CHAPTER TWO

Interaction: Mechanism and Meaning

Now the sum of all that is merely objective we will henceforth call *nature*, confining the term to its passive and material sense, as comprising all the phaenomena by which its existence is made known to us. On the other hand, the sum of all that is subjective we may comprehend in the name of the *self* or *intelligence*. Both conceptions are in necessary antithesis. Intelligence is conceived of as exclusively representative, nature as exclusively represented; the one as conscious, the other as without consciousness. Now in all acts of positive knowledge there is required a reciprocal concurrence of both, namely the conscious being and of that which is itself unconscious. Our problem is to explain this concurrence, its possibility and its necessity.

Samuel Taylor Coleridge[1]

Perception is where cognition and reality meet.

Ulric Neisser[2]

1.The Complementary Roles of Philosophy and Psychology

The aim of the next three chapters is to present an account of the way human beings learn. The study of learning immediately presents a problem of orientation. It is necessary at the outset to establish the relationship between the two main components of such an undertaking, the psychology of learning and the philosophy of knowledge. Learning involves a wide range of psychological changes, the acquisition of new skills, the development of changed attitudes towards oneself and others, a change in the capacity to experience and tolerate emotion, the attainment of new social skills, and so on. The investigation of learning can be said, therefore, to lie principally within the field of psychology. All types of learning, however, involve the cognitive component, the acquisition, retention, reorganisation and deployment of knowledge. The study of knowledge involves conceptual questions which fall principally within the field of philosophy. The study of learning, therefore, cannot take place independently of philosophical epistemology.

According to the school of educational theory currently most influential in this country, a clear distinction is to be made between the respective fields of philosophy and psychology.[3] While psychological study may concentrate, for example on those factors which contribute to the effectiveness of learning, the conceptual analysis of the acquisition of knowledge falls within the field of philosophical epistemology.[4] Knowledge, argues Paul Hirst, may be divided into a number of publicly specifiable "forms of understanding", achieved over the course of generations. Each form of understanding has its own distinctive logic. Learning, he argues, consists of initiation in

the understanding of the different types of logical relationships appropriate to the various forms of understanding. These logical relationships which characterise the structure of the various forms of understanding are to be distinguished from the psychological processes by which the learner arrives at his or her understanding.[5]

The distinction between the logical structure of a particular "form of knowledge" and the psychological processes involved in the acquisition of such knowledge reflects a particular type of epistemology, one based on the belief in the solidity, even objectivity of knowledge based on secure logical relationships, in contrast to the shifting sands of psychological association. The search for objective foundations has given rise in philosophy to what Stephen Toulmin calls the "City of Truth" metaphor.[6] According to empiricist epistemology, the foundations of the city of truth consist of certain, objective, empirical observations. The architectural principles by which the superstructure is erected are those of logical analysis. Empirical observation and logical analysis are, moreover, independent of one another. Philosophical or scientific certainty is to be achieved by a combination of value-free observation and logically guaranteed inference. These principles are those which W.V.O.Quine calls the "two dogmas" of empiricism:

> "Modern empiricism," he writes, "has been conditioned in large part by two dogmas. One is a belief in some fundamental cleavage between truths which are *analytic*, or grounded in meanings independently of matters of fact, and truths which are *synthetic*, or grounded in fact. The other dogma is *reductionism*: the belief that each meaningful statement

> is equivalent to some logical construct upon terms which refer to immediate experience."[7]

Quine concludes that these dogmas are, in fact, unsupportable. Analytic and synthetic truths cannot be conveniently isolated from one another for the purposes of analysis. There are, as demonstrated in the previous chapter, no observations of fact "uncontaminated" by theoretical assumptions. Empirical observation takes place in the context of assumptions based on previous experience and learning. New knowledge is inevitably assimilated, at least in part, to the structure of existing knowledge and belief.[8] An epistemology based on the "two dogmas" fails to take into account the contribution of the subject in perception, comprehension and learning. Its effect is to separate fact and value, external "reality" from the contribution of the perceiver. Knowledge is to conform to the logical structure of objective facts. The result is to reduce *meaning* to *description*, and thereby to confuse the two. It involves the assumption that any meaningful statement can be expressed as an empirically verifiable description of some state of affairs.[9]

The best modern example of this confusion is logical positivism, as expressed in the "verification principle", according to which the meaning of a statement is equivalent to the method of its verification. According to this principle, all meaning other than that of analytical statements is descriptive or factual, and the criteria for meaningfulness in any given realm of discourse is the extent to which its statements can be translated into simple descriptions capable of empirical and/or logical verification. All types of discourse in which this is impossible, including aesthetics, morals and, the main target,

metaphysics, are thereby rendered meaningless. Logical positivism is thus a modern attempt to put into practice the programme advocated by Hume on the last page of his *Enquiry Concerning the Human Understanding*:

> If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact or existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion.[10]

Beyond these basic principles of classical empiricism, however, the logical positivists were able to achieve no very substantial agreement. In particular, they were unable to agree on what constituted observation, on what status was to be assigned to "sense-data". They also failed to agree on the form of the logically pure language in which verified empirical statements should be expressed, so that there were almost as many proposals for a logical language as there were philosophers in the field.

