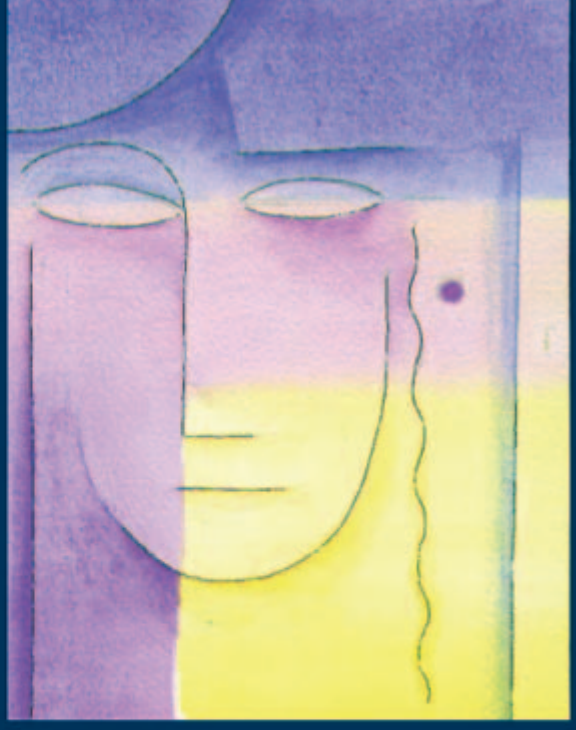

Cognitive Science

A Philosophical Introduction

Rom Harré

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List of abbreviations

ADHD	attention deficit hyperactivity disorder
AI	artificial intelligence
ASCII	American Standard Code for Information Interchange
CFS	chronic fatigue syndrome
CNS	central nervous system
EEG	electroencephalograph
GOFAI	good old-fashioned artificial intelligence
IPS	information-processing system
PDP	parallel distributed processing
PET	positron emission tomography
SSH	symbol system hypothesis
T/T	task/tool
TOTE	test/operate/test/exit
TPP	Taxonomic Priority Principle

Preface

This book is based on the Machette Lectures, delivered at the University of Ohio, Athens OH in March 1998. It gives me great pleasure to acknowledge the generous support of the Machette Foundation for the lecture series and its subsequent publication. I am particularly grateful to the Philosophy Department of Ohio University at Athens OH for inviting me and for providing such a rewarding and stimulating environment in which to do philosophy. My special thanks to James Petrik, Donald Borchert and Albert Mosley for managing the executive side of the visit so efficiently.

The basic work on preparing the lectures and the text that accompanies them was carried out when I was Guest Professor at the Philosophy Institute, Aarhus University, Aarhus, Denmark. I am very grateful for the opportunity. I owe special thanks to Uffe Juul Jensen, Chairman of the Philosophy Institute, both for the original invitation and for the many ways in which he made my stay both profitable and agreeable. I am immensely grateful to friends and colleagues with whom I had many discussions around the topics of these lectures, in particular Hans Fink and Steen Brock, as well as friends and colleagues at Aalborg and Copenhagen Universities.

The final form of this text owes much to the feedback from three generations of students at Georgetown University, Washington DC, and to the students of the Honors Program at American University in that same great city.

I am particularly grateful to my friends and colleagues Ali Moghaddam and Darlene Howard for their invaluable advice and comments.

Rom Harré
Oxford and Washington DC

Acknowledgements

I am grateful to the publishers of the following books for kind permission to reproduce various diagrams.

McLeod, P., Plunkett, K. and Rolls, E.T. (1998) *Introduction to Connectionist Modelling of Cognitive Processes*, Oxford: Oxford University Press.

Miller, G.A., Galanter, G. and Pribram, K.H. (1967) *Plans and the Structure of Behavior*, New York: Holt Rinehart & Winston.

Restak, R.M. (1995) *Brainscapes*, New York: Hyperion Press.

