blitz, 1992:177).

Bunge (1980) maintains that all mental states and processes are states or processes within the central nervous system of the organism. Furthermore, these states and processes are emergent relative to those of the cellular components of the central nervous system - these emergents are properties of systems not possessed by any of their parts. We can therefore conclude that since higher levels are not irrelevant to lower levels, emergence is not epiphenomenal nor does emergence modify the laws of the lower levels, or assume a top down control as proposed by Sperry (1969 and 1980), since this shifts supervenience away from emergentism and skews it towards holism and idealism (Blitz, 1992:162). Furthermore, as maintained by Griffin (1994:16), experience and consciousness are emergent properties that arise when organs and tissues are combined functionally in new ways.

Understanding that the evolution of our consciousness comes out of emergent orders of existence we see that one development allows the possibility for and thus leads to another. Each of these new levels are emergent orders of existence. What is important to remember is

earlier claim (1960) that a child learns about the world by operating on it, it is now known (see Laughlin, 1991) that because of the neurognostic nature of our brains that a version of the world is "already there" for the newborn (Laughlin, 1994:116). Husserl's phenomenological reduction may be interpreted as confirming this by demonstrating that the feeling of certainty is hardwired within the neural network of all animals (see Laughlin, 1994; and Laughlin et al., 1992:25-30). Biogenetic structuralism refers to this as "consciousness apprehending its own neurognosis" (1992:29). Furthermore, this all corresponds to Pribram's (1991) holonomic brain theory which argues that within the brain all species contain a model of the complex, dynamic essentials for survival. Consciousness, according to Pribram's model, is a holonomic world of awareness composed within the skull (Vandervert, 1995:116).

The unilinear method of studying the phylogenetic evolution of species has further proved to be less than satisfactory (Eibl-Eibesfeldt, 1973). While the two main proponents of ethology, Lorenz and Tinbergen, have maintained that animals are pre-programmed in precisely definable ways through phylogenetically evolved adaptation, Eibl-Eibesfeldt argues that when there is a similarity between human and nonhuman animal it is reasonable to investigate whether the homology, or

claims, is adaptive if it develops attributes that fit the environment in which the animal lives (i.e. hopping, flying, walking, burrowing). As the structures and functions become more complex, new organs develop and with the development of some structures others are lost. For example, the parasite protects itself from the same predators as its host is protected from (adaptive) but loses the ability to survive on its own (nonadaptive) (Severtsov, 1990:10). Severtsov defines adaptation as combining both progressive evolution of organs with a regressive phenomenon:

When a certain organ changes progressively, some parts of it that are not adapted to the changed conditions of existence degenerate and are replaced by new characteristics needed under the new conditions. This is what constitutes the process of adaptation (Severtsov, 1990:10).

According to Severtsov (1990), evolution is an evolution of adaptations and is accomplished under the influence of and in correspondence with the environment.

Those who espouse the neo-Darwinian thesis maintain that chance is the only true source of novelty and the only function of change must be adaptation (i.e. Barash, 1982). However, genetic drift pulls away from adaptation showing how many traits are not adaptive and non-purposive and yet play a role in the forming of a new species. Severtsov (1990) calls this general regression. General regression occurs when specific organs degenerate

without being replaced by others with the same or similar function. Furthermore, many genes are pleiotropic (have multiple effects) which goes against the principles of selective adaptation (Darwin called this "laws of correlation" - i.e. blue eyes and white hair meant a cat was deaf).

According to Wesson (1993), the only truly universal evolutionary beliefs are: 1. that there is nothing purposive in evolution; and 2. organisms adapt genetically only by success or failure in leaving descendants. However, today even these contentions are being challenged.

The "adaptationist programme" has received much criticism in recent years as the sole defining force of evolution (see Smith 1982; Gould and Lewontin, 1979; Anderson, 1985; Bargatzky, 1985; and Gould, 1991). The focus on adaptation as the singular purpose and source of evolutionary change was revived by the discipline of sociobiology made popular by Edward Wilson (see Wilson, 1980). Sociobiology, however, is reductionist in its approach to the study of evolution in that it takes all human behaviour, even in its most complex forms, and reduces its function to a merely selective value in the reproduction of the species. For example, sociobiologists claim that culture evolved to maximize reproductive success (Alexander, 1979b). Even altruistic behaviour is reduced to genetic selfishness by sociobiologists.

Alexander (1979b:143) claims that altruistic behaviour only occurs among relatives who contain some of the same genetic material and are therefore worth protecting (see also Ghiselin, 1974). This reductionist approach stems largely from the sociobiologists' ignorance of brain and brain functioning which can be evidenced in the following statement by Ghiselin (1974:263): "We have evolved a nervous system that acts in the interests of our gonads". Such a statement is inconsistent with current findings that show that both human and nonhuman animal sexual preferences are the result of a multitude of factors, some having no apparent adaptive value (see deWaal, 1995; Abramson and Pinkerton, 1995; Wallen, 1995; and Pattatucci, 1995).

Thomas Bargatzky (1985:399), a radical opponent of adaptationism⁹, says we "have to ask ourselves whether this concept has not really outlived its usefulness and should not be abandoned altogether". Bargatzky argues that the only acceptable definition of adaptation is provided by Ashby (1954:57): "a form of behaviour is adaptive if it maintains the essential variables within physiological limits" (in Bargatzky, 1985:400). While rejecting adaptation altogether is an overreaction, Bargatzky presents a convincing argument for limiting its

⁹ See "Comments on Bargatzky's Culture, Environment, and the Ills of Adaptationism" by Mydrene Anderson (1985) for an even more dogmatic rejection of the concept of adaptation.

application. According to Bargatzky, while adaptation suggests a pre-existing world within which problems are presented to its inhabitants, the only way for the organism to solve the problem being through adaptation, we should instead expect to find the coevolution of an organism and its niche as organisms themselves are active in creating niches and therefore actively modifying their environments. This can be seen within ontogeny which will be discussed later.

Stephen Gould (1991) critiques the sociobiological position arguing for what he has termed "exaptation"¹⁰ which he claims "provides a one-line refutation of human sociobiology" (58) as it "is neither rare nor arcane but a dominant feature of evolution" (43). Exaptation is the cooption of useful structures taken from other contexts "for such structures are fit (aptus) not by explicit modelling for (ad) current use, but as a consequence of (ex) properties built for other reasons." (47) There are two types of exaptation as defined by Gould (1991). The first involves features that have evolved by natural selection for one purpose and are coopted for another. This mode of exaptation (also referred to in the

¹⁰ This concept has previously been referred to as "preadaptation" as far back as Darwin (1859) and continues to be used today by other authors in much the same way Gould would have us use "exaptation" (i.e. Vandervert, 1995) despite the fact that Gould argues that he did not coin exaptation as "a mere etymological nicety" (1991:48).

literature as "preadaptation") contradicts the theory that the current function and historical origin are undeniably linked but is not an argument against adaptation per se because the feature is still derived from adaptation, and thus only the use has changed. However, in the second category presently useful traits did not arise as adaptations at all, but are merely side-effects of other features and so the currently useful trait developed for nonadaptive reasons. This second category cannot be explained within Darwinian style adaptationism (Gould, 1991:53-54).

According to Gould (1991), the greatest evidence for exaptation is within the human brain:

I wish to present an argument for regarding the human brain as, *prima facie*, the best available case for predominant exaptation - in other words, for a near certainty that exaptations must greatly exceed adaptations in number and importance (55).

Since most classical adaptations are small immediate adjustments or dead-end specializations and tend to be restrictive with respect to evolutionary innovation, the principal characteristics of human mentality are likely exaptive "as nonselected structural products of a brain grown large for a small set of adaptive reasons" (1991: 59-60). He finds evidence for this in the fact that the primate brain always exceeds other mammals in relative brain size and thus, he claims the "initial enlargement of the brain could not have occurred in the service of

what we now call consciousness" (60). Therefore, he argues that attributes considered unique to our species, and constituting the nature of human consciousness, are likely to be exaptations (1991:61).

The biogenetic structuralist concept of neurognosis is likewise an exaptational concept. Such models inherent in the premature brain are "coopted", in Gould's terms, by a Darwinian like selection for a variety of adaptational configurations¹¹. Therefore, biogenetic structuralism would argue that cognition is the predominant form of exaptation, as Gould acknowledges. This further corresponds to Piaget's "adaptive intelligence" (1971: 257-260). Therefore the evolution of intelligence in Jerison's (1990), Piaget's (1971), Gould's (1991), and biogenetic structuralism's (Laughlin et al., 1992) understanding, is the evolution of flexibility of adaptation and the brain is the most perfect example of adaptation in this sense as its flexibility of structure is used to match function to environmental conditions.

While evolutionary theory still remains largely influenced by the Cartesian and Newtonian simple, mechanical, linear paradigm, there are a growing number of theorists that see evolutionary change as internally as well as externally motivated, following a nonlinear path. Gould and Eldridge (1972) coined the term "stasis-

¹¹ Also see Changeux 1985.

punctuation" to describe the idea that change does not simply flow along a straight, linear path but is interrupted by unanticipated "jumps" within the evolutionary course. Furthermore, chaos theory, which demonstrates how disorder can arise from order, while not an entirely new concept¹⁴, is increasing in prominence within the literature on evolutionary theory (see Ferrière and Fox, 1995; and Van Der Laan and Hogeweg, 1995).

Within a linear system of evolution there are only two possible outcomes of long-term dynamics: either the system remains fixed, or it increases or declines at a determined rate (Ferrière and Fox, 1995:480). However, chaos theory provides evidence that this is in fact not how evolution takes place as small and seemingly insignificant conditions occurring at time t_1 may change the unfoldment in a nonlinear, rapid fashion causing the behaviour to unfold in an unpredictable way at time t_2 (Vandervert, 1995). According to Vandervert (1995), chaos theory demonstrates how the order lying behind a given structure is self-similar as opposed to self-same, and is self-referential across scale and outlook of nature. This means that a normal similarity of patterns repeats itself

¹⁴ For example Sellars, 1944 rejected the linear view of evolution which envisioned an initial creation followed by a universal, directed progression through time as well as the converse view of the imminent depletion of the universe. He proposed instead an ageless universal development towards a fixed and predetermined end, one where life and mind emerged locally and occasionally.

over and over, revealing more and more detail across more and more precise scales of measurement, and the similarity of pattern arising from the structure is from its pre-existing pattern (thus is self-referential). This form arising dynamically from pre-existing form creates an interconnected web or organization (Vandervert, 1995: 108). Self-similar or self-referential jumps occur within the system in a periodic fashion, creating emergent or nonlinear branchings in unfolding chaotic systems. Such a theory when applied to evolutionary theory makes it impossible to predict the course of the evolution of consciousness as one small change in the initial conditions will have unforeseeable results. In fact, Vandervert maintains that "consciousness, thinking, and mind are dynamically interconnected in a seamless web" (1995:119). This also corresponds to Gould's use of the term exaptation, as he maintains that exaptation, with its unpredictable functional shifts and its recruitment of nonadaptive, even invisible structures (e.g. repeated copies of genes providing for future flexibility) produces a cultural history with unanticipated changes in direction, potentially abrupt transitions and no simply derived status of cultural expressions (1991:64).

Chaos theory is further proving useful to the study of developmental psychology (see Cooney and Constatas, 1993; and Howe and Rabinowitz, 1995). Despite Piaget's

earlier claim (1960) that a child learns about the world by operating on it, it is now known (see Laughlin, 1991) that because of the neurognostic nature of our brains that a version of the world is "already there" for the newborn (Laughlin, 1994:116). Husserl's phenomenological reduction may be interpreted as confirming this by demonstrating that the feeling of certainty is hardwired within the neural network of all animals (see Laughlin, 1994; and Laughlin et al., 1992:25-30). Biogenetic structuralism refers to this as "consciousness apprehending its own neurognosis" (1992:29). Furthermore, this all corresponds to Pribram's (1991) holonomic brain theory which argues that within the brain all species contain a model of the complex, dynamic essentials for survival. Consciousness, according to Pribram's model, is a holonomic world of awareness composed within the skull (Vandervert, 1995:116).

The unilinear method of studying the phylogenetic evolution of species has further proved to be less than satisfactory (Eibl-Eibesfeldt, 1973). While the two main proponents of ethology, Lorenz and Tinbergen, have maintained that animals are pre-programmed in precisely definable ways through phylogenetically evolved adaptation, Eibl-Eibesfeldt argues that when there is a similarity between human and nonhuman animal it is reasonable to investigate whether the homology, or

similarity, was shaped by common causal factors. Such an investigation should not be limited by close phylogenetic ties. For example, monogamy is not present in chimpanzees but is among owls and so by studying owls rather than chimpanzees we may come closer to understanding this phenomenon in humans (1972:150-151). In fact, nonlinearity is what development in ontogenesis is all about.

ONTOGENY IN EVOLUTION

In evolutionary studies concern seems to be almost exclusively focused on inherited modifications of organs but equally important (perhaps even more important) in reference to the evolution of consciousness is the existence of non-inherited modifications of organs and modification in the animal's behaviour without any corresponding modification in their organs.

Griffin (1985) argues that it is likely that conscious thought exists in animals given the economic advantages in being able to think of possibilities instead of having preprogrammed responses for any possible situation that may face an animal. Considering that the major problems faced by animals are basically similar (i.e. hunger, sexual desire, fear of injury, attempting to escape from predators, preference for certain types of environments, etc.) and are almost

independent of anatomy or taxonomic position, we cannot presume that only humans and the great apes are likely to be conscious because such an argument would be linking consciousness solely to the animal's phylogenetic position (Griffin, 1985).

So what can be learned about the presence of adaptations that occur within one generation? Such phenomena are obviously not genetically preprogrammed although the capacity for their occurrence is. This capacity is central to what is known as *cognition*, as stated by Laughlin, et al.:

Since the function of a large proportion of neural models is to filter, input, and evaluate information pertaining to the environment and to direct appropriate motor responses to the environment, the notion of neurognosis is intended to denote these neural processes of sensory input, information storage, retrieval, evaluation, and the assignment of appropriate affect and action relative to stimulus - taken together these comprise what we know as cognition, the prime adaptive function of the brain (1979:8-9).