In practice, it is not difficult to see that an epistemology which depends on the interpretation of such things as "sense-data" involves implicit psychological assumptions. The same is true for a large number of philosophers. Descartes' *Meditations* is a particularly good example. His epistemology is dependent on the analysis of data received by the senses, on considerations as to the reliability of the sense organs and, notoriously, on his conceptualisation of "mental substance" as separate from and interacting with "physical substance". Locke, Hume, Berkeley, Kant, Price and Ayer, to name but a few, all make use of psychological generalisations. Such expressions as

ideas, impressions, imagination, sensible manifold, sense data and so on are all empirical, psychological terms. Even some modern philosophers, however, fail to recognise the need for adequate experimental grounding of these basic expressions of empirical reference.

Take, for example, A.J.Ayer's *Foundations of Empirical Knowledge*. The context of his use of empirical examples is the development of the "argument from illusion", whose conclusion is that what we perceive may be unreliable or illusory. The inference Ayer draws is that we do not perceive "material objects" but only "sense data". "Sense data", he maintains, are the basic level of perception, the "foundation of empirical knowledge", and, as such, they are "incorrigible", in contrast to material objects, whose existence is simply an inference from the experience of sense data. The examples Ayer gives in support of the argument from illusion include the experience of mirages or hallucinations, the perception of a coin which, although circular, appears elliptical for some observers, and that of a straight stick which appears to bend when put into water, due to refraction. Ayer's assumption is that the use of these examples is unproblematical, that they can all be taken at "face value". He fails to see the need for a process of interpretation involving careful empirical investigation before they can be used to provide evidence for his theory. "When I look at a straight stick, which is refracted in water and so appears crooked," he writes, "my experience is qualitatively the same as if I were looking at a stick that really was crooked." This example, like all the others Ayer uses, is anecdotal. He has performed no tests to establish the regularity of or the conditions for the experiences he describes. Nor does he bother to define in terms which could be experimentally verified what is meant by the phrase "qualitatively the same". Moreover,

there are several factors which Ayer has failed to take into consideration. The fact that along with the "bent stick" we also see the surface of the water makes a significant difference. Most people are familiar with the effect from past experience, and past experience, with or without a theoretical understanding of refraction, prevents virtually every intelligent observer from interpreting their perception as a "bent stick".[11]

It is important for the philosopher to be aware of the psychological generalisations underlying his assumptions. There can be no *a priori* self-validating theories independent of the need for confirmation by reference to empirical evidence. If the tendency to ignore the philosophical dimension leads to the impoverishment of psychology, the tendency of philosophy to become an independent, self-generating area of enquiry is equally misconceived. Typical of this approach is the "logical behaviourism" of Gilbert Ryle's influential *Concept of Mind*. Ryle attempts to derive the principles of behaviourism by deduction from *a priori* premises with virtually no empirical reference. The actual scientific practice of behaviourism is barely considered. Interestingly enough, Ryle's book is in turn virtually ignored by behaviourist psychologists, most of whom are unaware or dismissive of the philosophical foundations of their own empirical work.[12] Rather than admit an interdependence between empirical and conceptual questions, between the work of philosophy and psychology, many philosophers insist on a one-way logical dependence of the study of "learning" upon that of "knowledge". The result is a tendency to ignore the implications of the results of psychological research and a resistance to any "psychological idiom" in philosophy.[13]

It is equally important, however, that psychologists recognise the philosophical premises implicit in their own work. The question as to the relation of philosophy and psychology is a particular instance of the more general question dealt with in the previous chapter, the relation between conceptual and empirical factors in scientific enquiry. Underlying any field of empirical investigation are a number of philosophical assumptions, which, although they may be taken for granted for the purposes of a particular experiment or series of experiments, critically affect the way in which the results of those experiments are interpreted. Until recently, the situation in the various branches of psychology has suffered from a general failure to appreciate this aspect of its work. Psychology has been, and remains to a large extent, divided, with little cross-fertilisation between separate areas of research or awareness of the possible implications of even the basic theoretical assumptions of one branch for those of another.[14] In cognitive psychology, for example, Ulric Neisser critises the lack of "ecological validity", or contact with everyday reality, of the theoretical approaches prevailing up to the mid-1970s. Even more important, he noted the lack of awareness of the need for a new philosophical anthropology to undergird the picture of man as information-processor generated by the growth of the cognitive orientation.[15] Conceptual progress is hindered, however, by the continuing influence of positivism. Like behaviourism, cognitive science tends to be dominated by the assumptions of Humean empiricism, both in its methodology and its epistemological assumptions. "Information" tends to be treated as if it consisted of individual, self-defining units, and mental processes understood as effects of environmental causes.[16] Even in social psychology, it is rational processes which

constitute the preferred explanation even for the factors behind the development and maintenance of attitudes or relationships.[17]