How to use this book in the classroom

Increasingly, over the last decade, many psychology departments are including required courses in philosophy of psychology in their curricula. The content and level of such courses vary widely. Some have been devoted exclusively to philosophy of science. Others have covered topics in philosophy of mind. The course on which this text is based deals with philosophical questions raised by the project of developing psychology as a science.

Psychology students have usually had little exposure to criticial reflections on the concepts employed in their courses on standard psychological topics. Nor are critical discussions of standard methods of research at all common in the methodology courses offered in most universities. Experience in teaching the philosophy of physics has shown that students studying a science gain most from a course which introduces philosophical issues in discussions of specific topics drawn from the science in question. This text is aimed at introducing the practice of philosophical reflection in relation to examples drawn from branches of psychology that are already covered in the usual curriculum. These are presented in a way that highlights aspects of scientific psychology of particular philosophical interest.

What is philosophy of science? The contents of courses range from studies of the logic of scientific enquiry to the sociology of scientific institutions. For the most part, the available textbooks in philosophy of science are not easy to adapt for use by psychology students. They seem increasingly to reflect the way that philosophy of science has become a specialist field detached from the sciences themselves. The tendency to confine discussion to rather abstract debates concerning topics of interest to logicians and other scholars of a formal bent has left a gap when one is looking for a text that will have some immediacy of impact on psychology students. To some extent, philosophy of mind has followed the same path, into an increasingly esoteric and specialized pattern of debate around topics that have become difficult to reintegrate into psychology courses proper. This text is an attempt to remedy the situation. The need for courses that stand back from the routine presentation of 'results' and 'theories' is felt in many departments. The courses

on which this text is based have been built up on the basis of the principle that one can be philosophical, that is one can stand back and reflect on the ontological, epistemological and methodological presuppositions of psychological practice – while remaining in close touch with that practice.

Increasingly, psychology is becoming polarized around two seemingly irreconcilable schools of thought. There are those who see, rightly, that the phenomena that psychologists study are discursive, that is, consist largely of meanings and the means by which people manage them. There are also those who see, rightly, that the instruments of cognition are material, the brain and nervous system. These positions can and should be reconciled. Courses such as those for which this book has been written could serve, one hopes, as part of a long-term project to integrate the seemingly diverse directions of cutting-edge research into a unified though hybrid discipline.

This is intended as a teaching text. Though it presents a certain point of view on controversial matters it is not intended as a treatise or monograph either in discursive psychology or artificial intelligence. I hope that enough detail has been provided as a general groundwork to the more technical aspects of contemporary cognitive psychology without the risk of intimidating undergraduates. In some universities, undergraduates may be taking as many as four other courses in the semester in which they are advised to take a philosophy course. It is essential, therefore, that examples are drawn, at least in part, from standard topics in psychology with which most will have become acquainted.

University libraries are rich in detailed studies and telling discussions of many of the topics treated here. I very much hope that students will be encouraged to pursue their own interests by consulting some of this literature. To that end, I have offered some suggestions for further reading beyond the supplementary excerpts following each Self-test section. These are only suggestions. They should not be regarded as in any way definitive of what is worth serious study.

The level of exposition presumes that classes will be attended mainly by students in their Junior or Senior years, who have already taken some psychology or philosophy courses. Specific psychological content has been presented in a simplified way, but without, I hope, becoming so schematized as to lead to misunderstandings.

The structure is keyed in to a twelve-week teaching term or semester, assuming classroom time set aside for tests and quizzes. Each 'Learning Point' is meant to summarize the material that would roughly comprise a single lecture. It is good pedagogical practice to maintain continuity in the course by using the Learning Point of one lecture to introduce the next. Each part or module is more or less self-contained, with sets of study questions appended for revision and self-testing. The study questions for each chapter are followed by suggested chapter-length readings from a list of co-texts which would be on library reserve. In practice each module fits a six-lecture pattern of teaching, completed by a review session and a test.