This "cognitive imperative" brings new environmental situations into order with other events and entities modeled in the organisms cognized environment. The cognized environment is the totality of an individual's neural models in space and time, it is the model of the environment as conceived by the organism. This is opposed to the operational environment which is empirically observed, a representation of the physical world as it is (Laughlin and McManus, 1979:13). Thus the cognized

environment is much simpler than the operational environment as it is reduced to make sense within the informational capacity of the nervous system. Behaviour, therefore, is a response to the cognized and not the operational environment, but of course has actual repercussions in the operational environment.

Time is an important factor in the development of what is called cognitive ontogenesis. If changes in structure and functional changes in organs occur within a time frame shorter than the lifespan of the organism then we have a case of cognitive ontogenesis. This occurs when the operational environment as directly perceived by the organism changes and so the cognized environment too must change in order to adapt to these variations. These acquired changes in the organism's cognized environment are not hereditary but are rapid and adaptive responses to changes in the operational environment.

If we break mental activity down into three categories: reflex, instinct, and rational, with reflex and instinct being hereditary and mechanical while rational is not, only the capacity for it is inherited, as the brain structures that mediate rational thought must be present for rationality to occur. Then, according to biogenetic structuralism, since all behaviour is the manifestation of brain function, and all brain function is the activity of brain structure, and all brain struc-

ture develops to some degree under the governance of the genetic code (Laughlin et al., 1979:5), then the ontological development of behaviour cannot be attributed to instinct or reflex as it is not inherited. However, the *ability to behave must be present within the neurostructures of any animal in order for the animal to use the behaviour*. Ontogenesis is therefore the result of the active interaction between the central nervous system and new environmental situations. Therefore, we see that neural structures are not only genetically predisposed but are flexible in adaptation to the environment.

Severtsov (1990), Romanes (1882), Dawkins (1993), Masson and McCarthy (1995), Griffin (1992), and deWaal (1982 and 1986), to name only a few, provide numerous examples of what can be described as cognitive ontogenesis among several types of animals that are faced with sudden changes in their operational environment. For example, in many parts of Africa hunters would hide in the bushes, sneak up on an unsuspecting elephant, and kill it with spears. To avoid their death, the elephants took to grazing in open spaces making it difficult for the hunters to sneak up on them. However, with the invention of guns, being in the open space suddenly became more dangerous and the elephants quickly moved back into densely forested areas where it is difficult to get an easy shot at them with a rifle (this same

behaviour has also been observed among Canadian bison). This is an example of versatile behaviour as the behaviour is changed appropriately to novel situations. As we can see, the changes in the operational environment result in changes within the cognized environment of the animals involved, and therefore is indicative of the development of their neurognostic networks. These changes are adaptive responses within the cognized environment of the animal in order to deal with new situations arising in their operational environment. These responses are evidence of awareness which is most likely an adaptive function of neurophysiological processing that is poorly equipped for exploring itself, but good at exploring aspects of the environment most critical to survival (Laughlin et al., 1979:10). Furthermore, the inventors of the new behaviour will survive, allowing the potential mind to improve itself and enhance mental capabilities. This has led Severtsov (1990) to hypothesize that higher vertebrates are more intelligent than they appear under normal situations, having what he calls a "reserve intelligence". Other studies confirm this. For example, Sisson (1974) in observing green backed herons found that only some will use bait to fish and that those who do will do it repeatedly and even modify the bait by breaking a twig. This behaviour is appropriate but not stereotypical among the herons. Also, Franz deWaal (1986)

has observed that some chimpanzees will conceal their erect penis while approaching a female so as not to alert the dominant male of their intentions. However despite such evidence there are still those who argue that animals perform all of this unconsciously (Kennedy, 1992).

Therefore, as argued in biogenetic structuralism, (Laughlin et al., 1979) ontogeny consists of an initial, genetically determined precursor (neurognosis) to every model as well as a set of constraints inherent in the initial formulation of the model that ultimately affects the organization and complexity of the adult model. The function (i.e. learning) is possible only because the initial genetically determined model is present, but the function is developed as the result of the interaction between such models and the environment. Thus, in ontogeny, the versatility of behaviour causes the neurognostic models to grow, ramify and become more complex. In fact, Llyod-Morgan (1894) has argued that profiting from experience is one of the best indicators of conscious thinking. Piaget's genetic epistemology provides further evidence of this contention.

Piaget's genetic epistemology argues against both the empiricist¹³ and the nativist¹⁴ view that their is

¹³ The empiricist argument claims that there is no construction of new realities, the discovery has always existed and is only new to the individual who makes it (Piaget, 1970:77).

no novelty within reality. According to the genetic epistemologist, knowledge results from continuous construction since in each act of understanding some degree of intention is involved. In development, the passage from one stage to the next is always characterized by the formation of new structures which did not exist before, either in the external world or in the subject's mind:

The central problem of genetic epistemology concerns the mechanisms of this construction of novelties which creates the need for the explanatory factors which we call reflexive abstraction and self-regulation. However, these factors have furnished only global explanations. A great deal of work remains to be done in order to clarify this fundamental process of intellectual creation, which is found at all levels of cognition, from those of earliest childhood to those culminating in the most remarkable of scientific investigations (Piaget, 1970:78).

CONSCIOUSNESS AND THE BRAIN

Phylogenetic evolution in the animal kingdom has been shown to be a continuous, gradually progressing process marked by the occasional evolutionary jump known as "punctuated equilibrium" (see Rensch, 1959; Eldridge and Gould, 1972; Jerison, 1973 and 1985; MacLean, 1990; Armstrong, 1985 and 1990; and Laughlin et al., 1990). Furthermore, chaos theory postulates that these "jumps"

¹⁴ The nativist argument claims that all forms of knowledge are predetermined inside the subject (ibid).

may be the result of some invisible or unpredicted occurrence that arose during the initial creation of a structure. Nonetheless, it has become increasingly obvious that cognitive discontinuities might actually be consistent with, rather than contradictory to, the nature of evolutionary change.

Paleoneurology has shown that patterned changes in structure over time results in patterned changes in function (see Laughlin and d'Aquili, 1974 - Chapters 2 and 3 for a summary; Jerison, 1973; and Holloway, 1969). The evolution of consciousness can therefore be seen as the evolution of the development of the neural structures mediating consciousness as is shown in comparative neurophysiology and paleoneurology (Laughlin et al., 1990:123-124). All mammalian nervous systems operate on the same finite set of principles (i.e., reciprocal inhibition, hierarchial structures, relegation, entrainment, intentionality, prefrontosensorial polarity) and this set is recombined in many ways in order to adapt to the environment (Laughlin et al., 1990:124). These sets of principles are just as applicable to us as they are to any nonhuman animal according to the law of homology which states that similar biological structures produce similar functions (Laughlin et al., 1990:122-124, 350).

Primary consciousness evolved within birds and mammals as a function of newly evolved reentrant brain

structures - the resulting consciousness is a property or capacity conferred on the organism by particular evolved parts of the brain and not by properties of material particles or of the whole brain. Consciousness is therefore a property of morphology or of certain morphological structures in a given phenotype (Edelman, 1989a:262-265). Others have argued against this approach. For example, Brown (1977) states that the ape recognizing himself in the mirror is a "self-awareness, however, in which the self is identified as an object, it is another form of object awareness and not a true awareness of self" (21). However, such an argument does not hold as it is based on a subjective interpretation of the ape's thoughts and furthermore rejects the fact that the ape's brain is equipped with those structures that are known to be involved in the process of self-awareness in humans (Asimov, 1994). Also, Piaget (1960) states that the disposition towards self-consciousness needs to be constructed, as is further evidenced in Gallup's (1979) study in which he demonstrates that self-awareness is a learned process.

Harry Jerison (1973) used the concept of encephalization to describe a major evolutionary shift within animal brains. Encephalization refers to the tendency of the brain to increase in size relative to the body as one moves up the phylogenetic scale, although the

size in structure may remain unrelated to brain function (1990:297). Jerison has further shown that certain parts of the brain have evolved more dramatically than others (1973 and 1990). Jerison's "law of proper mass" states that the more important a neurophysiological process becomes in phylogenesis, the larger will the neurophysiological structures become in relation to the rest of the nervous system (Jerison, 1973, 1985; see also Armstrong 1985, 1990).

It has been documented that the only part of the brain that increased in size proportionately during the tertiary period was the neocortex. Other structures appear not to have changed (Jerison, 1990:300-302). Jerison (1990) has noted that neocorticalization is highly correlated with encephalization (change in total brain size increasing beyond the change in body size). Therefore, Jerison concludes that all things being equal, we should expect that larger species with larger brains would also have more neocortex than in smaller species. Thus the task is to analyze the amount of neocortex relative to the amount expected in species of a given body size and determine how this relative amount has changed over time (Jerison, 1990:297). Thus, Jerison concludes that the sizes of neocortex, paleocortex and hindbrain are positively related to one another independently of the correlation due merely to a general body

size. The correlation shows neocorticalization, but also a reduction in relative amount of paleocortex and hind-brain, "a reduction that can be understood as occurring for the fraction of hindbrain and paleocortex visible in lateral projections of the brain" (1990:299-300). Jerison (1973 and 1990) argues that since the neocortex has been shown to be larger in size one may assume that structures correlated with the neocortex also became larger (1990:300).

Since, as Jerison (1985 and 1990:305-306) has pointed out, the most demanding task that the brain has to carry out is to constitute the internal representation of the world for the animal, those areas of the primate, and most especially hominid cerebral cortex that have developed most dramatically (e.g. the prefrontal cortex) are precisely those known to mediate consciousness and higher cognition. He argued that this excess brain capacity was used to coordinate and fuse sensations into perceptions (sensation is the precursor to mind and present in all animals with a brain). The mental space of perception provides the individual with a model of the environment, or a cognized environment. As indicated by Popper (1978), the evolutionary advantage is that an animal can consider choices in the model as to appropriate actions to take in reality, rather than be limited to trial and error. The ability to choose among alter-

native acts is a manifestation of intelligence, and the awareness of these choices is consciousness as suggested by Romanes (1882) and later Griffin (1985).

According to Allman (1990), as we move up the evolutionary ladder a more extended portion of the brain is devoted to fibre pathways in white matter:

The ancient nontopographic organization has been retained in neocortex in spite of the high degree of topographic order present in many neocortical areas. Even in primary visual cortex, the true receptive field for many neurons is very much larger than the receptive field mapped in conventional studies (273).

Allman argues that the olfactory domain of the cortex as well as the visual cortex is important in identifying consistencies within the environment and storing them for later behavioural responses, i.e. red sweet smelling fruit is good to eat despite wet morning or dry afternoon. Therefore the development of the capacity of the cerebral cortex to extract behaviourally significant consistencies over a broad range of physical conditions fits the general context of vertebrate evolution (1990: 273-274). However, these perceptual mechanisms are metabolically very expensive and highly interdependent (1990:274).

Allman (1990) has shown that the correlation between the relative amount of neocortex to body size is greatest in those mammals with the longest life-span. This, he argues, is probably due to the high energy requirements

of mammals coupled with the different strategies needed for coping with occasional food shortages. Since longer living species tend to have fewer children, there is a higher parental investment (called K-selection) as opposed to R-selection species characterized by a high reproduction rate and a short life span. Food shortages in R-selection species are catastrophic but recovery is quick with improved conditions (Allman, 1990:279).

Allman argues that the expanded neocortex

enables metabolically active, nonhibernating mammals to store the necessary experiences, foraging strategies, and cognitive processes to cope with periods of severe food shortage that will inevitably happen during a long life span (1990:278).

Since large brains have much higher metabolic demands (Krantz, 1968; Armstrong and Bergeron, 1985; and Falk, 1992) mammals must therefore eat both a great deal more than reptiles and on a more regular basis. Since the neocortex works to store the animal's representations of the environment, Allman hypothesizes that the neocortex evolved with these higher metabolic demands in order to ensure a continual localization of food resources (279). The initial period of training required of the neocortical network is manifested, according to Allman (1990) in infant play behaviour, a time during which the developing infant's energy requirements are provided by its mother's milk, hence the K-selection reproduction strategy (see also MacLean, 1985).

implying that this preference is innate. However, these birds are not completely constrained by these innate preferences as Marler (1993) has shown there are distinctions in song between individuals indicating that these innate influences are in no way fixed. Furthermore, male sparrows deafened early in life develop abnormal songs with little or no structure although certain basic species-specific patterns are still identifiable (Marler, 1993). This demonstrates that it is unlikely that there is any internal brain circuitry that makes memorized songs directly accessible to guide motor development because in order for a memorized song to be transformed into a produced song the bird must be able to hear its own voice (Marler, 1993). Instinctual influences can be seen throughout the ontological development of bird song:

Ontogeny is guided by sensory feedback from motor activity, with referral of this feedback to templates with specifications that can be supplemented, modified, or overridden by experience (Marler, 1993:466).

Considering that all learning involves some instinct and all instinct involves some learning, it makes no sense to argue, as some theorists have done (see Griffin 1992:254-258), that only learned mental or physical operations may be conscious. It is the developmental possibilities of neurognosis that makes the cognized environment of animals adaptively flexible and it is highly unlikely that a totally rigid neurognostic

Allman's hypothesis corresponds to a study conducted by Murphy, et al. (1984), which demonstrated that hamsters deprived from birth of a neocortex still exhibited normal hamster typical behaviour patterns despite the belief that the neocortex is required for such behaviours. However, when deprived of the midline limbic structures the hamsters were lacking in maternal behaviour. Furthermore, Murphy et al. point out that lesions of certain parts of the striatal complex interferes with social display behaviour in species as diverse as lizards to monkeys. They conclude from this study that the foremost developments in the evolution from reptiles to mammals was the organization of nursing and maternal care of offspring and play behaviour.