The "cognitive orientation" is a means of approaching the study of knowledge in which due regard is paid to both dimensions, the empirical and the analytical, the psychological and the philosophical. It is a development in the field of cognitive science from the information processing approach, based on the recognition of the necessity of a fundamental change in the basic paradigm required by the role of "mental events" expressed in "internal structures". Marc de Mey summarises as follows:

> The central point of the cognitive view is that *any* such *information processing*, whether perceptual (such as perceiving an object) or symbolic (such as understanding a sentence) is *mediated* by a *system of categories* or *concepts* which for the information processor constitutes a *representation* or *model* of his world.[18]

De Mey traces four stages in the development of the cognitive view. The first is the monadic, in which information is treated, in the manner of behaviourism and its underlying philosophy, as composed of separate, self-defining entities. The next is the structural stage, in which the attempt is made to define more complex structures. In the third, the contextual stage, it is recognised that meaning depends on the provision of a suitable context. In the "cognitive" stage, however, the "context" for the interpretation of new information is recognised to be the whole of the processor's existing knowledge, or world model.[19]

The fact that scientific observation and experimentation takes place within a framework of shared assumptions is a reflection of the universally applicable conditions of perception. There is no "bird's eye view", from which it is possible to develop a system of concepts which match the pattern of reality. Our conceptual world forms a lens through we which we observe the "real" world and there is no possibility of guaranteed "objective" knowledge. It is possible to distinguish between the empirical and the conceptual aspects of the study of learning and knowledge, but not to treat them independently. Empirical observation of the psychological processes by means of which knowledge is acquired takes place within a framework of philosophical assumptions. This framework, in its turn, includes an implicit psychology of perception. Framework and observation interpret and correct one another. In the course of the investigation as a whole there is a dialectical succession of priority between the two aspects of the study, the empirical and the conceptual.[20] Neither philosophy nor psychology is capable unaided of supplying a solution. They are complementary and correlative aspects of a single field, the study of cognition.

2.The Contribution of the Knower

The study of learning involves a number of cognitive processes, including perception, recognition, comprehension and memory. While all these processes are related, it is perception which is fundamental. Perception is the point of contact between the mind and the outside world. As Ulric Neisser puts it, "Perception is where cognition and reality meet."[21]

In psychology, the study of perception consistently demonstrates the active contribution of the perceiver to play a crucial and integral role. In the words of Sir Frederic Bartlett, perception can be shown to involve an "effort after meaning".[22] In his experiments, Bartlett made use of a piece of equipment known as a tachistoscope. This is used to present subjects in an experiment with a variety of images for small fractions of a second. Usually, the exposure is repeated until the subject recognises the image correctly, and the number of exposures required noted. The tachistoscope parallels the condition of uncertainty of which we are sometimes aware in everyday life, in situations such as hallucination or the "bent stick" in water, and is thus particularly well suited to demonstrate the way subjects react to this kind of uncertainty.

In his experiments, Bartlett found a consistent tendency by subjects to assimilate the information presented to their own expectations or preconceptions. A particular pattern of lines so readily evoked an aeroplane that practically all the participants overlooked the "error" in the accompanying words: "An Airoplaxe", reporting them as "An Aeroplane". The only subject who did not make this error was a man who failed to recognise the drawing as representational in any way. A picture of a notice board by a

gate suggested to 80% of observers the words, "Trespassers Will Be Prosecuted", although in practice the lettering was too small to be distinguishable. This almost universal tendency for subjects to assign meaning to an image on the basis of a global impression or salient detail and to reconstruct the image on the basis of the meaning thus assigned, Bartlett called the "effort after meaning". He concluded that, "a great amount of what is said to be perceived is in fact inferred," that the report of a perception is, in fact, most likely to be an inferential construction.

The "effort after meaning" is also regularly observed in studies in which subjects are presented with words and letters. If the image consists of about 25 random letters, only four or five are usually recalled after a short exposure. If the 25 letters are arranged into four or five words, what is recalled is usually two or three words, or about 10-15 letters in total. If 25 letters are presented in the form of a meaningful phrase then it is likely that the whole phrase will be successfully recalled. The explanation for these results is that subjects bring to the experimental task a large amount of "tacit knowledge", remembered information previously derived from experience and organised for the comprehension of new experience. In the case of this experiment, it is the ability to read which enables participants to absorb more information from the meaningful presentations than from the random letters. The average printed page contains, in fact, an enormous amount of redundant information. The skill of effective reading consists of the ability to extract the important cues, the key words and sentences, and use these to reconstruct the sense of the rest.[23]

A similar situation has been observed in studies using chess players. De Groot and, following him, Chase and Simon discovered that the difference between a master, a

good player and a beginner consists not in the ability of the better players to see further ahead nor to consider more possible moves. In fact, the masters frequently considered less moves. The difference in ability was not related to logical, deductive processes, but to perceptual familiarity. The only significant difference was found to be the ability of the master to reconstruct a given state of play from memory after an exposure of 5-10 seconds far more effectively than either the good player or the beginner. The explanation is analogous to Bartlett's "effort after meaning". For the master, the game situation is more easily reducible to a coherent pattern of meaning on the basis of the vastly superior amount of tacit, stored information derived from his experience. The information presented in the form of a chessboard is the same but the master both perceives and is able to recall more than the good player, who is in turn more effective than the beginner. This conclusion is strengthened by the fact that in randomly arranged, meaningless situations all three performed equally well.[24]