There is sufficient material in each part to allow different course patterns to be created by selection of particular topics. For example in Part I, Chapter 2 could be omitted or, in Part II, Chapter 4. In Part III, Chapter 8 could be left out, while

in Part IV, any one of Chapters 10, 11 or 12 could be used as an example of an integrated research program. Other patterns have been found to be workable, depending on departmental interests and requirements.

Co-textbooks

These should be on reserve in the library. Chapter-length readings are suggested for each self-test section at the end of each part. The books below have been selected not only on their intrinsic merits but also because they are believed to be in print. ISBNs have been included for the convenience of librarians.

Part One The nature and methods of science

Harré, R. (2000) *One Thousand Years of Philosophy*, Oxford: Blackwell (ISBN 0 631 21901 3).

McErlean, J. (2000) *Philosophies of Science: From Foundations to Contemporary Issues*, Belmont CA: Wadsworth (ISBN 0 534 55163 7).

Morgan, M. and Morrison, M.S. (1999) *Models as Mediators*, Cambridge: Cambridge University Press (ISBN 0 52 165571 4).

Part Two The search for a science of human behavior

Robinson, D.N. (1995) *An Intellectual History of Psychology*, third edition, London: Arnold (ISBN 0 340 66212 3).

Copeland, J. (1998) *Artificial Intelligence*, Oxford: Blackwell (ISBN 0 19 852313 0).

Part Three Towards a scientific psychology

Edwards, D. (1997) *Discourse and Cognition*, London: Sage (ISBN 0 80 397697 6).

Dennett, D. (1987) *The Intentional Stance*, Cambridge MA: MIT Press (ISBN 0 262 04093 X).

Copeland, J. (1998) *Artificial Intelligence*, Oxford: Blackwell (ISBN 0 19 852313 0).

Part Four Cognitive science in action

Cohen, G., Kiss, G. and Le Voi, M. (1993) *Memory: Current Issues*, Buckingham and Philadelphia: Open University Press (ISBN 0 335 19079 0).

Way, E.C. (1992) *Knowledge Representation and Metaphor*, Dordrecht: Kluwer (ISBN 1851516390).

Gillett, Grant (1999) *The Mind and its Discontents: an Essay in Discursive Psychiatry*, Oxford: Oxford University Press (ISBN 0 19 852313 0).

Additional readings

There are many useful publications covering aspects of the topics covered in this text. The following are recommended for supplementary reference.

Boden, M.A. (1988) *Artificial Intelligence in Psychology*, Cambridge MA: MIT Press.

Button, G., Coulter, J., Lee, J.R.E. and Sharrock, W. (1995) *Computers, Minds and Conduct*, Cambridge: Polity Press.

Dreyfus, H.L. (1972) *What Computers Can't Do: a Critique of Artificial Reason*, New York: Harper & Row.

Engel, S. (1999) *Context is Everything: The Nature of Memory*, New York: Freeman

Fulford, K.W.M. (1998) *The Philosophical Basis of Ethics: Standards in Psychiatry*, Preston: University of Lancaster Press.

Giere, R.N. (1988) *Explaining Science: a Cognitive Approach*, Chicago: University of Chicago Press.

Gigenrenzer, G. and Goldstein, D.G. (1996) 'Mind as computer: birth of a metaphor', *Creativity Research Journal* 9: 131–44.

Gillies, A. (1996) *Artificial Intelligence and Scientific Method*, Oxford: Oxford University Press, chapter 2.

Luria, A.R. (1981) *Language and Cognition*, New York: Wiley.

Sobel, C.P. (2001) *The Cognitive Sciences*, Mountain View CA: Mayfield.

part one

The nature and methods of science

Psychology is the study of thinking, feeling (emotions), perceiving and acting. The field of cognitive psychology has traditionally been concerned with just one of the four kinds of psychological phenomena: namely, thinking or cognition. What do we mean by 'cognition'? In scientific matters it is unwise to set up hard-and-fast definitions. It is best to list some examples of what a general concept covers, and to add an etcetera! Among the psychological phenomena in the field of cognition are remembering, reasoning, calculating, classifying, deciding, etc.