Within an individual's neurognostic repertoire any organism has the capacity to model any environment but the actual environment encourages a set of models to grow and ramify and become more complex in structure and function. However, most earlier structures and functions are retained and thus the common basic design of brains and nervous systems across phyla remains the same. Thus consciousness as a form of brain processing is phylogenetically very old, and the human brain can be viewed as carrying in it a "triune" paleontology of consciousness that involves that of reptiles, prehomimid mammals, and humans (MacLean, 1990; also Joseph, 1993). For example,

Allman (1990) has shown the similarities in number and organization of cortical visual areas in old and new world monkeys indicates that the basic pattern for simian visual cortex was established before the separation of these lines approximately 40 million years ago. These primary visual areas can further be homologized in different orders of mammals indicating a much more ancient development.

Neocorticalization trends indicate that later evolved species have more neocortex than earlier species as opposed to other brain structures which have largely remained unchanged, i.e. the olfactory bulbs which have remained a stable feature throughout 60 million years of evolution (Jerison, 1990). Neocorticalization then is correlated with survival of the species, it is a progressive trait and is a general trend among all mammals, as Jerison states:

The evolution of the neocortex may then be thought of as the evolution of different ways of knowing the real world, or, more precisely, of constructing a real world (1990:306).

Therefore, higher cognition owes its development to the evolution of complex neural reorganization and thus the subsequent increase in brain size can only be seen as an elaboration of previously existing neural structures (Laughlin and McManus, 1974:19), as indicated by cognitive ontogenesis described earlier. Furthermore, neural reorganization is not tied to brain size but is an

adaptation to an altered environment. Jerison (1973) says that we should expect that various adaptations to the environment are possible with the evolution of appropriate structures and functions (81).

So as we can now see, any organism's reality (meaning the operational environment) is translated into experienced reality (meaning the cognized environment) by sensorimotor systems and the brain which work to translate environmental codes into neural codes - this is the most demanding work the brain does, requiring large amounts of brain tissue (Jerison, 1985). Since these patterns of neuro-psychological development of the individual change and develop during the individuals life course,

any single observation, any momentary experience or perception, is generated by neural organizations that have been influenced by the evolution of the species, the development of the individual, and the forces of social conditioning (Laughlin et al., 1992:337).

Humans are further influenced in this way by the sociogenetic conditioning of paradigmatic views of the operational environment (Laughlin et al., 1992:337).

SUMMARY

Arguments for the existence of human or nonhuman animal consciousness that operate outside of an evolutionary framework are of no relevance to scientific inquiry. Anti-evolutionary contentions have no

theoretical, methodological, or empirical basis from which to study nonhuman animal consciousness and furthermore they reject or ignore the basis of all current biological and neurophysiological knowledge of the brain and central nervous system.

The evidence provided in this chapter has demonstrated that by the very nature of our own consciousness, consciousness must also be present to some degree in nonhuman animals. With our modern understanding of neurobiology we know that if the neural structure is there, then so must be the function of that structure. We know from the research conducted by MacLean (1990) that what Romanes suspected is in fact true - that the raw materials for consciousness are present in our limbic system and they function with the more highly developed parts of the brain to produce consciousness. And from the lawful conservatism we find in phylogenesis we know that nature retains physiological structures that prove adaptive and so we find similar structures, and therefore functions, in widely disparate phyla as evidenced by Paul MacLean's (1990) triune brain theory of evolution.

Due to the remarkable similarities in the structures of nervous systems throughout the animal kingdom it is pointless any longer to ignore the question of nonhuman animal consciousness. If one were to argue that consciousness could somehow be separated from the

evolutionary process, they would have to develop a whole new set of physical laws to explain its sudden appearance and there is thus far evidence that requires such a saltative leap.

CHAPTER 3

A BIOGENETIC STRUCTURALIST ANALYSIS OF QUESTIONS PERTAINING TO ANIMAL CONSCIOUSNESS

Scientific humility suggests that complete understanding of other animals may be impossible. But we will come far closer if we do not begin by insisting that we already know more than we do about what characteristics they do not have.

- Moussaieff Masson and McCarthy When Elephants Weep 1995.

IS LEARNING A REQUIREMENT FOR CONSCIOUSNESS?

Many researchers argue that in order for consciousness to be present there must be evidence of learning, because if an animal cannot learn then they are merely acting on mechanical and instinctual reflexes. It is true that much nonhuman animal (and human) behaviour does appear to be the result of instinct-like processes as behaviour can be observed occurring in situations where it is no longer appropriate (i.e. domesticated dogs unsuccessfully burying bones) and occurring even when the animal is reared in complete isolation of their natural environment. Humans do this as well, for example Eibl-Eibesfeldt (1974) has shown that a blind and deaf newborn human baby will still cry, crease their brow and stamp their feet when angry. These same children develop fundamental social attitudes, i.e. fear and hostility towards strangers. But does this mean that such behaviour is the mechanical workings of instinct and instinct alone?

The problem is that much of the literature on animal behaviour tends to be highly dichotomized with the

researcher either taking the position of behaviour as a result of learning or behaviour as a result of instinct. However, from a biogenetic structural perspective, all learning, by any species, involves the development and transformation of neurognostic models. The fact that many organisms, particularly in infancy, are responsive to specific principle stimuli during socialization as well as with their physical environments when they first encounter them, indicates the presence of certain innate brain mechanisms that respond to certain kinds of stimulation. Therefore, all learning is based upon genetically predisposed structures which grow, ramify and become more complex in structure and function throughout the organism's life. In fact, the initial organization of neural models, the course of their development and the patterns of interaction are all neurognostic in nature (see Laughlin et al., 1992:Chapter 2).

Research conducted by Peter Marler (1993) on bird song supports this position. Marler argues for what he calls the "instinct to learn" which involves the presence of innate mechanisms which provide the mental capacity to enable and direct the learning processes (1993:455). Bird song, he argues is productive and logical and yet it is also a learned behaviour. Marler has shown that swamp and song sparrows, even when reared in total isolation, will express a preference for their own type of song, thus

implying that this preference is innate. However, these birds are not completely constrained by these innate preferences as Marler (1993) has shown there are distinctions in song between individuals indicating that these innate influences are in no way fixed. Furthermore, male sparrows deafened early in life develop abnormal songs with little or no structure although certain basic species-specific patterns are still identifiable (Marler, 1993). This demonstrates that it is unlikely that there is any internal brain circuitry that makes memorized songs directly accessible to guide motor development because in order for a memorized song to be transformed into a produced song the bird must be able to hear its own voice (Marler, 1993). Instinctual influences can be seen throughout the ontological development of bird song:

Ontogeny is guided by sensory feedback from motor activity, with referral of this feedback to templates with specifications that can be supplemented, modified, or overridden by experience (Marler, 1993:466).

Considering that all learning involves some instinct and all instinct involves some learning, it makes no sense to argue, as some theorists have done (see Griffin 1992:254-258), that only learned mental or physical operations may be conscious. It is the developmental possibilities of neurognosis that makes the cognized environment of animals adaptively flexible and it is highly unlikely that a totally rigid neurognostic

structure exists within any animal (Bonner, 1980). Therefore the structures mediating consciousness have both learned and instinctual properties. The earlier a neural network emerges in ontogenesis, the more important will be the role of genetic information, and the less important the role of environmental information in forming this network (Laughlin et al., 1992:44). While the brain has the ability to create new synapses with experience, it loses to a large degree the ability to support them metabolically with increased age (Greenough, 1993).

It is through the inherited neurognostic structure of experience that universal functions of the mind are accounted for. Thus Marler concludes that "the instincts to learn" can offer those involved in the study of animal behaviour opportunities to identify the ways in which both physiological and neuroanatomical changes can affect the process of learning a new behaviour (Marler, 1993: 477).

DO NONHUMAN ANIMALS HAVE CULTURE?

Culture, like consciousness, is a term which has a countless number of definitions, in fact Robert Lowie declared that culture "can be explained only in terms of itself" (1988:127). This has made it easy for some to argue that culture, as it is an easily observable phenomenon among humans, is what makes humans unique in terms

of mental functioning. This belief continues even today. For example, Vandervert (1995:116) gives the following definition of mind:

...one's collection of culturally shareable mental-model circuitry configurations in the brain. Mind thus began with cultural evolution, perhaps with *Homo habilis* some two million years ago, and continues to evolve in both its composition and nature.

To which he adds, "lower animals are conscious, but since they do not have culture they likewise do not have appreciable minds" (116).

Conversely, many researchers have argued that animals do have culture. For example, Moussaieff Masson and McCarthy (1995) maintain that animals have culture based on their ability to learn from each other; "it is transmitted by *learning*, that is by *culture*" (41; italics added). Dawkins (1993) maintains that there is more to culture than just *simple* learning, the learning in order to be culture must be social, *nongenetic* learning, meaning that information must be passed from individual to individual solely through observation. However, as argued earlier, there can be no nongenetic learning as all learning is a development of genetically predisposed neurognostic models and processes.

I will not attempt to provide a review of the various theories and definitions of culture¹⁵ as such an

¹⁵ For a review on various definitions of culture see Keesing, 1974.

undertaking is far outside the scope of this paper (likely requiring volumes). However, the biogenetic structuralist view of culture as "how symbols operate neurocognitively to canalize meaning, and how meaning becomes expressed, even enshrined in symbols" (Laughlin et. al, 1990:xv) is used here. Ritualized behaviour is therefore a cultural behaviour as it is dependent on the transfer of information through symbolic means. In this sense we may argue that animals do have culture.

Ritualized behaviour has been observed among various animal species, some of the most convincing claims coming from our closest relatives, the chimpanzees (see Goodall, 1986; and deWaal, 1982). For example, Jane Goodall has witnessed what she has termed the rain dance among chimpanzees (Goodall, 1971). The rain dance incorporates what Laughlin and McManus (1979:101) consider to be the elements to look for when studying cross-species ritual including allelomimetic arousal, alternating sympathetic-parasympathetic tuning, fixed action elements, synchronized and repetitive action and role differentiation.

Ritualized behaviour has also been observed among other more phylogenetically dissimilar animals. For example, Schenkel (1967) made the following observations while watching a pack of wolves at the Whipsnade Zoo in England:

After rising in the morning the leader of the pack walked around sniffing the soil. Some-

where he stopped and dug out a big bone. He seized it and passed, the bone in his jaws, near the pack in 'proud' gait with his tail up. Now the other wolves rose, surrounded the leader, and joined in a begging ceremony. The leader first growled and continued his walk, then he dropped the bone and left it. The others surrounded the bone for an instant, and then left the spot. Obviously the begging-for-food-scene was not a real but symbolic one. The bone was only a requisite for the leader and the pack to join in a ceremony of harmonic social integration (321).

Schenkel argues that such organized ritual behaviour is needed to reenforce the submissive-dominant roles within wolf packs, allowing harmonious social integration to take place and thus the survival of the pack.

Boesh et al. (1994) have shown that nut-cracking behaviour, once thought to be typical for most West African chimps, is in reality restricted to a very small area within the evergreen forest perimeter of the Ivory Coast. Their study demonstrates that neither the density of chimpanzee population, nut-producing trees, anvils and hammers, nor the type of forest can account for this phenomenon. The authors conclude that this is most likely cultural behaviour as the nut-cracking behaviour has irregular and unpredictable distribution patterns similar to those of human culture. Furthermore, Osamu Sakura (1989), in studying the relationship between calling and grooming in three troops of Japanese Macquaes, argues for the presence of "cultural drift". Sakura noted that "girneys" and "coos" were vocalized only immediately

before grooming contacts and that grooming contacts following these contact calls lasted longer than those without contact calls regardless of whether the call was given by the groomer or the groomee. In one troop contact calls were uttered frequently by the groomers whereas they were uttered mostly by groomees in the other two troops. Furthermore, contact calls were used more often between nonrelatives within two of the troops and were directed from the subordinate to the dominant animals in one troop.

Mundinger (1980) has done a review of the evidence that suggests that animal traditions are phylogenetically widespread, appearing in all major vertebrate classes and in the insecta. Mundinger claims that some but not all of these traditions fit a definition of culture, and that the evidence further indicates that the cultural traditions of some avian and mammalian species may constitute complex cultural systems (183). Mundinger (1980:187) defines tradition as:

a learned behaviour complex shared by individuals in a population of organisms, with that behaviour complex appearing in the population generation after generation and persisting in the behavioural repertoire of individual organisms following removal from, or of, the immediate learning situation. In addition, two different criteria can be applied to identify, as traditions, animal behaviours described in the literature: 1. evidence that a particular behaviour is passed on from generation to generation by learning and/or 2. evidence that different forms of a modifiable behaviour characterize different populations of a species.

Tradition differs from culture which, after reviewing various "partisan" definitions (189-191), Mundinger defines as:

Culture is behaviour. It should be defined behaviourally, that is, in terms of behaviour patterns and/or their codes. A purely behavioural definition not only retains the extra-somatic context (i.e. culture is then viewed in relation to other nonorganic ideas, entities and the like) but it also provides a broad nonpartisan definition. In contrast, a partisan definition making culture the sole prerogative of humankind is restrictive, artificially prohibiting a search for culture elsewhere and blocking a full understanding and appreciation of the concept (1980:191).

Mundinger argues against the claim made by some that culture is only a behavioural adaptation (i.e. Rappaport, 1968; and Alexander, 1979). Such a position posits natural selection as the major selection mechanism affecting culture change instead of addressing the active role of the individual on their environment (see Bargatzky, 1985). Mundinger maintains that it is wrong to argue that culture is specific to humans as this introduces a somatic context, for culture is then viewed in relation to an organism (Mundinger, 1980:191).