One of the most instructive experiments in this field was performed as long ago as 1949 by Jerome Bruner and Leo Postman.[25] Bruner and Postman's experiment demonstrates the importance of "set" or expectancy on perception. They demonstrated not only that observers are attentive, actively looking for meaning, but also that observers typically resist the contradiction of their expectations, though not to the point of irrationality. The experiment involved the presentation, using a tachistoscope, of a number of playing cards, included amongst which were a number of "trick" cards, a black 3 of hearts, a black 4 of hearts, a red 2 of spades, a red 6 of spades, a black Ace of diamonds and a red 6 of clubs. Following the usual procedure in such experiments, subjects were presented with the cards one by one in exposures of increasing duration

until they correctly recognised each one. Not surprisingly, it took much longer, that is more exposures of longer duration, for subjects to recognise the trick cards.

The most interesting outcome of this experiment, however, is the different forms of failure to recognise the trick cards exhibited. One common form was a dominance reaction in which either colour or, more often, shape was dominant. Faced with a black 4 of hearts, subjects would report seeing a 4 of spades or, more often a (red) 4 of hearts. Another type of failure was the compromise reaction. A red 6 of spades was reported, for example, as purple, brown, black on a reddish card, rusty colour or "black but with redness somewhere".

It is a frequent experience that on coming across a mis-spelled word one often struggles to remember the correct spelling. This type of recognition failure, disruption, was also exhibited in the experiment. Not only did some subjects fail to recognise the anomalous cards, but their expectations of normality were thrown into disarray. One subject was reported as saying, "I can't make the suit out, whatever it is. It didn't even look like a card that time. I don't know what colour it is now or even whether it's a spade or a heart. I'm not even sure now what a spade looks like!" When correct recognition did take place, it was usually quite sudden. Previous expectations were overturned and replaced by a new "set" in which anomalous cards were allowed for and consequently recognised much more quickly.

The conclusion to be drawn from this and the other experiments is that perception is an active as well as a passive process. There is an "effort after meaning" by which observers utilise tacit knowledge derived from previous experience in order to comprehend the present. As Bruner and Postman put it, "Perceptual organisation is

powerfully determined by expectations built upon past commerce with the environment."[26] Where these expectations are violated, peception is hindered.[27]

3.A Theoretical Framework: Interaction

While Hume and, following him, the empiricists understood perception largely as the passive contemplation or reception of information from the environment, the experiments described in the previous section have shown the importance of the active element in perception. The problem is how these two apparently incompatible viewpoints can be reconciled. As Neisser puts it,

> There is a dialectical contradiction between these two requirements: we cannot perceive *unless* we anticipate, but we must not see *only* what we anticipate.[28]

How is the relation between the active and the passive elements in perception to be understood?

Let us begin by viewing perception at its most basic level, namely as a physical process. Human beings are dependent for the use of their five senses on physical mechanisms, the eyes, ears, nose, tongue and skin. In addition to these, there is a "sixth sense" of great importance to perception, kinesthetic sense, or the ability to monitor the position of the body. The use of this sense in interpreting perceptual data is familiar from the experience of travelling in a lift, or when on a train slowly leaving a station, it is the platform or adjacent train which appears to be moving until the sensation of acceleration is registered.

To take sight as an example of the physical aspect of perception, information is received by the eye in the form of light waves. However, the eye is not a kind of video-

camera, passively recording a constantly moving picture. The task of the eye is as an encoder. What it does is to convert information in the form of light waves into neural signals to be relayed to the brain. These signals are not sent back in a constant stream, but in a series of impulses, and they are then recoded by the brain to give the impression of an image.[29]

The main problem for the mechanisms of perception is the problem of limited capacity. This does not refer to the limitations of memory. Of the capacity of long-term memory there is no known limit. The bottleneck in capacity occurs in the area of short-term or working memory. There is a limit to the amount of incoming information to which we can actually attend at any given time. An example of the use of short-term or working memory is when dialling an unfamiliar telephone number. Most people can remember a number long enough to dial it, but often the number is forgotten straight away and the need to redial means we have to look it up once more (an inconvenience catered for in the most recent models of telephone). This is because longer-term storage requires extra effort.[30] It has been recognised for some time that the capacity of working memory is limited to about seven items, but that these items can be of any size. For example, an isolated letter or digit makes up a single unit of memory, but so also does a word, a phrase, a sentence even a whole narrative. A unit of memory may be of any size so long as it contains within itself the key to recovering all the information included in it.[31]

The organs of perception are being continually bombarded with information, far too much to make sense of at any one time. In the face of this potential information

overload, the brain is forced to be selective, to attend to one thing and not another. To further assist in the task of comprehension, the brain is able to maximise its capacity by "chunking" or "unitising", storing information in the largest possible meaningful units, in order to comprehend as much as possible of the outside world. What the brain is looking for in incoming information is meaning, readily comprehensible units, not the uninterpreted "red patch", but the bus, or even the No.57 bus.