In recent years it has become increasingly clear that neither the psychology of the emotions, nor the psychology of perception, nor social psychology can be studied without considerable attention being paid to the role of the processes listed above as the topics of cognitive psychology. In this text we shall be concerned only with the principles and methods of the scientific study of cognition.

Cognitive science is the attempt to study cognitive phenomena in a way not unlike the way the physical sciences study material phenomena. Physics includes mechanics, the study of the laws of motion of elementary material things. Chemistry includes the study of the synthesis of material substances from other material substances in the light of knowledge of their atomic constituents and internal structures. In recent years the field of cognitive science has been taken to include the study of the relevant aspects of the neuroanatomy and neurophysiology of the brain and nervous system.

The history of attempts to create a cognitive *science* which includes both naturalistic studies of thinking and technically sophisticated studies of the relevant brain activities, reveals many false starts. For the most part the failure of these programs of research can be accounted for by the philosophical presuppositions that their progenitors took for granted. Science is a human practice. Like tennis, the law, politics and other human practices, science has its presuppositions. Some presuppositions of past attempts to create a science of the cognitive activities of human beings were metaphysical, such as the presupposition that the domain of cognition involves non-material entities, ideas in the mind. Some were methodological, such as the presupposition that the work of cognitive

psychologists can be reduced to a study of the material aspects of thinking alone, psychology as neuroscience. In studying a scientific project philosophically we bring out taken for granted presuppositions and subject them to critical scrutiny. To do well in the practices of some domain it is desirable to have a clear idea of what is presupposed in what one does. Philosophical studies of presuppositions have a practical role.

Not only are there philosophical presuppositions involved in the practice of the sciences, but there are highly influential philosophical theories of the very nature of science itself. These too we must scrutinize. Taking the sciences to be the disciplined searching for indubitable truths, philosophers have demanded that only what can be perceived by the senses should be admitted to the domain of the sciences. This is the philosophical position of positivism. The contrasting position is realism. The physical sciences, from their beginnings in the ancient world, have been based on hypotheses about processes that cannot be readily perceived. Astronomers imagined various heavenly architectures. Chemists and physicists imagined a realm of minute, invisible atoms, the motions and rearrangements of which accounted for the phenomena human beings could perceive. Realists argue that we have good reason for preferring some pictures of the invisible regions of nature to others. The history of the physical sciences shows a pattern of back and forth between positivistic reactions to unsupported speculations about the causes of what can be observed and realist developments of more disciplined and plausible hypotheses about the world beyond the limits of the senses. At the turn of the third millennium the physical sciences are in a strongly realist phase of this cycle. Physicists are happy with quarks. Chemists have no trouble with atomic structures. Biologists are comfortable with genes. Geologists talk freely about tectonic plates, and so on. We will follow the fashion. The program for cognitive science presented here will be realist, using techniques like those well established in physics, chemistry, biology and the earth sciences, to pass beyond what can be perceived by the senses, into the deeper realms of material reality.

As we look into the philosophy of the natural sciences for guidelines to be followed in developing a scientific psychology of cognition, we find two main aspects of scientific work. There is the complex task of classifying the phenomena of the field of interest. This requires not only that they be found places in a classificatory scheme, but also that such a scheme be well founded, free of contradictions and linked with theories about the nature of what it is we are classifying.

Then there is the task of building explanations of the phenomena of interest. For the most part the processes that produce phenomena are not observable in the same way as the phenomena, if they are observable at all. Chemical reactions can be seen, heard and sometimes smelled. The molecular processes by which they are explained cannot be. Molecules and their behavior are works of the human imagination, representing, one hopes, real productive processes. The techniques by which this phase of scientific work is done are well understood.

However, the insights that have come from a close study of the physical sciences have yet to be fully integrated into the methods of cognitive science. In our course we shall be at the 'cutting edge', learning the very latest techniques for

creating explanations of psychological phenomena that can stand alongside those of physics, chemistry and biology.