However, it is pointless to argue for the existence of culture or consciousness based solely on behavioural observation because behaviour is a product of cognition and therefore just a manifestation of universal neural structures. Behaviour in itself is not universal, to assume that it is requires that surface structures are illusory, varying from species to species or from society

to society (or even from individual to individual) in space and time. Therefore any analysis that relies on surface phenomena such as behaviour are unreliable in studying universal brain processes (Laughlin and d'Aquili, 1974; Laughlin et al., 1992). Since the major ontological assumption of biogenetic structuralism is that there exists no reality intervening between the central nervous system and the environment, behaviour is therefore the synthesis derived from the dialectic between the brain and the environment (Laughlin and d'Aquili, 1974; and Laughlin et al., 1979 and 1992). Therefore, as argued by the authors of Biogenetic Structuralism, philosophy's mind, psychology's personality, anthropology's culture, and sociology's society are all referring to patterns abstracted from behavioural equivalents of internal brain processes (Laughlin and d'Aquili, 1974:11-12). Furthermore, Piaget (1971a) argues that any behaviour may be generated by two or more structures. This presents a problem when one tries to argue for the existence of consciousness (or culture) on the basis of behavioral observation as it creates more questions than it can answer, as one theory may argue that a certain behaviour requires consciousness and another may argue that it simply requires rote learning (an argument used by Terrace, 1985 against the conscious nature of ape communication). Therefore the only

convincing argument for the presence of culture in animals must be explained on the basis of neurocognitive origins. The neurocognitive organization of the neural network provides this basis for the universal features of mind and therefore culture (Laughlin and d'Aquili, 1974, see especially Chapter 5). Without this basis there will always be those researchers who argue that culture is not present among animals, but only "tradition" (e.g. Galef, 1992) or imitation (e.g. Heyes, 1993).

IS LANGUAGE REQUIRED FOR CONSCIOUSNESS?

The ability to use spoken language is perhaps the most widely used argument for the presence of consciousness in humans and not in nonhuman animals. The language requirement is a legacy that began with Descartes and his "language test" (see Radner and Radner, 1989) and is still being applied today. There are only two ways for an animal to pass Descartes' language test: either by learning a human language or by employing their own natural communication systems in a way in which they may be understood by us. Descartes believed that animals would never pass this test:

Nor should we think, like some of the ancients, that the beasts speak, although we do not understand their language. For if it were true, then since they have many organs that correspond to ours, they could make themselves understood by us as well as by their fellows (Descartes, 1955:117).

Upon initial reflection, such a statement sounds anthropocentric and absurd. Why should the onus be placed on the animal to learn a human language or to make itself understood by us? However, the language test continues to be used today as researchers interested in animal communication inevitably employ one of two methods in their studies: try to teach the animal a human language or examine their natural communication for possible resemblances to human language (i.e. syntax, representative function, etc.).

APE LANGUAGE RESEARCH

In order to test whether or not nonhuman animals were capable of learning a human language, many researchers became involved in "ape language research". It was presumed that the most likely candidates to learn a human language would be the great apes because of their phylogenetic similarity to humans. Initially, the ape language research attempted to teach chimpanzees how to "speak" English. The most famous study of this sort was conducted by the Hayeses (1951) with a young female chimpanzee named Vicki. As a result of their research, Vicki managed to learn only a few words and uttered them with great difficulty. It was quickly realized that the lack of success in teaching Vicki how to speak did not imply that the apes were incapable of language, as their inability to speak, at least at a basic level, is the result of

slight difference between the human and animal vocal tracts and the chimpanzees' inability to duplicate certain vowel sounds with their tongue (Asimov, 1994:343-345). As a result, the spoken language research was abandoned and replaced with teaching the apes how to communicate using ASL (American Sign Language).

The best known study of this sort was conducted by the Gardners with a female chimp named Washoe (1969). The success of this study led to many others, some of the most well-known being Patterson's work with Koko, a female lowland gorilla who learned over 500 words in ASL (Vessels, 1985); Terrace's (1979) work with Nim, a male chimpanzee; Savage-Rumbaugh's (1980) work with Sherman and Austin, two chimpanzees who were taught to communicate with a lexigram, a language made up of geometrical configurations on a keyboard which required the construction of sentences; and Premack (1976), who used plastic chips that could be arranged to form statements, commands or questions to teach Sarah, another chimpanzee, how to communicate.

Many advances were made within these studies that called into question the generally held belief that humans alone were capable of language. For example, Premack's chimpanzee, Sara, was able to learn how to ascribe the same properties (red, round, stemmed) to the symbol for apple (a blue triangle) to the actual apple

production at the expense of swallowing and respiration:

Indeed our teeth have become so crowded because of the reduction of the length of the body of the mandible and maxilla that we suffer the risk of serious infection and death due to impaction of teeth (166).

Also, Holly Smith (1986) and Tim Bromerge (1985), have shown that the age of death for *Australopithicus* is better estimated using information about tooth development in apes instead of humans. So, we can see through examining the structure of the hominid jaws and teeth that capacity for spoken language was probably not yet present in *Australopithicus*. It may therefore be concluded that human language did not evolve until after cortical reorganization of the brain which now may be understood as having occurred after the large increase in brain size with *Homo habilus*.

Humans communicate in a number of ways, and language is but one of these methods. The gestural repertoire of deaf and mute humans are similar to those observed in hearing and speaking humans and furthermore deaf children have been shown to be significantly less delayed in development than blind children (Piaget, 1960 and Eibl-Eibesfeldt, 1974). Furthermore, as shown by MacLean (1990), it is the protoreptilian and paleomammalian brains, rather than the neocortex, that play the basic roles in paleomentation which includes protomentation and emotional mentation, both of which are involved in the

as a fruitless endeavour.

However, as argued by Savage-Rumbaugh et al. (1985), the apes involved in the language research were being taught according to what the researcher assumed that they would want to learn (i.e. what children talk about) and since apes are very good at using symbols to communicate, the direction of the research automatically shifted to the ape's syntactic capacities. This, was indeed unfortunate because "it equated language with the ability to produce complex structurally correct sentences, a feat that seems to be beyond the ape's capacity" (653).

Another problem that occurred among most of the ape language research was that the apes were first taught to produce symbols and then taught their meaning, whereas children are taught to understand and then produce. While the ape language research has done a lot to further our knowledge about the nature of the pongae mind, we must divorce ourselves from such antiquated methods as those suggested by Descartes' language test and work instead towards determining the effectiveness of an animal's communication system used under appropriate circumstances. To do this we must assess them according to their expression within the animal's own world, not ours - this is, in effect, what Savage-Rumbaugh attempted to do with Kanzi, a young male bonobo.

Studies have shown that bonobos (also called pygmy

chimpanzees) possess a larger and more flexible gestural and vocal repertoire than the common chimpanzee and furthermore, they frequently engage in patterns of eye contact that are more human in form than the common chimpanzee (Savage-Rumbaugh and Lewin, 1994). Savage-Rumbaugh's research with Kanzi was ground-breaking in that Kanzi spontaneously learned how to communicate using a lexigram by watching the researchers teach his mother. Kanzi was able to understand the meaning of the word before the symbol and subsequently signed many things that were not requests and furthermore, communicated outside the scope of what was considered to be normal chimpanzee communication topics - i.e. places he wished to visit, demonstrating the property of displacement (Savage-Rumbaugh and Lewin, 1994).

THE AUDIENCE EFFECT

The inference of consciousness from communication via the "audience effect" is a commonly used argument (i.e. Griffin 1985, and 1994). Such arguments state that if Groans of Pain (GOP), instinctive like reflex - i.e. batting an eye, are assumed to result solely from the internal, emotional or physiological state of the animal, then they should occur whether another animal is present or not. Various studies have shown that the GOP of animals as diverse as chickens (Marler et al., 1991) and chimpanzees (Gardner, Gardner and Van Cantfort, 1989) are

wholly dependent on whether or not there is another animal present and are further modified when responded to. These findings are not surprising considering the social nature of many different types of animals which would require some form of communication system in order to adapt and live within their given environment. Thus, much of the social communication of animals is difficult to pass off as a GOP. It is instead actual communication. For example, Emil Menzel (1975) has demonstrated the ability of chimpanzees to communicate what is important to them in the wild. In Menzel's experiment he showed a hidden object to one of a group of chimpanzees. When the lone chimpanzee was returned to the group he was able to communicate the presence, direction, rough location and degree of desirability of the hidden goal to the group.

Up until the 1960s the commonly held view of animal communication was that it was affective - meaning that it conveyed the emotional or motivational state of the signaller and nothing more. Signals that refer to something other than the animal's affective state are called "semantic" (Cheney and Seyfarth) or "symbolic" (Marler) and syntax is used in ethology to refer to any system of rules that allows one to predict sequences of signals (Snowdon, 1982:231). According to Griffin (1994: 2), if animals experience simple conscious thoughts and feelings, then it is likely that they are sometimes

communicated to others. This he believes is a promising approach to the investigation of animal mentality "namely the use of their communicative signals as evidence of their mental experience".

Irene Pepperberg (1991) trained an African grey parrot named Alex to speak in English to request, refuse, identify and categorize objects that seem to be important to him. Alex answers questions spoken by a stranger about colours and shapes with over eighty per cent accuracy. Undetected cuing has been ruled out of Pepperberg's experiments through demonstrating that Alex can successfully answer the first question asked by a stranger, and since he must select one out of a considerable number of vocal responses it is doubtful that inadvertent cues from an unknown person can account for his high degree of accuracy (Pepperberg, 1991). Furthermore, Pepperberg (1994) has recently obtained similar results with two other African grey parrots. Likewise, Hailman and Ficken (1986) have shown that the chick-a-dee call system has a computable syntax as it is an open system with a limitless number of possible call-types that commute as grammatical.

Even more impressive is the presence of deceptive signalling that has been found among various animal species, i.e. the Arctic fox (Rüpell, 1986), and chimpanzees (deWaal, 1986). Cheney and Seyfarth (1990 and

1991) have shown that animals change the meaning of signals, vary the rate of signalling and thus withhold or conceal information, signal false information, and respond sceptically to the signals of others. Their field experiments suggest that vervet monkeys are the "sceptical recipients of communicative calls" and that the detection of deception is determined in ways in which animals compare signals based upon their meaning, i.e. they respond to alarm calls for three different types of predators, each of which requires a different escape route (Cheney and Seyfarth, 1990 and 1991).

LANGUAGE AND THE BRAIN

There is a lot of controversy surrounding the appearance of language systems in the hominid brain. Dean Falk claims that language systems in the brain, i.e. Wernicke's Area, that are anterior to the lunate sulcus did not expand and develop to the point where hominid "language", as we know it, was possible until *Homo habilis*. Conversely, Holloway argues that this development began with *Australopithicus*. Both Falk and Holloway argue based on evidence provided from the same endocast - the so-called Taung child, a young *Australopithicus africanus*. Falk argues that the Taung child's lunate sulcus is in a pongid-like position and therefore brain enlargement must have proceeded cortical reorganization, while Holloway argues that it is in a hominid-like

position and therefore the reverse is true (see Falk, 1983, 1985a, 1985b, 1989; and Holloway, 1981 and 1983; or Falk, 1992, Chapters 2 and 3 for a summary of the debate). While both positions seem quite convincing, upon consideration of other relevant information, Falk's argument appears to be the more likely of the two.

Falk examined the Taung endocast with the most up-to-date technology available, i.e. high resolution computerized tomography scans, to see parts of the Taung skull that had previously been hidden. Furthermore, since the australopithecine and chimpanzee brains are similar in size then if the lunate sulcus is in the hominid-like position, as proposed by Holloway, then

if hominids and chimpanzees required similar amounts of primary visual cortex to process visual information, the representation of vision in medial neocortex would have been much greater in early hominids than in living chimpanzees. Packing this additional tissue medially would have required major changes in the medial profile of the brain, especially around the calcarine fissure and the splenium of the cerebral cortex, which are among the more uniform landmarks in mammalian brains (Jerison, 1990:289).

Further evidence to support Falk comes from dentition. Lieberman (1993) has shown that the supra-laryngeal airway that is necessary to produce the full range of human speech is derived from morphology adapted for swallowing in other primates. As a result the human supra-laryngeal airway has become specialized for speech

production at the expense of swallowing and respiration:

Indeed our teeth have become so crowded because of the reduction of the length of the body of the mandible and maxilla that we suffer the risk of serious infection and death due to impaction of teeth (166).

Also, Holly Smith (1986) and Tim Bromerge (1985), have shown that the age of death for *Australopithicus* is better estimated using information about tooth development in apes instead of humans. So, we can see through examining the structure of the hominid jaws and teeth that capacity for spoken language was probably not yet present in *Australopithicus*. It may therefore be concluded that human language did not evolve until after cortical reorganization of the brain which now may be understood as having occurred after the large increase in brain size with *Homo habilus*.

Humans communicate in a number of ways, and language is but one of these methods. The gestural repertoire of deaf and mute humans are similar to those observed in hearing and speaking humans and furthermore deaf children have been shown to be significantly less delayed in development than blind children (Piaget, 1960 and Eibl-Eibesfeldt, 1974). Furthermore, as shown by MacLean (1990), it is the protoreptilian and paleomammalian brains, rather than the neocortex, that play the basic roles in paleomentation which includes protomentation and emotional mentation, both of which are involved in the

regulating the expression of behaviour used in social communication. Thus, according to MacLean (1990), our behavioural forms of communication may be seen as homologous to the communication systems of other animals.

When communicating with language, we use a neuro-behavioural system that Jerison (1973 and 1985) believes evolved as a unique adaptation to contribute to the construction of reality. When we talk, we share realities. The use of language in humans may therefore be seen as a species-typical cognitive adaptation (Laughlin and d'Aquili, 1974; and Jerison, 1985:5) and we may then presume that it is intellectual operations that give rise to linguistic processes and not the other way around.

We can now see that language is not a sudden, unanticipated appearance within humans with no intermediate form existing anywhere in the phylogenetic scale. Despite Lieberman's (1991) claim that all transitional forms of language are extinct, research on the ontogeny of primate signals suggests parallels with the development of human speech (see Snowden, 1982; and Van Cantfort, Gardner and Gardner, 1989). Likewise, phylogenetically old language accompanies newly acquired language (i.e. facial gestures, body language, olfactory).¹⁶ Furthermore, such arguments contradict

¹⁶ Joseph, 1993 traces forms of communication back to the neuronal, unicellular level.

what we know about evolution as we do not "lose" earlier parts of our brain or its functions we only develop and expand them, albeit sometimes quite elaborately.