Let us now return to the consideration of perception from the psychological point of view, with the physical mechanisms in the background. Perception involves two types of information processing, data-driven and concept-driven processing. Data-driven processing is what is involved in receiving the incoming information. This is essentially an automatic physical and, to that extent, passive process. Light strikes the eye and causes a certain neural reaction. The information acts as a stimulus, to which the organs of perception and the brain respond. Concept-driven processing involves the deployment of tacit knowledge in such a way as to generate a "set" or expectation. In other words, it is essentially active, involving the "effort after meaning". Incoming information acts not as a stimulus but as a cue, to which the brain responds by offering an interpretation. A complete act of perception must involve both active and passive, both data-driven and concept-driven processes. Perception is not simply a process of passive absorption; people frequently fail actually to see what is there, as the playing card experiment makes abundantly clear. But neither is perception simply active. This would result in a sort of "controlled hallucination" in which perception was governed entirely by expectation. What is required is a balance between data-driven and concept-driven processing, in which perceptual meaning is neither exclusively derived from external stimuli nor totally

supplied by the subject but arises as a result of interaction between the active and passive side of the process.[32]

As long ago as 1951, Jerome Bruner proposed that perception be understood as a process of "hypothesis" and confirmation. His theory was intended to "make room for the perceiver", that is, to allow for the active contribution of the perceiver and to account for individual differences, the fact that very rarely do individuals perceive the same situation alike. Bruner's theory explained perception as the outcome of three steps:

1. The preformed "set" of the observer, governed by a series of task demands. This generates a "hypothesis", or broad range of expectations about what is likely to be perceived.
2. Input of information, understood not as stimulus, but as cue.
3. The checking, confirmation or modification of the original hypothesis, or expectation.[33]

Bruner's "hypothesis" is a determining tendency or cognitive predisposition, a generalised state of readiness for a range of responses, related to a broad range of expectations. The hypothesis will vary in "strength" according to a number of factors, including the frequency of past confirmation, the number of possible alternatives and the possible consequences for other strong expectations and for the particular goals of the perceiver of its being upset. The stronger the hypothesis, the less the information needed to confirm it. It requires less mental readjustment to recognise a bus coming round the street corner than, for example, an elephant. The role of tacit knowledge in perception is

thus as a generator of expectations, of readiness to respond in certain ways. But it is the environment itself which is the final arbiter of the validity of the perceptual hypothesis.

More recently, Ulric Neisser, in a departure from his earlier views, has put forward a theory of perception very similar to Bruner's.[34] Neisser uses the term "schema", following Bartlett, who in turn derived it from the work of Sir Henry Head. Bartlett describes schemata in the following way:

> "Schema" refers to an active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response. That is, whenever there is any order or regularity of behaviour, a particular response is possible only because it is related to other similar responses which have been serially organised, yet which operate, not simply as individual members coming one after another, but as a unitary mass. Determination by schemata is the most fundamental of all the ways in which we can be influenced by reactions and experiences which occurred in the past. All incoming impulses of a certain kind, or mode, go together to build up an active, organised setting: visual, auditory, various types of cutaneous impulses and the like, at a relatively low level; all the experiences connected by a common interest: in sport, in literature, history, art, science, philosophy, and so on, on a higher level.[35]

The function of schemata in Neisser's theory is similar to that of Bruner's hypotheses. They serve as predispositions, or organised expectations, directing

exploration of the environment and modified by the information received. The schema directs exploration of the environment, samples the information available and is modified in turn in order to respond to what is found.

Tacit knowledge is to be understood as organised in the form of "schemata". A schema provides the setting or context for the comprehension of incoming information. It is, therefore, as the playing card experiment nicely demonstrates, predisposed toward certain expectations, based on the regularity of previous experience in a given area. The "settings" which form the content of a given schema are extremely varied. Bartlett speaks of a number of levels, from types of perceptual organisation to common interests, such as history or art. A schema might represent a situation or task, such as one's route to work, or a visit to the dentist. Earlier, we spoke of the ability to read as a unit of tacit knowledge, a schema, and this suggests that the ability to speak a given language is also to be understood as a schema. In any particular situation, a number of schemata are likely to be found operating together. One's route to work, for example, may involve the skill of driving a car and the ability to read the road signs as well as the knowledge of how to get there. In addition, one may be listening to the car radio, deploying one's schemata for the understanding of music, drama or news events, and performing the other tasks, semi-automatically. Finally, the theory of interaction makes it clear that schemata are continually modified. One may think of the normal individual as continuously looking for information to make a given schema more effective. All experience is potentially a lesson for the future. It becomes so by incorporation into the active settings by which the past is organised and the present comprehended.