Part I introduces two main themes. We shall be learning how philosophers delve into the presuppositions of human practices. Then we will look closely into the two main phases of a scientific research program, classifying and explaining. Bringing the two themes together will introduce us to the philosophy of science. We shall then be ready to follow the history of attempts to found and develop psychology as cognitive science.

A science for psychology

There are two aims in the course. One is to gain a command of what it takes to make a philosophical approach to a human practice, unearthing the presuppositions upon which a way of thinking and acting depends. The other is to achieve some mastery of the basic principles of a unified cognitive science. We shall take for granted that both projects are worth undertaking. Philosophy is a long-standing way of taking up a critical attitude to human practices. Cognitive science, in the hybrid form we will develop it in this course, is, one might say, the best shot yet at achieving a genuinely scientific psychology. There have been many such attempts in the past, but all have so far fallen by the wayside for one reason or another. We will pay some attention to the debris of past enthusiasms that litters the path of history. From each false start we can gain a better view of what it would take to get it right eventually.

We begin with an overview of two aspects of our topic, first sketching the way scientific knowledge is produced and presented. Then we turn to examine what is involved in doing philosophy. We shall then be in a position to understand what it is to do philosophy of science, bringing the two disciplines into fruitful conjunction. It will then be an easy step to the constructive phase of the course – coming to a philosophical understanding of what is required for there to be a science of cognition – a genuinely scientific psychology.

What is the domain of cognitive science?

There is a range of human activities – remembering, deciding, reasoning, classifying, planning and so on – that have traditionally been thought to belong to a group of mental processes, generally falling under the label 'cognition'. We can think of cognitive activities in terms of tasks. We use our cognitive powers and capacities to carry out all sorts of projects, from deciding what to wear to a party to 'keeping tabs' on a bank account. We may use our cognitive powers to solve problems – for example, to find the shortest way home. Tasks can be performed well or ill, carefully or carelessly, correctly or incorrectly, with many

intermediate possibilities. Solutions can be more or less adequate, more or less cleverly arrived at, and so on.

The study of these activities, and the standards to which they are taken to conform, is *cognitive psychology,* the descriptive phase of a psychological science. However, what about the explanatory phase? What must be invoked to account for a person's ability to make choices, to do sums and to solve problems? The principal thesis of what has come to be called 'cognitive science' is that there are neural mechanisms by which cognitive tasks are performed.

The course for which this textbook has been written is based on the conviction that cognitive science should cover a broader field than just the neuropsychology of cognition. It is based on the principle that any branch of psychology, be it the study of cognition, emotions, social action or any other aspect of human mental life, is necessarily a hybrid. It must encompass the naturalistic study of psychological phenomena as they are manifested in what people do. It must also include an empirical and theoretical investigation of the neural mechanisms by which people act and think as they do. Both types of research, however different the natures of the phenomena they study, can be carried out in conformity with the standards and methods of *scientific* investigations. We will develop our understanding of the nature of scientific as opposed to other kinds of research by attending to how research is actually conducted in the realm of the natural sciences.

Why should it be necessary to take time out to establish what is needed to make a method of enquiry 'scientific', in the sense that chemistry and physics are scientific? In the not so recent past psychologists slipped into following mistaken or partial interpretations of the natural sciences. This was particularly true in the days of the dominance of behaviorism. We shall follow the rise and fall of behaviorism as a case study. It illustrates very well how mistaken philosophical views on the nature of science can exert a malign influence on the development of a new science. Even now, a good deal of the misleading terminology of behaviorism and the simplistic empiricism of which it was a part survives among the presuppositions of some contemporary psychology. Fortunately, philosophers of science now offer us a much more satisfactory and plausible account of the natural sciences than heretofore. This will be our guide in following the way that a true cognitive science can be developed.

Our studies in this course will begin with a thorough analysis of the natural sciences. This will provide a methodological springboard from which we will build our understanding of the actual and possible achievements of cognitive psychology and its relation to neuroscience. It will also give us the ability to identify and understand some of its current shortcomings and to appreciate the ways we may overcome them in fruitful programs of research. Some of the practical exercises suggested in the text could become contributions to the growth of cognitive psychology itself.