We know from biology that animals must be capable of communication not only as an adaptive strategy but by the very nature of their neural structures. It is the development of the human forebrain, the part that mediates language also being present in the greater apes (Asimov, 1994) that has allowed the development of spoken language, providing humans with an easily accessible expression of consciousness (Laughlin, 1992).

Furthermore, the concept of language as definitive of consciousness as some, i.e. Daniel Dennett (1991), have argued, contradicts the contemplative traditions that report numerous states of consciousness in which language is not present, but awareness and intentionality are still operating (Laughlin, 1995). Likewise, those who argue that mind is a product of language (i.e. Davidson and Noble, 1992 and 1993) strongly misunderstand how our brain's work, taking a position that is the very pinnacle of epiphenomenalism.

The capacity for self-awareness involves those brain structures capable of modelling the distinction between self and nonself in a way that exceeds that of biological individuality, meaning the capacity to relate this distinction to any action present, a prerequisite for

language formulation. In humans, development of the larynx, supra-laryngeal airway, and neural perceptual and production systems for phonemes must have coevolved to form the capability of spoken language (Edelman, 1989a: 187-188). Furthermore, intentionality is not a property of language, but a property of cortical level brains (Laughlin et. al., 1992). Language, therefore, is not a prerequisite for consciousness it is simply an instrument for sharing consciousness.

INTENTIONALITY

Intentionality was presented by Husserl as a direct-
edness toward the world in order to identify particular items as objects of study. This, he maintained, was because consciousness itself cannot be any-thing nor can it have any content within it (Silverman, 1980). In fact the word intentionality comes from the Latin verb *intendo*, meaning to point at. One approach taken by Husserl in trying to understand intentionality was to examine the nature of the objects towards which acts of consciousness are directed (Silverman, 1980). Furthermore, as pointed out by Smith and McIntyre (1982), Husserl's account can also be seen as one which seeks to understand intentionality by looking at the relationship between the subject and the object.

Every conscious act for Husserl consisted of three

components: a noesis, a noema and an object. The noesis was that real part of a conscious act which made the experience intentional. The noema was not "real" but had an atemporal meaning. The ontological status of the object was important on this account thus an act intends (is directed toward or is intentionally related to) an object only if the act (or its noesis) entrains a certain noematic meaning and that meaning prescribes the object (Baruss, 1990:79-80). Husserl focused most of his attention on perception as he saw perception as that which formed the basis of one's understanding of the world (Baruss, 1990:80).

Sarte argued that in directing consciousness towards things, intentionality had a negating function, i.e. a pen is constituted as an object and therefore consciousness is constituted as not the pen or the nothing which is directed towards the pen and so the essence of the pen is not in consciousness but rather an object of consciousness (in Silverman, 1980).

Searle defines intentionality as "that property of many mental states and events by which they are directed at or about or of objects and states of affairs in the world" (Searle, 1983:1 quoted in Baruss, 1990:81). Yet as pointed out by Searle (1983) there are intentional states that are not conscious, for example the unconscious beliefs that one holds. Likewise, there may be conscious

states that are not intentional, for example the experience of anxiety and anxiety itself are identical but the fear of snakes and snakes are not identical, for intentionality to be present there must be a distinction between the state and what the state is directed at, about or of.

Intentionality, like phenomenology, poses a problem for functionalists as its focus of attention is on the subjective aspect of conscious mental acts. Functionalists therefore insist that intentional occurrences be replaced by linguistic occurrences. The functionalist approach to dealing with the "problem" of intentionality is antithetical to reason, as Baruss (1990:83) states:

the whole project of reducing intentionality to syntactic properties is based on the assumption of the omnipotence of language. Intentionality is in essence, a feature of mental activity. It is lived as part of experience, and it is an article of faith that it can ever be adequately characterized syntactically.

Such a functionalist approach has been used by Cheney and Seyfarth (1990) in their study of vervet monkeys.

Cheney and Seyfarth (1990) define intentionality according to the levels first defined by Dennett (1987). They thus describe voluntary control as first-order intentionality. This type of intentionality, they claim, is displayed by vervet monkey alarm calls because the monkeys want to modify the behaviour of their audience. Second-order intentionality occurs when an animal

believes that another also has beliefs, so if a vervet monkey gives an alarm cry because he wants others to believe that there is a predator nearby then he is using second-order intentionality. Third-order intentionality would occur if the monkey wants others to believe that he wants them to run into the trees. In linguistic communication it is argued that at least third-order intentionality is required by both the speaker and the listener (Cheney and Seyfarth, 1990:143).

True communication, according to Cheney and Seyfarth does not occur until second-order intentionality as first-order intentionality only wants to alter the behaviour of the audience and so it makes no claim concerning what a signaller knows about the effect of his communication on the audience's mind (1990:144). If deception and the manipulation of signals is being used, then the animal must be capable of second order intentionality because they would have to attribute mental states to others and be able to modify their call (1990:144).

Any signal given that is tied to an emotional state exhibits no form of intentionality at all (zero-order). However, Cheney and Seyfarth (1990 and 1991) have observed that the vervet monkeys do not usually make any kind of call while alone. Furthermore, the type of vervet alarm call does not only depend on the type of predator

but also on the type of audience present, i.e. male, female, offspring. Cheney and Seyfarth (1990) have presented evidence that vervet monkeys and other nonhuman primates use vocalizations in a manner that effectively denotes objects and events in their environment. They have also noted parallels between the way vervet monkeys learn calls and the way human infants learn words. Yet, while they claim that simple explanations that posit no mentality at all (i.e. they give alarm calls because they are excited) can be ruled out for many reasons, they remain hesitant to attribute second-order intentionality to the monkeys because they claim that there is no conclusive evidence that monkeys attribute mental states to others. They therefore conclude that vervet monkey calls are most consistent with Dennett's (1987) first-order intentionality.

Cheney and Seyfarth believe that while there is a strong case for mental representation or concept in the monkey calls, they also claim that they cannot know what exactly it is that occurs in the minds of these animals (1990:175). Likewise, Marler et al. (1991) argue that it is likely that chickens use deceptive signals and that these acts of deception are a potentially valuable source of insight into intentionality. In fact, as is argued in this thesis, the only way we can know what is in the mind of any animal is to look for homologous neural structures

in the brain that mediate any particular form of mental activity, including intentionality.

According to biogenetic structuralism, one of the primary features of the conscious network in any animal is a polar dialogue between the prefrontal cortex and sensorial cortex distributed in various areas posterior to the frontal lobes. This dialogue mediates the intentionality of consciousness, allowing a distinction between subject and object when it is made present to awareness (Laughlin, 1998; Laughlin, McManus and d'Aquili 1992:105). Experience, as such, is produced by the intentional dialogue (throughout brain structures) that constructs a meaningful, phenomenal world. While one of the definitive characteristics of consciousness is intentionality (Searle, 1983), arguments that claim that the only types of cognition that are intentional are reason, thought and language renders their answers as to whether animals can be conscious tautological (see Weiskrantz 1988; Griffin 1992:115-153 and Radner and Radner 1989 on this issue).

It is clear from the empirical research conducted in the area of cognitive ethology that nonhuman animals do think (Griffin, 1981, 1984, and 1992; Ristau, 1991; Oakley, 1985b; Jolly, 1985 and 1991; and Goodall, 1986), if by thinking one means either the intentional organization of knowledge pertaining to the object of

consciousness, or making decisions and plans about perceived events relative to a cognitive map of the world retained in memory (see Linden, 1993). Gould (1976) has demonstrated that even insects (e.g. honeybees) are capable of this "thinking". In one study, Gould has shown that honeybees impart symbolic information about distance and direction of food and water in the "waggle dance". Gould (1976) devised an experiment to trick the bees into performing these dances to point to an incorrect direction - as expected, the bees flew to the corresponding location indicated by the dance and not to where the actual food source was. However, when the information about the location of a food source was inconsistent with the bee's cognitive map of the terrain, for example, in the middle of a lake, they did not follow.¹⁷

CAN A COMPUTER BE CONSCIOUS?

While many researchers still find it difficult to warrant conscious experience to animals there seems to be an increasing amount of attention being focused, for the most part by these same researchers, on the possibility of consciousness being present in computers (i.e. Dennett, 1991). The metaphor used to present conscious-

¹⁷ Wenner and Wells (1991) critique Gould's study claiming that while information is contained in the dance, the bees will not follow this information.

ness as a machine-like function is characteristic of the functionalist account of consciousness. This view was made popular by Daniel Dennett (1969) and is recently gaining in credibility (i.e. Jackendoff, 1987; Johnson-Laird, 1983; and Lycan, 1987). In order to argue that a computer is conscious, one must also argue that the properties of a computer are the same properties that account for consciousness in humans. This is easily done by the functionalists as they claim that it is the processing of information that is important to mentation and not the substrate within which that processing takes place (Baruss, 1990:74). Dennett employs the "Turing test" (1991:310-311) as evidence that a computer's ontological status is similar to that of a human being.

The Turing test was devised by Turing (1950) to test the ability of a human to distinguish between another human and a machine by asking them both questions. The computer and the person are hidden from the questioner who asks questions that are geared towards trying to determine who is the human and who is the computer. If the questioner cannot distinguish between human and machine, then the computer is said to have intelligence. However, as pointed out by Baruss (1990), this removes consciousness as a criterion for intelligence. Turing himself acknowledged this but did not think this was a serious concern as he claimed that humans use the same

criterion for making a judgement about machines as they do for other people.

Functionalists seem to have an anthropomorphic view of machines that can be best summarized by the following quote Dennett (1991:430-431):

If the self is "just" the Centre of Narrative Gravity, and if all the phenomena of human consciousness are explicable as "just" the activities of a virtual machine realized in the astronomically adjustable connections of a human brain, then, in principle, a suitably "programmed" robot, with a silicon-based computer brain, would be conscious, would have a self. More aptly, there would be a conscious self whose body was the robot and whose brain was the computer. This implication of my theory strikes some people as obvious and unobjectionable. "Of course we're machines! We're just very, very complicated, evolved machines made of organic molecules instead of metal and silicon, and we are conscious, so there can be conscious machines - us." For these readers, this implication was a foregone conclusion.

While the bible offers no objection in principle to the possibility that artificially constructed 'brains' might embody some kind of conscious mentality (MacKay, 1984:48), the idea of computers as conscious is not in line with the overall pattern of evolution. In the past, each new evolutionary development has come from the integration and improvement of existing systems. At no stage has any branch of evolution been replaced by its artifacts - they have always evolved together, becoming more integrated rather than separate. According to Peter Russell, if the pattern of the past 4.5 billion years is

to continue then we can expect to see the co-evolution of humanity and its artifacts in a mutually supportive relationship,

Rather than UIMS taking over from humanity, they will become another factor increasing the integration of society and speeding human evolution towards greater complexity (1991: 77).

MATHEMATICAL DEVELOPMENT IN HUMAN AND NONHUMAN ANIMALS

Piaget (1970) has shown that logical mathematical structures exist before language in children, at approximately twelve months and two and a half years respectively. Mathematical knowledge is a sensory-motor intelligence that has its own logic, that of action. The actions that form sensory-motor intelligence are capable of being repeated and of being generalized, this is what Piaget calls a "scheme". Any given scheme in itself does not have a logical component, but schemes can be coordinated with one another, giving them a logic. Thus, schemes have all the foundations of logical mathematical structures. Piaget (1970) has shown two characteristics of operations within logical mathematical structures: conservation (permanence of an object - by twelve months) and reversibility (the understanding of movement in space in which the child moves at the time of the culmination of sensory-motor intelligence - beginning of the second

year).

Hauser et al. (1996), using the same methodological framework employed in studying mathematical ability in preverbal children (called the preferential looking paradigm), has provided evidence that the mathematical abilities found in the preverbal child may also be present within nonhuman primates. Their research demonstrates that wild rhesus monkeys are able to detect additive and subtractive changes in the number of objects displayed in their visual field and thus conclude from their results that it appears likely that nonhuman primates have access to arithmetical representations.

IS SELF-AWARENESS CONSCIOUSNESS?

Gordon Gallup (1979 and 1985) argues that we must learn to infer consciousness by behaviour and that mind itself involves more than just awareness. In trying to demonstrate this he performed an experiment evidencing that chimpanzees are capable of self-awareness. To conduct the experiment Gallup (1979) placed several adolescent chimpanzees with no previous exposure to a mirror in a room full of mirrors for prolonged periods of time. Having never seen a mirror the chimpanzees initially reacted as do all other animals - as though their reflection was another animal. However, after only three days of prolonged exposure the chimpanzees began

using the mirror to respond to themselves- they learned how to recognize their reflection. They used their reflection to gain visual access to and experiment with otherwise inaccessible information about themselves, i.e. grooming parts of their body they have never seen before, looking into their mouths and making faces.

Gallup (1979), in order to deter any doubt of his findings anaesthetized the chimpanzees and applied a red paint, with no smell or texture, to their upper eye ridges - visible only with the aid of a mirror. Upon awakening, the chimpanzees were once again shown a mirror. They immediately touched the red markings and then smelled their fingers, indicating that they were aware that this was unusual and they were aware of its presence on their body. A control group of chimpanzees who had never seen a mirror were also marked but they reacted as the experimental group did when first exposed, as though they were seeing another chimpanzee. Further experiments conducted by Gallup with other anthropoid apes and monkeys have led him to conclude that only humans and the great apes have the capacity for self-recognition in a mirror (Gallup, 1979).

Gallup's research also found that people with congenital visual defects who undergo corrective operations later in life initially react to themselves in mirrors the same way that animals do. Furthermore,

children do not show signs of self-recognition until 18 to 24 months of age, indicating again that self-reflection is a learned behaviour. Seriously mentally delayed children and adolescents and comparably handicapped adults are incapable of recognizing themselves in a mirror - therefore demonstrating that the capacity for self-recognition is even beyond that of some humans (Gallup, 1979).