One of the most important features of the process of perception so described is its intentional nature. The deployment of schemata is, for the most part, entirely unconscious. It becomes conscious in cases of ambiguity, such as the attempt to make sense of a Gestalt figure, or in cases of consciously directed attention. But the unconscious processes of the "perceptual cycle" are nevertheless intentionally deployed, toward the extraction of potential meaning from the situation and the achievement of the goals of stability, coherence and comprehensibility of the environment.[36] These unconscious processes take place within a matrix of more or less conscious orientations, the choices of goal and plans for action by which we live our lives. The interaction of data-driven and concept-driven processes reflects the ongoing dynamic interaction between organism and environment, person and world.

If perception is to be understood as interaction, learning must be understood in the same way. Another important feature of schemata is that they are learned. Perception does not take place in isolation from other cognitive processes. Interaction supplies a broad framework in which the tension between active and passive elements in perception is resolved. It does so by linking perception with all the other cognitive processes, including recognition, comprehension and memory, in such a way as to make them all part of one continuous process of response to the environment, the outcome of which is learning. Interaction requires intentionality as the origin of the active contribution of the perceiver. This is to say that perception and learning are to be understood in the context of the realisation of particular goals and purposes.

4.Meaning and Intentionality

The theory of interaction proposed here involves two assumptions:

1. The cognitive processes involved in learning, including perception, recognition, comprehension and memory, are dependent in some way on physical mechanisms, those of the brain and the organs of perception.
2. The way these processes are employed demonstrates purpose or intentionality, whether conscious or unconscious.

In this section, it will be necessary to consider further the relationship between intentionality and physical processes.

The first point to be made is that intentionality can be effectively modelled by physical processes. The simplest model of an intentional world-view, that is an arrangement of tacit knowledge geared to a specific purpose, is a thermostat. This is to say that a thermostat exhibits "behaviour" based on the interpretation of specific information. The minimum requirements for the physical modelling of purposive behaviour are:

1. a transducer, to convert the particular information required, in this case the temperature of the environment, into a signal (ie. a model of perception).
2. short-term memory, the ability to hold the information on which the response is to be based.

3. long-term memory, which processes the information held in short-term memory.

4. output - "communication" or "behaviour".

The thermostat is designed to "perceive" the temperature of its environment and to represent this information in terms of the state of the mechanism. Its long-term memory consists of the programme, which specifies the temperature at which it is to operate, and its "behaviour" is to switch on and off at the appropriate state of the mechanism. A thermostat, therefore, exhibits purpose, namely to keep its surroundings at a given temperature, mediated through a world-model represented by the physical mechanism.[37]

If the thermostat is an example of a simple physical model of a world-view, the computer is probably the most sophisticated, and capable of comparison with the human mind. Artificial Intelligence, the modelling by computer of mental processes, in which the focus of attention is on the performance of the computer, has led rapidly to Cognitive Science, in which computational models are used to understand human cognitive functioning. It is at this point that the problem of the relationship of intentionality to physical systems, the old mind-brain problem, occurs in its most acute form. Can intentionality be completely explained in terms of physical processes? Can the mind be "reduced" to the status of epiphenomenon of the working of the brain?

Like the computer, the mind is a processor of information. And, like the computer, the information to be processed exists in two forms, or can be described at two levels. At one level, "information" describes the physical state of the mechanism - the

pattern of neurons in the brain or the state of the electrical connections in the computer. At another level the information exists in the form of symbols which represent elements of the outside world. In psychology, the two levels are brain and mind; in computing they are the levels of "hardware" and "software". The relationship of brain and mind is thus analogous to that between hardware and software in computing. This relation is also analogous to that between description and meaning. Information fed into the machine is a description of something. At the software level, it is a symbolic description of the same kind as an ordinary language. But if the software may be said to represent that of which it is a description, so also may the state of the machine. The electrical state of the machine also constitutes a "model" of the state of affairs described in the programme.[38] The question, "Is the phenomenon of the mind to be understood in terms of the physical functioning of the brain?" can also be expressed, "Is there a level of meaning expressed in the software or semantic level of a computer which cannot be reduced to the terms of the physical syntax of the machine?"[39]

It was the programme of logical positivism which attempted to reduce meaning to description by proposing the idea of an ideal language in which the logical relation between states of affairs would be exactly reflected. The effect of the success of this programme would have been to reduce the experience of meaning to grammatical syntax in much the same way as it is proposed, by the proponents of "strong AI", to reduce it to the physical relations of the computer. The conclusion already reached is that this programme has failed.[40] It is, ironically, Wittgenstein's *Tractatus Logico-Philosophicus*, one of the chief inspirations of logical positivism, which demonstrates its impossibility.