This course is demanding. We shall be dealing with four disciplines: philosophy of science, discursive or naturalistic psychology, cognitive psychology and the modeling of thought by the use of techniques from artificial intelligence. Finally, to complete the progression, some basic brain chemistry, anatomy and

physiology will be required to understand how some and only some forms of computer modeling can be fruitful sources of deep theories in cognitive science. Inevitably, none of these disciplines can be studied in real depth, but that does not mean that the aspects selected in this treatment will be superficial. Readings in supplementary specialist textbooks will, therefore, be of great importance. They will be given in detail as our studies progress.

When we carry out cognitive tasks such as calculating or classifying we use systems of symbols, *meaningful* shapes, marks, patterns, real and imaginary, sounds and so on. One major problem, to which we will frequently return, is how to give a plausible account of what it is that makes a mark a meaningful mark. This is the problem of *intentionality*. No serious efforts at creating a cognitive science can pass it by.

There are right and wrong ways of using symbols which are meaningful for us. One useful metaphor for discussing the standards of their correct uses is to think of manipulating them as if we were consciously paying attention to rules and instructions for so doing. A key field of investigation in the philosophy of cognitive science is how to express the norms that are evidently at work in much that we do but that we are not consciously following. If norms are not expressed as explicit rules and conventions how can they be so efficacious? This is the problem of *normativity*. This problem too must be tackled as we try to build a science of cognition.

Among the symbols and symbol systems we use are words, gestures, signs, diagrams, models, drawings and so on. Cognitive psychology must start with studies of activities such as classifying or remembering, as they are performed by people using the symbol systems available to them in their own cultures. A dancer thinks of a routine in the form of a flow of bodily movements. A student remembers the theme of a lecture in the form of words, propositions. A chemist may think about a chemical reaction in the form of a model or picture of the flux and reflux of ions in a solution.

How are these cognitive tasks performed? By the use of organs in the brain and nervous system, 'cerebral tools'. Cognitive science must include an essential neuro-anatomical and neuro-physiological dimension. We must not forget that most of us possess a supplementary kit of prosthetic devices, such as electronic organizers, which can take over some of the functions of the tools we are endowed with naturally. One can use one's brain to remember an appointment, one's hippocampus to find one's way home and so on. However, one can also use a diary for keeping track of personal commitments in time and a map to manage one's movements in space. Nowadays each of these devices is readily available in electronic form. One of the major questions we will be asking is how much can we learn about how the natural tools work from understanding how the artificial ones do their version of the job. This will take us into the field of artificial intelligence and computational models of the mind.

Our first acquaintance with cognitive activities comes very early in life, much earlier we now believe than had hitherto been thought. Under the influence of the recently rediscovered developmental studies of L.S. Vygotsky (1978), we no longer think of ourselves as maturing cognitively as isolated individuals

according to some predetermined schedule, step by step. Our cognitive skills have their beginnings in the flow of symbolic activity of ordinary life in co-operative activities with other people, particularly in the family. Vygotsky's importance for cognitive psychology comes from his work in unraveling the complex processes by which the cognitive and practical skills of adults are acquired by infants and young children in social interactions. Higher order cognitive functions, he said, appear first in the relations between people and only later as part of an individual's mental endowment. First of all we think publicly and collectively with the assistance of others. Only later do we get the knack of thinking privately.

What makes a study program scientific?

In a scientific treatment of some domain, for example the surface of the earth, we make use of a classification system to identify, describe and categorize the main features of geography. We use such categories as 'islands'. 'continents', 'oceans', 'seas', 'estuaries' and so on. In most sciences, intermediate or borderline cases soon appear, and boundary disputes take place. Is Australia a large island or a small continent? Questions like this can never be settled by observation or experiment. It is not a matter of fact until we have settled on how we will use the concept of 'continent'. Adherents of one way of drawing a boundary around the domain of a classificatory concept offer their reasons and their opponents offer theirs. Issues of convenience, consistency and so on are used to bring agreement on a working convention for settling the scope of application of a category.