Hauser et al. (1996) repeated Gallup's experiment with cotton-top tamarins (a new world monkey species) and had the same results as Gallup (1979). Hauser et al. (1996) claim that it is likely that the prior failure to pass the mirror test in Gallup's study may have been due to methodological problems, rather than phylogenetic differences in the capacity for self-recognition.

Gallup (1985) argues based on his study that consciousness is a learned behaviour when in actuality he has only shown that recognition of one's reflection is learned. Furthermore, while self-awareness is a very complex form of consciousness that develops after birth, this does not mean that it is not a function of the structures of the central nervous system already present at birth. Instead what Gallup's study may be showing us is where the capacity for self-awareness has evolved, most likely as an interaction of the already present consciousness mediating structures in all animals (paleo-

mentation - see MacLean, 1990) with the more highly evolved neocortex. Gallup is not showing evidence of consciousness, only indicating the evolutionary advanced cognitive processes in the chimpanzee brain and there are always those authorities who will deny that these properties are evidence of consciousness in the human sense of the term (as in Terrace, 1985 and Brown, 1977).

Additionally, the argument that ego-awareness is the only true form of consciousness opposes the knowledge available from the contemplative traditions who report that ego-loss is a requisite for "higher" states of consciousness. Furthermore, self-awareness as a definition of consciousness is scientifically unacceptable because it is impossible as yet to define self-reflection in a neuropsychologically operational way (as recognition of oneself in the mirror has not yet been neuropsychologically operationalized) - thus we have no way to empirically study it and the criteria of such a claim is so narrow that, in principle, only humans manifest it (i.e. Hauser et al. (1996) conclude despite their findings that such a test remains ambiguous as a method for understanding the concept of self and the mental states of nonhumans), even children before a certain point in their development would have to be arbitrarily considered unconscious (see also Swartz, 1990 for a discussion on the problems with Gallup's claim).

CHAPTER 4

HOW CULTURE SHAPES OUR ATTITUDES TOWARDS ANIMALS

The greatness of a nation and its moral progress can be judged by the way its animals are treated.

- Gandhi, The Moral Basis of Vegetarianism 1959

INTRODUCTION

It seems to be the case that often when a belief system is held by an individual or group of individuals it is perceived, for a time, as irrefutable despite mounting evidence against it (i.e. Kuhn, 1970). The belief system is irrefutable because frequently the individual feels they hold an emotional investment in the claim. This investment has been referred to as the "psychoanalytic method of argumentation". The problem lies in the fact that we are primarily all products of the culture in which we live and we perceive and therefore construct the world around us relative to our conditioned cultural mindsets (see Berger and Luckmann, 1984). Quite often conflicting evidence results in both sides of an argument taking a more dogmatic stance in a desperate attempt to hold onto their views. So it is with the argument against nonhuman animal consciousness as it continues to be debated among those who insist on denying its presence based on various theoretical or emotional stances. Some even continue to maintain that animals are no more than the machines that Descartes envisioned them

to be back in the seventeenth century (i.e. Eccles, 1989; and Davidson and Noble, 1993).

In order to gain insight into the ongoing debate about nonhuman animal consciousness, it is important to understand how our relationships and feelings towards nonhuman animals are both biologically and culturally shaped. Subjective, cultural predispositions that are responsible for the status we attribute to nonhuman animals is the same that has been historically applied to people of different races, cultures, genders and even to children. Quite often these perceptions are very harmful, i.e. the 1857 ruling of the Supreme Court of the United States that constitutional rights did not extend to African Americans (Coleman and Cressly, 1987). It is only through recognition of our cultural biases that we can get closer to understanding the actual nature of all minds, human and nonhuman.

The purpose of this chapter will be to explore both the cultural and biological foundations of the treatment that we give to the creatures that share our world. In order to better illustrate the huge cultural and historical influence on our perceptions of animals a case study will be presented having to do with the treatment of dogs within Euro-American, Judeo-Christian culture.

**THE BIOLOGICAL FOUNDATIONS OF OUR ATTITUDES TOWARDS
NONHUMAN ANIMALS**

Anthropology has largely ignored the role of pets or companion animals in non-western societies even though it is in fact wide-spread; for example, cross-cultural accounts of breast feeding pets have been documented (Serpell, 1988). Herzgog and Burghardt (1988) suggest that behind the apparent diversity of attitudes towards nonhuman animals are some universal underlying biological processes that are the result of natural selection. They provide evidence of the connection between human attitudes toward animals and natural selection as being of two types: first, evidence of innate responses or the readiness quickly to learn certain things; and second plausible scenarios indicating that the value-related considerations could have been produced or influenced by natural selection (1988:77). An example of the first type of evidence can be seen in the almost universal human phobia of snakes. Whether or not the fear of snakes is learned or innate has been debated for many years. However, Mundkur (1983) has shown that even nonhuman primates show an intense fear of snakes even with little or no experience with them, suggesting a genetic origin perhaps resulting from our past evolution in which dealing with snakes could have been selected out. Evidence of the second type comes from domestication

practices which have revealed that those animals who are cared for by humans are more productive and healthier than those who are not (Herzog and Burghardt, 1988). This would prove to be an adaptive practice within animal husbandry. Furthermore, Voith (1985, in Herzog and Burghardt, 1988) has suggested that the presence of animals is soothing to humans because of our evolutionary past in which the proximity of nonfrightened animals signalled that there were no nearby predators.

As part of our own adaptive evolutionary strategies, humans are hardwired to have maternal-like responses to certain stimuli. There are certain physical attributions that human and nonhuman babies have that are universally considered "cute" such as big eyes, a big head, a fat body, big ears, and short, stubby limbs. Konrad Lorenz (see Gould, 1979) has termed these characteristics "baby releasers" and argues that they are an evolutionary adaptation to survival as they have been shown to trigger innate releasing mechanisms for affection and nurturance and thus makes them more likely to be protected. Likewise, humans will often respond to the sound of a dog cry as they do to the sound of a human cry.

The continuing enlargement of the primate brain resulted in the production of progressively altricial young, so that growth in brain size was completed after birth therefore producing young that required a greater

time and degree of nurturance (Katcher and Beck, 1988: 63). In addition, human evolution has been marked by considerable proximity with nonhuman animals, whether they be for work, food, transportation or companionship and increasing amounts of time have been spent in the nurturing of infant nonhuman animals. Today, only three per cent of the United States is engaged in farming, birth rates have dropped significantly, and rapid urbanization has removed us from our historical closeness with nonhuman animals in the wild or on the farm. As a result, the number of pets being kept in North America has dramatically increased in order to provide the much needed outlet for affection and nurturance (Katcher and Beck, 1988). Further evidence of the psychological necessity for such relationships is documented by Katcher and Beck (1986) who have listed many characteristics of speech between human and pet that have also been noted as characteristic between mother and child.

There is much available evidence that the desire to care for other living things has a direct influence on our emotional and physical health:

When humans give up caring for others and lose their appetite for work and pleasure, they do become more vulnerable to disease (Katcher and Beck, 1988:62).

Various studies (i.e. Grossberg and Alf, 1986; and Baun et al., 1985) have shown that the touch-talk dialogue between humans and animals is associated with low blood

pressure, more so than dialogue between people. Bowlby (1966) has shown the importance of touch to human psychological, emotional and physical well-being and Jane Goodall has reported similar findings studying infant-mother relationships among chimpanzees (Goodall, 1971; and Montgomery, 1991:24-45).

CULTURAL DIFFERENCES IN OUR ATTITUDES TOWARDS NONHUMAN ANIMALS

The line of progression drawn within western science between human and nonhuman animals is not a cultural universal. In fact, the hierarchy we have constructed as a phylogenetic scale must be taught, as it is not an inherent knowledge among humans. For example, Piaget (1960) has noted that all human children go through a phase during which they attribute human traits to animals and Freud (1953) states that all children rank individual animals as their equals. Furthermore, cross-cultural evidence demonstrates that the hierarchy of humans over nonhuman animals is a social construct as many societies view animals and humans as equal and even interchangeable (Montgomery, 1991). For example, among the Inuit, shamans must enter the realm of the deity named *Pinga* to ask for a successful hunt because it is she who understands the souls of the animals and does not want too many of them to be killed. Among the Great Plains Cree, the buffalo is

considered a higher order of being (Campbell, 1988: 95-96) and thus "Buffalo Woman" is a highly revered mythological figure who can alternate between woman and buffalo manifestation, as can "Fox Woman" among the Labrador Inuit (Montgomery, 1991). In fact, "the image of human within the animal and the animal within the human is one of the most widespread in animal symbolism" (Walens, 1987:292).

The construction of the type of human-animal relationship a given culture experiences often serves a practical purpose. For example, among the Inuit it is essential that for good hunting to occur they must maintain a good relationship with the whale, dealing with it on a conscious level. In fact, the Inuit have accounts of men turning into whales in order to aid their hunt (Turner, 1990). While conducting fieldwork among the Inuit, Edith Turner (1990) states that she witnessed "a world of ritual unfold at a deeper level which gave the people knowledge and experience of the religious dimension of the whale" (39).

Within Inuit cosmology the whale is a conscious, willing creature who voluntarily sacrifices his life as a creative act (Turner, 1990). Sharp (1988; in Turner, 1990) uses the term "inverted sacrifice" to refer to the self-sacrificial animal who acts purposefully to enhance the person's spirituality, creating a relationship that

is the opposite of domination and hierarchy. This is a common situation among hunting and gathering societies, as stated by Joseph Campbell,

...the basic hunting myth is of a kind of covenant between the animal world and the human world. The animal gives its life willingly, with the understanding that its life transcends its physical entity and will be returned to the soil or to the mother through some sort of ritual restoration (1988:90-91).

Animal symbols can be found everywhere within our literature, art, religion, mythology, television and language. In fact it would be difficult to overestimate the significance of nonhuman animals in the social, emotional and psychological life of our species (Herzog and Burghardt, 1988:75). The Encyclopedia of Religion states that:

animal symbols convey the deepest and most abstruse dimensions of human existence... They have freedoms, powers and abilities denied to humans...they may be the linkage between the mundaneness of everyday life and the divinity underlying the cosmos (Walens, 1987:291; in Turner, 1990).

Perhaps the most dramatic example of the human-animal bond is the artistic use of the animal as an "alter ego" or double of a human within art and literature (Burt, 1988). Artists often depict pets as doubles of their owners and thereby illuminating the qualities of each, i.e. the self-portrait of William Hogarth and his pug Trump showing a remarkable resemblance in both physical features and posture (see Burt, 1988:122 for visual).

Within literature, writers as diverse as Dostoevsky, Camus, Falkner (who uses animals as totems) and Richard Wright (who draws the link between poor blacks and subjugated animals) have used animal doubles to portray the fragmented personality of the characters, illustrating inner-conflict, self-love or loathing, essentially, relationships that the characters have with themselves (Burt, 1988). A perfect example of a situational human-animal double is presented in Steinbeck's Of Mice and Men (1937) as stated by Burt (1988:126):

... Old Candy's ancient dog is his double, and his helplessness when the other men decide that the dog must be killed foreshadows George's unwilling mercy killing of Lennie at the close of the tale. When the dim-witted Lennie accidentally crushed a puppy, this sets the stage for his unintended killing of another creature he sees as soft and cuddly - Curley's wife. In fact, in death, the woman and the puppy lie side by side in the hay.

The animal theme is usually symbolic of one's primal and instinctual nature, animal doubling is often detrimental and incomplete as the animal represents the wo/man but only for the part of him/her that s/he fears and dis-claims (Burt, 1988:133).

**ETHICS - WHAT DETERMINES AN INDIVIDUAL'S MORAL STANCE
TOWARDS NONHUMAN ANIMALS?**

An individual's ethical decisions about the use of animals by human beings must be based on an analysis of that individual's characteristics, including concepts such as personhood, consciousness, cognitive ability, harm and pain (Bekoff and Gruen, 1993). Another obvious relevant factor is economics. Bernard Rollin (1989) argues that if the millions of dollars tied up in medical research on animals were offered to prove that animals were conscious, thinking and feeling beings, then it is likely that science would quickly present a radical difference of opinion.

There is some evidence that humans are instinctually opposed to the ill-treatment of animals. For example, when the television show 20/20 aired a documentary on factory farming it received more letters, phone calls and telegrams than ever before (Rollin, 1989:167). This suggests that perhaps people have an intuitive inner-knowledge that such treatment of animals is wrong although the fact that people are generally not well informed about how modern farming and science is conducted means that they cannot participate in its rationality. For those directly involved in the ill-treatment of animals a heavy rationalization process or "brain-washing" is necessary in order to place a

conceptual gap between the actual act and the perceived act of killing another conscious being. Just as traditional hunter-gather societies have ceremonies and rituals to appease the spirit or the spirit guardian of the animal which perhaps actually appeases their own guilt over killing the animal (Campbell, 1988: 90-95; and Rowan, 1988), western science too employs such methods, i.e. referring to the death of research animals as a "sacrifice" (Reagan, 1986) and claiming that the use of an estimated 200 million animals in medical experiments is a moral or philosophical question and therefore not one that science need not address (Rollin, 1989). Furthermore, different religions employ various methods for dealing with this guilt, i.e. within the Jewish religion a Rabbi must slaughter the animal so as to make it acceptable to "God" and in Buddhist Tibet the butcher is made an outcast to society (Rowan, 1988).

Ethical decisions about the use of human subjects in medical research are very similar. For example, in 1966 the U.S. passed a mandate to protect (but not abolish) the use of human subjects in research. This mandate was not wilfully accepted in the medical community, in fact, the National Institute for Health argued that it was a violation of academic freedom (Rollin, 1989: 109). Rollin (1989) reports that in 1984 at an international meeting of medical researchers, a man from South Africa urged his

colleagues to move their research to his country where he claimed that a hospital administrator can sign informed consent forms for as many patients as the researcher needs. Furthermore, Boozer (1980) and Lifton (1986) have documented the arguments made by the Nazi doctors during World War II that were used to rationalize their heinous medical experiments on human beings.