In the *Tractatus*, Wittgenstein put forward his "picture theory" of meaning, in which he maintained that language is to be understood as picturing reality. Language is made up either of "logical atoms" which have a one-to-one correspondence with the reality they describe or else, as in the normal state of affairs, of complex statements, which need to be analysed into logical atoms. Thus, the *Tractatus* was a perfect expression of Quine's "two dogmas". The logical atoms were intended to refer to immediate experience, and the relationships between them to picture the logical structure of reality. Despite the enthusiasm with which the *Tractatus* was received, however, Wittgenstein soon began to have his doubts about it. He was, in fact, unable to produce a single example of a logical atom, but perhaps more important than this practical failure to implement the programme, the *Tractatus* contains within it the seeds of its own destruction. On the last page of the book, Wittgenstein writes:

> Anyone who understands my propositions recognises them as nonsensical, when he has used them - as steps - to climb up beyond them. (He must, so to speak, throw away the ladder after he has climbed up it.)
>
> He must transcend these propositions and then he will see the world aright.[41]

What Wittgenstein means by these enigmatic statements is that although it is possible to assume that language pictures reality, it is impossible for language to picture this assumption, to picture the relation between language and reality. His statements are meaningless, therefore, because, like morals and metaphysics, they all fall within the area which it is impossible to express in the ideal language. It has to be conceded that there remains in the province of meaning a tacit element, namely the relation between

propositions and the reality to which they refer, which it is impossible to reduce to explicit description.

There is in the experience of meaning more than can be represented in language or symbolic relations. To return to the comparison with the computer, the ability to understand the programme requires an element of tacit knowledge, the experience of the relation between symbols and the reality to which they refer, which is itself irreducible to explicit description. On the analogy of this argument, therefore, intention is more than can be exhausted by the working of a physical system. Intentionality may be *dependent* on a physical mechanism or organism for its expression, but it is not *reducible* to the working of that mechanism or organism. The mind may be dependent on the brain, as the computer's software is dependent for its correct functioning on the set-up of the hardware. Moreover, the failure of the underlying physical system in some way will impair the ability to function meaningfully. But the characteristic of the psychological level over against the physical is intentional representation, the reference of symbols to reality. The relationship of representation to reality is an element of tacit knowledge, irreducible to explicit description.

The computer model of mental functioning is valid, therefore, up to a point. It is valid to the extent that both computers and human beings exhibit two levels of information processing, the syntactic, dependent on physical causation, and the semantic or representational. But in neither case can the two levels be simply equated or the one reduced to the other.[42] Human intentionality is not reducible to its physical base. To take an example once again from Wittgenstein, this time from his second philosophy, in the *Philosophical Investigations* he asks,

> If I raise my arm, what is left over if I subtract the fact that my hand went up?[43]

The answer is, "The intention to raise my arm." "The fact that my arm goes up" is a description of movement which has a variety of possible causes. But "I raise my arm" is the description of an action. In action, the intention to perform replaces the causal explanation. Whereas movement may be explained by means of a chain of past causes, the explanation for an action is the purpose in view; it lies in the realm of meaning. If asked, "What are you doing?", a person normally responds in terms not of the movements he is carrying out, but of the purpose involved, not, "I am moving my arm," but, "I am hailing a taxi." "What are you doing?" becomes, "What are you trying to achieve?" As Stuart Hampshire points out, it is characteristic of agents that we always know what we are doing. Even if immobile, we still direct our thoughts.[44]

To say that cognitive processes are intentional, therefore, is to maintain that they cannot be adequately described in the language of physical causation appropriate to physical systems. The language appropriate to the description of cognitive processes is the language of action and intention. The understanding of cognitive processes is dependent, therefore, on the concept of agency, a concept which will be treated at a later stage.[45]

Notes

1. Biographia Literaria, p.145

2. Cognition and Reality, p.9.

3. See, for example, Peters (ed), Concept; Hirst and Peters (eds), Logic; Peters (ed), Philosophy.

4. D.W.Hamlyn, "Human Learning", Concept of Education, ed.Peters, p.178f., reprinted in Perception, Learning and the Self.

5. Paul Hirst, "Liberal Education and the Nature of Knowledge", Philosophical Analysis, ed.Archambault, p.97f.,108.

6. Toulmin, Knowing and Acting, p.82-90.

7. Quine, "Two Dogmas of Empiricism", From a Logical Point of View, p.20.

8. See below, p.89-90, for explanation of the terms, "assimilation" and "accommodation".

9. Danto, Analytical Philosophy of Knowledge, p.159f.

10. Hume, Enquiry, p.165.

11. Ayer, Foundations, p.3-9. See Austin, Sense and Sensibilia, p.48-50, Hirst, Problems, p.36-37,48-51 for criticism of Ayer.

12. Taylor, Explanation.

13. G.E.M.Anscombe in Brown (ed.) Philosophy of Psychology; Strawson, The Bounds of Sense, p.19 (objecting to Kant).

Among philosophers who have given their attention to the activities of psychologists and their implications for philosophy is D.W.Hamlyn. But Hamlyn operates within the traditional framework in maintaining a rigid distinction between the work of the psychologist and that of the philosopher. See, for example, "The Logical and Psychological Aspects of Learning", in Peters, Concept, p.24-43, reprinted in Perception, Learning and the Self, p.71-90. See also his exchange with Stephen Toulmin on this subject in "Epistemology and Conceptual Development", Cognitive Development and Epistemology, ed.T.Mischel, p.6f. reprinted in Perception, Learning and the Self, p.107-131. The relevant article of Toulmin's is "The Concept of 'Stages' in Psychological Development", in T.Mischel, op.cit.