A scientific treatment of the surface of the earth would be incomplete without an explanation of how the observable features and their patterns of distribution came about. Why does South America seem to fit so snugly into the curve of Africa, if we imagine them juxtaposed? Scientific explanations typically postulate unobservable entities and processes which bring about the geographical features we can observe. In the case of the earth, geologists nowadays invoke the existence of tectonic plates, slowly moving across the semi-liquid magma in the interior of the earth, and carrying the observable features of the surface with them.

How could we possibly know what these plates are like? We cannot observe them as they are in themselves. Beliefs about the unobservable entities and processes that account for observable states of affairs are usually arrived at by the use of powerful, plausible and fruitful analogies. Instead of trying to think about the real but inaccessible deep structures of earth's crust, we think about Wegener's tectonic plates. How we do that? The plates are a model, that is, a pictorial representation of the real structures. We imagine what they are like by drawing an analogy with something we already know. Perhaps Wegener, the man who first proposed the theory of tectonic plates, saw a similarity between the behavior of icefloes grinding against one another as they are driven by currents in the water and tectonic plates grinding against one another as they are driven by the circulation currents of the molten iron that forms the core of the earth.

Thus a complete earth science must be a hybrid of geography, playing the descriptive role, and geology or plate tectonics, playing the explanatory role.

Here we have a simple example of one of the major techniques of theory building in science. This is model making, using analogies with discretion. Understanding the role of models in science leads to an understanding of the main research methods and procedures by means of which human beings, limited in space, time and resources have gained an understanding of the forces of nature. This has enhanced the human capacity to manage and manipulate them. Most philosophers of science now believe that the basis of our understanding of nature is our capacity to create and manipulate analogs and models of those aspects of the material world that interest us.

Giving written or discursive form to the insights we thus acquire, that is, presenting our scientific knowledge in books and articles, is a secondary matter when compared with the primacy of model making.

learning point

What is science?

1 A science consists of:

- **a)** An ordered catalog of phenomena.
- **b)** A system of models representing the unobservable mechanisms by which observable phenomena are produced.

2 A scientist therefore needs to have:

- **a)** A system of concepts for classifying phenomena. These will define types and kinds, and so create a taxonomy.
- **b)** An accepted source of concepts as a means of controling the making of models, representing the unobservable processes by which phenomena are produced.

Ideally the classification system and the repertoire of explanatory models should be linked in a coherent overall system. There are various ways that this can be achieved.

Philosophy in the context of science

Philosophers try to bring to light and critically examine some, at least, of the presuppositions upon which the effectiveness, intelligibility and so on of human practices depend. This involves making a preliminary distinction between factual presuppositions and presuppositions concerning the relations between concepts. Conceptual presuppositions are evident in the meanings we give to our concepts and the ways that we take them to be interrelated.

The realization of the great importance of this basic distinction has been one of the major philosophical contributions to our ability to interpret the sciences and to our sensitivity in detecting deep-lying fallacies and muddles. We

have learned from Wittgenstein how easy it is to fall into treating an issue about concepts or the uses of words as if it were an issue about matters of fact. Is it just a matter of fact that I cannot feel your pain, or is it a matter of how the word 'pain' is to be used in everyday language? If it is a matter of fact, it could have been otherwise. If it is a matter of the uses of words, we ought not even to make sense of the alternative.

Matters of fact are adjudicated by observation and experiment. Nevertheless, conceptual presuppositions are always involved. To rely on observation and experiment we must presuppose that there are no paradoxes, contradictions or other faults in the system of concepts we use to describe our factual discoveries. Philosophical investigations sometimes involve asking how well a factual presupposition of one aspect of a practice fits with one or more conceptual presuppositions of some other aspect. For example, the practice of finding people guilty of breaking the law presupposes that as a matter of fact someone could have done otherwise than he or she did. However, this clashes with the presupposition of much of psychiatric medicine that in fact aberrant social behavior is fully explicable in terms of neurophysiology and genetics.