There seems to be a significant divergence of opinion between the sexes when it comes to scientific studies of animals. Women have historically been the primary activists in the fight to protect animal rights, perhaps because they saw the relationship between the subjugation of animals and the subjugation of women (Donovan, 1990). The women's movement as a whole never claimed that their oppression was worse than the oppression of nonhuman animals because they recognized the similar methods of justification being used to oppress any group (Donovan, 1990). In fact, two of Rene Descartes' earliest critics were women. Margaret Cavendish, the Dutchess of New Castle (1623-73) and Anne Finch, Lady Conway (1631-79) both argued against Descartes' masculine view of science, claiming that animals indeed have souls, knowledge, sense and love (Donovan, 1990:365).

Furthermore, while chimpanzees have suffered in captivity for several hundred years, it is only in the

last three decades that we have acquired a significant understanding of their cognitive potential. The majority of this knowledge has come from studies in the wild and began with the research conducted by Jane Goodall (1971). Jane Goodall has made numerous landmark discoveries that have provided the scientific community as well as the general public with a whole new perspective as to the workings of the chimpanzee mind. For example, Goodall was the first person to publish observations of nonhuman animals using tools (1986). Before this discovery scientists assumed that it was tool-making that made humans unique from other animals. Upon receiving this news, Louis Leakey wrote to Goodall saying: "I feel that scientists holding on to this definition are faced with three choices: They must accept chimpanzees as man, by definition; they must redefine man; or they must redefine tools" (Montgomery, 1991:101).

Louis Leakey maintained that the reason he choose three women (Jane Goodall, Dian Fossey and Biruté Galdikas) to conduct the research for his great apes project was due to the fact that women are more biologically prone to take on long term projects and that women are more likely to be able to relinquish power thereby allowing them to see and understand a wider range of the ape's behaviours (Montgomery, 1991). However, as may have been expected, the scientific community had trouble

accepting the claims of all three women based on the very thing that made their work so successful, namely their well-formed relationships with their research animals (Montgomery, 1991). All three women were able to see the apes as real, sentient beings that love their children, mourn their dead, are afraid of thunderstorms and enjoy sunny days. For example, Goodall's first scientific paper, sent to *The New York Annals of Science*, was sent back and requested that she change all the *he/shes* to *its* and all the *whos* to *which*. She refused and the paper was finally published anyway (Montgomery, 1991). Likewise, anthropologist Colin Turnbull repeatedly criticized Dian Fossey for naming the gorillas she studied (Montgomery, 1991:143) and others have criticized her for making them "the ideal for which humans should live up to" (Mowat, 1987). Dian's relationship with the gorillas she studied was seen as so intense that many who knew her say that she was in fact a gorilla herself (Montgomery, 1991 and Mowat, 1987).

On the other hand, even the most well-known of animal rights activists, Peter Singer (1975) and Tom Reagan (1983), insist that they are not "animal lovers" claiming that their arguments are both philosophically and scientifically based and that emotional sentimentality does not play a role in their arguments. Such differences in approach between men and women in studying

animal behaviour has led Sy Montgomery to hypothesize that: "Somewhere in the collective human psyche we seem to know that women are best equipped to approach the world of animals (1991:264).

CASE STUDY: THE DOG IN EURO-AMERICAN CULTURE

In 1983, the United States Department of Defense announced its plans to set up a wound lab to teach combat surgeons how to deal with bullet wounds. The plans involved hundreds of anaesthetized dogs that would be shot and experimentally operated on. The public outrage was overwhelming (Rollin, 1989: 167-168). In 1974 army nerve gas tests on dogs were publicized and the Pentagon received more than 30,000 protest letters, more than they have ever received before (Holden, 1974). To deal with the problem in both cases, the Department of Defense replaced the dogs with sheep and goats and nothing more was heard on the subject.

Upon hearing of these incidents one is led to wonder: How can cruelty to dogs elicit such a strongly negative response while when the same cruelty is inflicted upon sheep or goats it does not? The question that needs to be asked here is: Why the dog? Why not the fox, the goat, the lamb, the gerbil or even the cat? How can one society have so much reverence for one particular type of animal above all others? How did the dog become,

as Beck (1974) declared, "America's sacred cow"?

In order to answer these questions certain issues must be addressed including the culture-specific taboo on the eating of dog meat, how and why the dog became domesticated, how our language enforces the code of dog as sacred or totem, and the influence of Judeo-Christianity over this thinking.

A totem is usually an animal, less often a plant or even such things as rocks, wind and fire, that is seen to have a relationship with the clan, with descent or with the socialization of values (Levi-Strauss, 1968). Certain modes of conduct are sanctioned when dealing with the totem animal that usually includes a strictly enforced taboo against eating the totem and a high degree of respect for the animal (Levi-Strauss, 1968). The two basic rules of conduct towards a totem is not to kill (or eat) the totem and not to have sexual relations with members of the totem clan (Freud, 1953:53-54).

According to Freud, a totem is almost always an animal, seen as a descendant of or protector of the clan - "it knows and spares their children, they are not to destroy or eat the totem, to do so is punishable" (Freud, 1953:3-4). To a typical Euro-American the very thought of eating a dog is repulsive and furthermore taboo, while in other countries such as China, the Pacific Islands and Korea, the dog is a part of the staple diet.

Many anthropologists have theorized about the Euro-American taboo on eating dog, i.e. Edmund Leach (1964) argues from a structuralist perspective that the taboo against eating dogs is directly a result of our associating eating with sexual intercourse. Therefore, he concludes, eating a dog is mentally equated with incest, a universal taboo. DeVos (1975) argues that eating a totem animal is mentally equated with cannibalism, which he claims is a more universal taboo than that of incest (which Levi-Strauss 1968 claims is the most universal of all taboos) because the totem animal is seen as somehow related to the people in the totem group. Upon questioning Indian peasants about their practice of not eating cows, DeVos received the common reply that "the cow is like mother."

Marshall Sahlin's has been criticized by Harris for his claim that nothing but the "whimsical feeling that *dogs are like people* prevents Americans from eating them." (Harris, 1979:255). However, in a very basic way Sahlin's is right. Because the dog has been accepted into the social world of humans we associate the dog with man and if man is not food then neither can the dog be food (Leach, 1964). We cannot kill, much less eat, that which is *like us* and so we must construct that which we kill as an "other", just as we need to believe that "other" humans are less than us in order to subjugate and oppress

them (thus the word *meat* replaces *flesh* when an animal is eaten). But how did the dog become the totem of Euro-American society? In order to answer this question we must look to how the dog became domesticated.

Because humans and wolves were competing for the same food resources and because they were the only two animals in the area sharing such highly complex social structures, an alliance was soon formed (Clutton-Brock, 1987). Wolves often scavenged around human settlements, eating their discarded food, a practice that brought them into close proximity with humans. Humans and wolves, being both territorial animals, developed a shared association with the same territory. Humans benefitted from this alliance as wolves would growl at intruders which in turn warned the humans of potential danger (Olsen, 1985).

It is presumed that occasionally a particularly docile wolf pup would survive to be an adult and accept the human group as his pack (Clutton-Brock, 1987). A domesticated animal is always a product of a breeding population that is isolated from the wild species so that the wild temperament is bred out (Clutton-Brock, 1987). In order for any animal to be successfully tamed and domesticated it must be able to suppress its natural or normal living pattern and subjugate it to what is dictated by humans or learn to respond to the same new

set of triggers (Olsen, 1985). The wolf and dog have been able to do this while other animals have not. For example, records extending as far back as dynastic Egypt indicate that many animals that seemed to be potential domesticates to their captors could not make the transformation (Olsen, 1985:19-21). The wolf appears to be the only animal that will easily and fully accept the companionship of humans in a manner that nearly approaches that of a domestic dog.

Many social animals depend on a hierarchial system of differentiation between individuals with reference to reproduction and maintenance of territory, but it is only in the large carnivores and in some primates that there is such a rigid structure of personal relationships between individuals as is found in the wolf and in humans (Clutton-Brock, 1987). For this to occur there has to be not only dominance behaviour but submissive behaviour as well. Submissive behaviour has been defined by Schenkel (1967), for the wolf and the dog, as an impulse and effort on the part of the inferior animal towards friendly and harmonic social integration. It is ritualized behaviour that is characterized by the combination of inferiority and a positive social tendency without any element of hostility. The form that the submissive behaviour will take depends on the attitude and behaviour of the dominant individual. If he responds

in a negative way the inferior will not persist but if the dominant wishes to enter into friendly interaction with the inferior then harmonic social integration may take place. Active submissive behaviour in canids is derived from the relationship between the pup and its parent. This biological link based on social structures and behavioral patterns are closely similar to our own because they evolved in both species because of the need for a hunting team. The pattern endures today and has become adapted to life in industrial societies (Clutton-Brock, 1987).

The dog satisfies not only a number of human working needs but psychological needs as well that can be illustrated by certain behaviours present in the domestic dog. For example, communication for the dog is dependent on facial expression and posture as it is in humans. The dog who grows up with a family that smiles a lot will also develop a smile of its own - a sideways grin of the lips and muscles around the mouth. This facial expression adds to the anthropomorphism of the dog as it is a behaviour that is never seen in wolves (see Clutton-Brock, 1987:36 for visual).

While it was the similarities between man and wolf that brought them together in the first place, it is their differences that keeps them apart. Only the tame, controlled and altered version of the wolf enjoys a high

symbolic status within Euro-American culture. Despite the harmonious relationship that human and wolf have historically enjoyed, there is a great degree of fear and myth surrounding the wolf even today.

The wolf's reputation is unfortunate and not well deserved. Clarissa Pinkola Estes (1992), describes the wolf's reputation as:

The wolf has been portrayed as vicious, ravenous, preying upon the innocent and the unguarded, killing to kill, never knowing when enough is enough. As you can see, the wolf has a very bad and unearned fairytale and real-life reputation. In real life wolves are dedicated social creatures. The entire pack is instinctively organized so healthy wolves kill only what is needed for survival. Only when there is trauma to an individual wolf or the pack does this normal pattern loosen or change (229-230).

Wolves are in fact very caring social animals that when behaving characteristically, will kill only what they need to eat, caching anything that is left over and regurgitating food back at the den for cubs and lactating mothers (Morris, 1990). Desmond Morris (1990) argues that the wolf is in fact no more aggressive than a dog. Wolves will, however, on a rare occasion go on a killing rampage, wasting much of what they kill. While this behaviour is not typical and only occurs under extreme circumstances, for example, if the wolf pack has undergone a lengthy famine (Pinkola Estes, 1992), it nonetheless continues to be associated with the wolf and as a result, often stirs up violent behaviours in humans, as

illustrated by the following incident:

...the recent sighting of a wolf in southern Norway sparked a frenzied wolf hunt and a lucrative tourist trade in wolf artifacts that did not end until the wolf was shot dead, doused with champagne, and dragged off first to a school, then to an old people's home, and finally to the steps of the national parliament. Even today, with modern weapons, sophisticated transport, and a highly educated population, one solitary wolf is still capable of inciting mass hysteria (Rowan, 1988:4).

In our everyday expressions we find evidence of our negative associations to the wolf as a species. The expression "hungry like a wolf" describes a state of being bloodthirsty, aggressive, savage and even sociopathic. The connotations given to the expression "hungry like a wolf" is further evidenced in the popular myth of the werewolf - a bloodthirsty person who at night becomes a wolf and kills humans. Likewise, during the Inquisition, witches were described as having the power to transform into wolves to commit their evil deeds (Biedermann, 1992).

We disassociate ourselves with the wolf because it is a constant reminder of an earlier stage in our evolution when we, like the wolf, were dependent on nature for our survival. The dog, on the other hand, like us today, lives in a culture that dominates and controls its environment, having overcome the wild. The Judeo-Christian cultural value of dominating nature can be seen throughout representations of nature and that which is

"wild". For example, according to the bible¹⁸, it is man's duty to overpower nature. In the words of Genesis, man was to "replenish the earth and subdue it":

The fear of you and the dread of you shall be upon every beast of the earth, and upon every fowl of the air, upon all that moveth upon the earth, and upon all the fishes of the sea; into your hand they are delivered. Every moving thing that liveth shall be meat for you (Genesis, ix. 2-3).

Furthermore, in the 1897 Catholic Dictionary it was recorded that animals:

...have no rights. The brutes are made for man who has the same right over them which he has over plants and stones...it is lawful to put them to death, or to inflict pain upon them, for any good or reasonable end (in Morris, 1990:36).

Thus zoos and circuses with their caged animals, dancing bears, and lions jumping through hoops, can act to satisfy our need to see nature tamed. Likewise, by owning a pet we are maintaining a dominance relationship although we compensate for this by also engaging in an affectionate relationship. This affection aspect of the relationship tempers the domination aspect making it softer and more acceptable (Tuan, 1984).

It was not until half way through the nineteenth century that nature began to be portrayed within Euro-American literature and art as something aesthetic, prior to this, nature was seen as something ugly, frightening

¹⁸ See also Mundkur (1988) on this issue.

and uncontrollable (Thomas, 1983; Ritvo, 1987; and Midgely, 1988). Our changing perception of nature came with a rapidly increasing rate of control over it. Widespread pet ownership can be dated back to the late eighteenth and early nineteenth century (Ritvo, 1988), the same time as the English were extending their control in those parts of the world where nature was perceived to be at its wildest - Asia, Africa and North America. Likewise, progress in the field of veterinary medicine, firearms and animal husbandry lessened the fear associated with nature and led to a greater acceptance of it (Ritvo, 1988).

Crone (1991:4) states that we are in a world "from which nature as such has been eliminated". We have taken the wolf, thought to be a shrewd, deceitful and untrustworthy creature, and turned it into a faithful and loyal counterpart - the dog - that serves us against even the wolf itself. Essentially we have taken the wild wolf (nature) and made it more like the civilized human (culture) by the medium of the dog. For instance, Schowalter (1983), a psychotherapist, claims that:

Perhaps because of a natural fear of animals (and the primitive instincts which they represent), there is for most children great satisfaction in having an animal tamed and rendered harmless and subservient (68).