14. See, for example, W.Mischel, "Reconceptualisation",

15. Neisser, op.cit., p.1-9.

16. Taylor, "What is involved in a genetic epistemology?" Cognitive Development, ed.T.Mischel, p.399,401.

17. Fishbein and Ajzen, Attitudes. Schlenker, Impression Management. Clark and Woll, "Stereotype Biases". Weldon and Malpass, "Biassed Communications". See below, p.93-95, on attribution studies.

18. De Mey, Cognitive Paradigm, p.4.

19. De Mey also traces his four stages in the history of philosophy of science:

Monadic stage: classical positivism

Structural stage: logical positivism

Contextual stage: interpretation of scientific progress in terms of sociological factors, ideology etc.

Cognitive stage: the approach from the study of the characteristics of pardigms.

Kuhn's contribution is sometimes mistakenly confused, especially by his opponents, with the contextual stage. The approach to knowledge from the point of view of ideology is also a feature of this stage, and is superceded, though not discredited, by the cognitive orientation.

20. Toulmin, "Concept of 'Stages'".

21. Neisser, loc.cit..

22. Bartlett, Remembering, p.14-33.

23. F.Smith, Understanding Reading, p.28-31.

24. Chase and Simon, "The Mind's Eye in Chess".

25. Bruner and Postman, "On the Perception of Incongruity: A Paradigm."

26. ibid., p.82.

27. The playing card experiment nicely illustrates the distinction, drawn by Wittgenstein, between "seeing" and "seeing as" (Philosophical Investigations II.xi, p.193-228). Bare perception, without the element of interpretation, Wittgenstein believed to be very much the exception to the general rule. Even those things which appear too obvious to require to be "taken as" are nevertheless the objects of interpretation. Everything is what it is in a context of meaningful description. These contexts are inevitably public. Wittgenstein calls them, "forms of life". These, he appeared to believe, constitute the given. They have to be taken for granted as the context in which everything is perceived "as" something, that is, given a meaning.

28. Neisser, op.cit., p.43.

29. F.Smith, op.cit., p.25-36.

30. Lovell, Adult Learning, p.23

31. G.A.Miller, The Psychology of Communication, p.1-13,14f.

32. This point was made by Samuel Taylor Coleridge, by means of an observation on the behaviour of pond-skaters, in his Biographia Literaria:

Most of my readers will have observed a small water-insect on the surface of rivulets which throws a cinque-spotted shadow fringed with prismatic colours on the sunny bottom of the brook: and will have noticed how the little animal wins its way up against the stream, by alternate pulses of active and passive motion, now resisting the current, and now yielding to it...This is no unapt emblem of the mind's self-experience in the act

of thinking. There are evidently two powers at work which relatively to each other are active and passive; and this is not possible without an intermediate faculty, which is at once both active and passive.

That faculty, whose task was to reconcile the requirements of activity and passivity, Coleridge believed was the imagination.

33. Bruner, "Personality Dynamics and the Process of Perceiving", Perception: An Approach to Personality, ed. Blake and Ramsey, p.121-147.

34. Neisser, op.cit.

35. Bartlett, op.cit., p.201.

36. Hilgard, "The Role of Learning in Perception", Blake and Ramsey, op.cit., p.103-106.

37. N.M.Amosov, Modelling of Thinking and the Mind. New York: Spartan, 1967.

38. Craik, Nature of Explanation. Craik's treatise constitutes the basis of "Strong AI", the aim of whose programme is to provide a complete description of mental functioning in terms of a physical model. Its achievement would, in the words of Margaret Boden, be equivalent to a total scientific explanation. ("The Computational Metaphor in Psychology", Philosophical Problems, ed.Bolton, p.113)

39. See Pylyshyn, "Computation and Cognition", p.111-169; Searle, "Minds, Brains and Programmes", p.417-457.

40. See above, p.48.

41. Wittgenstein, Tractatus, 6.54, p.74.

42. On computer modelling of the mind, see further: Boden, "Intentionality and Physical Systems"; "The Computational Metaphor in Psychology", Philosophical Problems in Psychology, ed. Bolton; Dreyfus, What Computers Can't Do; Dreyfus and Haugeland, "The Computer as a Mistaken Model of the Mind", Philosophy of Psychology, ed. Brown.

43. Wittgenstein, Philosophical Investigations, I.621, p.161. The whole discussion begins at I.612.

44. Hampshire, Thought and Action, p.40f. See Swinburne, Evolution, p.85-102, for a description of action and its relation to intention and to causal relations. Acceptance of Swinburne's description of action and underlying "purposings", however, does not necessarily entail agreement with his position on the relation of mind and brain or, in Swinburne's terms, body and soul. Swinburne holds that "soul" is a category of (immaterial) substance. The view put forward below is that the foundation of human agency is the "spirit", which is a not in itself a substance, but a source of vitality or dynamism, a relational or dynamic category rather than one of substance. See below, p.155f.

45. Taylor, Explanation; Searle, "The Intentionality of Intention and Action", Perspectives on Cognitive Science, ed. Norman. See below, p.146f., for further discussion of the concept of agency.