Matters of the rules for the correct use of words and other symbols are adjudicated by an analysis of meanings. Sometimes such an analysis reveals unnoticed confusions, contradictions and other faults in a seemingly coherent conceptual system. These can be revealed by studying the interrelations among the meanings of the words that are the verbal expression of a conceptual system. For example, if it is a matter of the meanings of words that people are active agents purposefully finding their way through the problems of living, how can that be reconciled with the use of the concept of unconscious wishes driving a person to behave in ways that are contrary to a long-standing pattern of life?

This kind of critical analysis of large-scale conceptual systems often involves making connections with presuppositions of adjoining practices. For instance, legal philosophy and medical ethics involve cross-connections and comparisons between medical and legal uses of what seem to be the same concepts. In both practices, important parts are played by concepts such as 'death', 'madness' and so on. The *concepts* of 'life' and 'death' have changed in recent years, and this has had its effect on how the law interprets such controversial practices as abortion and euthanasia. To illustrate the fundamental distinction between the two main kinds of presuppositions let us examine a simple, everyday practice. What is presupposed in ordinary commercial transactions where money is used in exchange for goods and services?

An elderly philosopher approaches the ticket office at Jefferson's mansion at Monticello. The clerk says, 'The entrance tickets cost $20.' The philosopher proffers $15 and his Golden Age card. He receives an entrance ticket. What has been presupposed in this not untypical human practice? First of all, here are some *factual presuppositions*:

1 Hidden from view there is a mansion.
2 There was such a person as Thomas Jefferson, who ordered the construction of the mansion in accordance with his plans.

3 There is a discount for senior citizens.
4 The philosopher is a senior citizen and the Golden Age card is his.
5 This is Monticello, Charlottesville, Virginia.
6 The dollar is the local unit of currency.

Here are some *conceptual or philosophical presuppositions*:

1 Dollars are fungible, that is, the $5 bills the philosopher received in change elsewhere are still, in this new context, worth $5. It would not make sense for the philosopher to ask the cashier, 'Which $5 do you want?'
2 The mansion, being a material thing, will still be there when the visitor has ascended the hill.

Since the philosophical presuppositions do not involve matters of fact, they can be brought into question only by discussion and analysis. For example, one could get into a discussion about the concept of 'money'. The concept has changed since the days when Hamilton settled on the Maria Theresa thalers, the original silver dollars, as the federal unit of currency. Now dollars are more often than not electronic somethings in cyberspace. Our visitor could have paid by debit card. One could get into a discussion about the concept of a material object. For example, is the mansion that is eventually visited by the philosopher the same mansion that is being visited by each person in the group, if, as some philosophers have maintained, the mansion exists for each visitor only as patterns of colored patches in their personal and private visual fields?

Philosophy of science is a study of the non-factual presuppositions of the practices of the natural and the human sciences. In short, it is a study of the systems of concepts that are put to work in scientific research and theorizing.

Some other terms for presuppositions

Thomas Reid (1788), writing towards the end of the eighteenth century, called the presuppositions of the human way of life 'the principles of common sense'. By 'common sense' he did not mean everyday wisdom but rather principles that formed a shared background for everyone capable of rational thought.

In the same period Immanuel Kant (1787) coined the phrase 'synthetic *a priori* propositions' to identify the working presuppositions of perception, thought and action. He meant by this to draw attention to the fact that, as he thought, we did not arrive at these principles by the analysis of our experiences. Rather they were what made orderly experience possible. By calling them *a priori* he wanted to emphasize that they were *not arrived at from experience*. By calling them *synthetic* he wanted to emphasize their role in the processes by which our minds synthesize the raw data of the senses into the material world as we know it and, at the same time, into our thoughts about that world. Somehow each person comes into the world equipped with the same basic system of schemata. Though we perform our syntheses of sensations individually to reciprocally create our worlds and our minds, the worlds we create are more or less the same.