In the bible only Saint Francis of Assisi, Saint William of Vercilli (who saddled a wolf), and Philibert

of Jumieges have the power to transform the wolf's savagery into "piety" (Biedermann, 1992). Humans, therefore, have shown that they, like the saints, can transform the savagery of the wolf through domestication. The practice of dog breeding is another illustration of humanity's control over nature. Having the control and the ability to shape and alter both the physical appearance and the personality of the dog has allowed humans, in a sense, to play God.

The wolf is used within Judeo-Christianity as a symbol of the forces of Satan. The wolf is portrayed as a demonic enemy, with malevolent red eyes, that threatens the flock of the faithful. The devil is often described as being accompanied by wolves and the gates of hell are often described as being the jaws of a wolf (Biedermann, 1992). This relationship is seen within Christian mythology, where the dog protects the flock of sheep from the wolf¹⁹.

In the early Christian text Physiologus, the wolf is described as "a crafty, wicked animal" (in Biedermann, 1992:388), pretending to be lame when it encounters a human, so as able to attack. In this text St. Basil states:

That is what crafty, treacherous people are like. When they encounter good people, they

¹⁹ It is no coincidence that in biblical times the most popular occupation was sheep herding.

pretend to be utterly innocent and harmless, but their hearts are full of bitterness and deceit (in Biedermann, 1992:388).

This portrayal is upheld today through the use of various culture-specific phrases, i.e. "a wolf in sheep's clothing" serves as a symbol of the seductive false prophet, whose goal is to corrupt and mislead the faithful. The false prophet also appears in our own well known fairytale, Little Red Riding Hood. In this story a wolf disguises himself as Little Red Riding Hood's kind and loving Grandmother in order to trick a young and innocent girl so that he may eat her. This is really quite a morbid story to tell young children, and yet it upholds an underlying belief within Christian mythology, namely the Book of Revelations, that just before the end of the world (Armageddon) a false prophet will appear on earth and, under false pretenses, lead people away from God and towards evil. Furthermore, the expression "cry wolf" means to cause false alarm or danger and the "wolf gaze" is one of distrust and fear, further enforcing the wolf's symbolic deceitful nature (Biedermann, 1992).

A symbol, to be effective, must arouse the memory image of the original stimulus. The substitute stimulus and the original stimulus are not always given together (except in the conditioning process) or there would be no real substitution. Accordingly, in such cases, the substitute stimulus in order to be a symbol must arouse the

original stimulus in a non-tactual form, or state it in a more conventional form (Morris, 1993:13). Such a process can be seen in the biblical symbolism associated with both the wolf and the dog as it originated in the corresponding pre-Christian astrological beliefs.

The wolf in astrology is associated with mars, the god of war. To the ancient Romans the appearance of a wolf was considered to be an omen of victory (Biedermann, 1992). The dog in astrology is seen as a guardian at the gateway of the Afterlife (Cerebus, a three headed dog), or as a sacrifice to the dead, to guide them to the next world (i.e. Anubis, an ancient Egyptian god of the dead) (Biedermann, 1992).

During pre-Christian times, those born under the sign of the dog were believed to be destined to rule and distribute valuable gifts (Biedermann, 1992). The god Xolotl (twin) had the form of a dog and was supposed to bring the dead across the "ninefold river" to the underworld. Xolotl also accompanied the sun into the west as it sank into the "jaws of the earth", leading it through the underworld back to the place where it rose the next morning. Xolotl died himself in the process but returned to life as he guided the sun back from the realm of the dead (Biedermann, 1992). The symbol of the dog as a god of the underworld was also present in ancient Mexico where dogs were sacrificed to the dead as guides in the

afterworld (Biedermann, 1992). Throughout the middle ages the dog appears as an image of feudal loyalty or martial fidelity, a frequent symbol placed on tombstones (Biedermann, 1992).

According to the psychoanalytic method of analysis, one sign represses the other, although the repression is never fully successful. The repression is a dynamic force in that one side oppresses the other, while the oppressed side is constantly struggling for manifestation through symbolic means (Freud, 1953). Astrological worship is a case in point. Christianity forbids the worship of any celestial beings, as the first commandment states: "Thou shalt have no other gods before me". The astrological code must be repressed because it is unacceptable to the Christian code. However, astrological beliefs continue to exist because we gear our lives to them (i.e. summer holidays). Symbolism, on the surface, acts in valuing our institutions and conscious beliefs, but underlying the surface context is a countertext, that which is forbidden. Through the dialogue between context and countertext, language, ritual and other symbolic means are used to maintain the moral code while also transgressing the repression of the hidden code.

Despite our great reverence for the dog, the dog as a symbol remains, for most, relatively autonomous to the origin of its symbolic significance. Relative autonomy is

the process whereby human knowledge becomes independent of its original procedures (Elias, 1991:2). Likewise, our language becomes relatively autonomous as it develops, transgresses and shapes our world by enforcing our values and beliefs while at the same time repressing the factors that work against our accepted ideology.

In modern Christian society the symbolic status of the dog continues to soar as more and more laws are created to protect them from cruelty and more and more knowledge is gained of their intellectual capabilities. Conversely the dog receives much different treatment across the globe. For example, the municipal authorities in Peking have banned dogs except for police dogs and those bred for meat because they consider them a danger to health and society and in Russia there has been a recent, sharp increase in the number of anti-dog letters to the press and several calls to destroy all dogs except those used for service (Rowan, 1988). These varied cultural responses to the dog are due to varying cultural experiences and beliefs that are deeply woven into the fabric of every individual society.

In order to get to a deeper level of understanding of our symbolic systems we must look at that which was previously ignored. We must look both at the social system as it actually works and the manner in which through myth, ritual, and religious representations, we

try to hide or to justify the contradiction between actual society and the ideal image of it present only on the surface (Levi-Strauss, 1976).

SUMMARY

While many other countries throughout Europe are making advances in animal protection laws, animal protection laws in North America remain weak and insufficient. Canada has no federal laws regulating animal research and the Canadian Council on Animal Care (CCAC) has been in existence only since 1970. The CCAC is a body chartered by Canadian universities with no force in law, its only power being that it can make recommendations and if they are not followed the CCAC can try to convince funders to discontinue their support (Rollin, 1989; Wilson, 1990). Even the United States has better animal protection laws than Canada. While it took until 1984 for the National Institute of Health to enforce any of its laws it led to the introduction of 75 bills to the U.S. Congress pertaining to the use of animals (Rollin, 1989).

Despite the fact that we can have no knowledge that exists outside of our experience (see James, 1976), western science continues to argue that science does not allow the "subjective" to penetrate into their work. However, while it would seem irrational to argue that

given the similar behavioural responses and neuro-physiological processes and structures among animals and humans that consciousness is not present anywhere on the phylogenetic scale except with humans, this continues to be done within western science for "subjective" reasons. Within Euro-American culture we have devised a classification system that draws a line from the perceived lowest form of animal to the highest - dogs and cats because of our relationships with them and primates because of our similarity to them - whereas in India cows are perceived to be more closely related to people. Essentially, our relationships with animals remains relative to our perception of the way the world works and our worldview is further reinforced through such mediums as mythology, ritual, art, literature and language. By not addressing the close relationship between humans and animals, anthropology is allowing the belief that animals are valued only for utilitarian purposes such as food and work to continue. However, through a cross-cultural analysis of the human-animal bond we see evidence that our long history with animals is one of deep symbolic and psychological closeness based on both biological and cultural influences.

CONCLUSION

Perhaps it will always be the case that the most convincing evidence of animal consciousness comes from the simple act of owning a pet. It is unlikely that anyone that has spent any amount of time with an animal would doubt that they are in fact conscious, thinking, feeling, wilful beings. Such experience with animals is not accepted within the current western scientific paradigm and yet relationships with animals are considered of prime importance to the knowledge of the consciousness of animals within other cultures (see Campbell, 1988; Turner, 1990; and Montgomery, 1991). In fact, Burghardt (1985) in a survey of lay attitudes on the mental continuity between animal and human mind has shown that people are more prone to believe that there is emotional continuity between human and nonhuman animals than intellectual continuity.

The values of western science oppose the use of the subjective experience of consciousness to such an extent that many researchers are more willing to attribute consciousness to a machine than to nonhuman animals (i.e. Dennett, 1991; and Lycan, 1987). It has been suggested within this thesis that the only way for western science to gain a true understanding of consciousness is to recognize its cultural roots in monophasia and in doing

this recognize the importance of subjective experience in the undertaking of consciousness (see James 1976; Laughlin, 1994; Lyons, 1986; and Piaget, 1971b). An anthropological understanding of consciousness can aid in this "awakening". While western science tends to ignore the knowledge available from nonwestern societies (Laughlin, 1995), anthropology searches for universals underlying human thought. It appears that western science stands alone in its unwillingness to incorporate the role of experience in producing knowledge about consciousness.

The two main problems that seem to be ever-present in consciousness studies are: first, the tendency to attribute consciousness to only highly complex forms of its manifestation (i.e. the requirement of language by Dennett or of self-awareness by Gallup); and second, the long standing belief that consciousness is a product of the mind and that this mind is somehow separate from the processes of the brain and central nervous system (i.e. Eccles). Both these views are inconsistent with the findings of modern neurobiology and evolutionary biology, and further, with a basic understanding of the etymology and meaning of the concept of consciousness. Even within our scientific framework, in light of modern neuroscience, denying that animals are conscious is no longer scientifically defensible.

In order to reasonably consider the question of

animal consciousness we must have a structural basis for judgement which is only possible through resolving the issue of brain-consciousness relations. Otherwise all judgements remain at an inferential level, i.e. they rely upon observable behaviour such as recognizing one's image in the mirror, deception, communication, altruism, problem solving, abstraction, etc. -- all of which are evidenced in the chimpanzee research, by the way (see Jolly, 1991 for review) -- as evidence of consciousness.

The basic methodological problem with such inferential methods is that any single behaviour may be produced by more than one possible structure (see Piaget, 1971a). This means that any behaviour taken as evidence of consciousness by one researcher may be interpreted as evidence of unconscious processing by another. The only way to avert this methodological dilemma is to recognize that consciousness is a wholly internal state which can be ascertained in one of only two ways, either through an introspective account given by a conscious being, or by demonstrating homologous neurophysiological structures mediating consciousness and consciousness related processes in human and nonhuman subjects (Laughlin et al., 1992). While the former method is only relevant to other human beings with which we can verbally communicate, the second method is very useful in ascertaining the presence of consciousness in nonhuman

animals, but thus far has been under utilized in arguments about animal consciousness mainly because of a lack of knowledge of neuroscience on the part of advocates (i.e. Latt, 1986). Our knowledge does develop and we do learn about the consciousness of others, but we do not have to learn that others are conscious by inference from their behaviour.

However, we know that nature is, in fact, quite conservative. Consciousness is probably a property of the organization of the nervous system of animals and evidence has shown that in most respects, the structures and functions of the human brain and central nervous system are very similar to those in other nonhuman animals. Therefore we would expect to find several homologies when comparing human and nonhuman brains (see Edelman, 1989a, 1989b and 1992; Armstrong, 1990; Jerison, 1973, 1985 and 1990; and MacLean, 1990) and in fact, brains of widely disparate phyla have been shown to exhibit remarkably similar structures and functions (Edelman and Mountcastle 1982); for instance, between primate and avian brains (Cohen and Karten, 1974; and Ułinski and Morgoliash, 1990). Furthermore, when homologous structures are established between human and nonhuman brains and such a structure is known to mediate consciousness-related processes in humans, then we may reasonably infer that they do the same in the nonhuman

animal.

However, the intent of this paper has not been to argue that human and nonhuman animal consciousness are in all respects the same. There are in fact unique aspects of human consciousness that are mediated by the distinct organization of the human brain. The best example of this is the encephalization of the human prefrontal cortex. This area of the neocortex is unique in its development during the evolution of the hominids (Jerison, 1990) and in its ability to store information and synapse it elsewhere. All sensory systems are represented within this area, and is furthermore directly interconnected with the hippocampus (involved in memory), the hypothalamus (involved in arousal and internal states) and the limbic system (mediating emotion; see Fuster 1980; Stuss and Benson, 1986; Laughlin, et al., 1992). Likewise, the prefrontal lobes in humans are much larger relative to the rest of the brain than in any other animal, and are responsible for the unique (with the likely exception of the cetacea) human capability of expansive cognized spacetime. However, nonhuman animals do have prefrontal lobes which exhibit similar, if only less advanced, faculties to humans. For example, emotional dissembling, which is also mediated by prefrontal lobe operations, is found in common with other animals, particularly the chimpanzee.

Furthermore, due to the neurognostic structure of our brains we are born interacting with other human beings as fellow conscious beings. This is why both children (see Freud, 1953; and Piaget, 1960) and most nonwestern societies (see Campbell, 1988; Turner, 1990; and Montgomery, 1991) accept the reality of animal consciousness - the belief that animals are not conscious therefore needs to be constructed (see Rollin, 1989 and Ryder, 1975).

The construction within western science of nonhuman animals as unconscious beings is done in order to protect us psychologically from the ramifications of dealing with nonhuman animals as conscious. By accepting nonhuman animals as conscious, feeling beings we would necessarily also feel a certain degree of compassion for them. It has been shown that within certain cultures compassion is felt for certain animals, i.e. the cow in India and the dog in North America. It is our culture-specific cosmologies that allow for such exceptions and through symbolic means we uphold them, it is not the "rational" or "common sense" methods that science claims to purport. However, in order to feel compassion for all living creatures we cannot protect ourselves from the suffering we would feel in knowing that they, like us, experience pain and hardship and furthermore that this pain and hardship is often caused at our own hands. However, in

order for western science to launch a truly scientific study of consciousness, the current paradigms must reach beyond practices that rationalize consciousness away. Otherwise we will continue to accept the dualistic approach of Descartes, Eccles and even Sperry, close the door on the study of the evolution and development of consciousness, and ignore all that we have learned.

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