

V O L U M E III

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FOOTNOTES TO THE INTRODUCTION

(1) The term "urban planning", its variable usage and meaning and the contexts with which it is associated are discussed in Chapter two.

(2) Some aspects of the "newer" philosophy of science are discussed in Chpaters four (sect.6) and eight (sect.3), with reference to the work of T.S.Kuhn, P.K. Feyerabend, I.Lakatos, and others. Notions relating to the Kuhnian conception of "paradigm" are discussed in Chapter eight, footnote (55). The Husserlian programme for a "presuppositionless inquiry" is referred to in Appendix to Part II, entry: "The Phenomenological Method".

(3) The notion of a "problematic" features prominently in the work of Louis Althusser; its transfer in planning was due to Hasan Ozbekhan. Cf. Chapter eight footnote (55), where reference is also made to "language games" as an element of the work of the "later" Wittgenstein. In connection with the latter, see also Appendix to Part II, entry: "Linguistic Philosophy", and Chapter five, sect.2. Hermeneutic philosophy is discussed in Chapter five, sect.4, 5, and 6; The kind of planning that ensues by adopting an interpretative (or hermeneutic) perspective is discussed in Chapter five, sect.6. A form of planning that would be informed by the synthesising perspective of Critical Theory, attempting to reconcile scientific, hermeneutic and critical views, is discussed in Chapter five, sect.5.

(4) The formal sciences of logic and mathematics are briefly discussed in Chapter six, sect.4.

(5) The assumption regarding stable material things and enduring structues is characteristic of the materialist foundations of modern science. It is discussed in the context of prediction of social phenomena, in Chapter nine, sect.4; and in Chapter six, sect.1.

(6) What is referred to as the "hermeneutic circle" or "spiral" is discussed in Chapters five (sect.4 and 6) and eight(sect.3).

(7) A large portion of this thesis is about models and certain epistemological and methodological questions that arise during their application in cognitive inquiry. In fact the whole of Part II is devoted to the task of unravelling the snarls of the language employed to speak about models; clarifying the ways in which models are conceived in the framework of theories <u>about</u> science -- e.g. positivism, instrumentalism, realism; characterising the status of models in the edifice of knowledge; and assessing the tasks that they are invoked to accomplish in cognitive activities. Characterisations of "model" corresponding to different views of science are to be found in that Part. In the context of this Introduction, "model" is taken in one of its senses as an instrument for achieving specific or general research objectives rather than as an interpretation copying some empirical domain either sharing the same structure with it or describing some hypothesised and potentially <u>real</u> structure or mechanism that generates the phenomena in that domain. For these distinctions see Chapter fourteen, below.

(8) Cf. Appendix to Part II,entry:"The phenomenological method";also Chapter five, sect.3.

(9) The realist (or neo-realist) philosophy of science is acquiring prominence among contemporary philosophers of science and social science as an "objectivist" replacement of the receding positivist philosophy. It comes into sharp contrast with instrumentalist and conventionalist conceptions of science with which what is referred to in this thesis as the "newer" philosophy of science has many affinities. The realist account of models and scientific method is discussed at length in Chapter twelve, sect.5. A more general account of realism as a set of philosophical views advanced by the Oxford philosopher Rom Harré is given in the Appendix to Part II, entry: "Realism". Distinctions between realism and instrumentalism (and positivism) are drawn in Chapter fourteen in connection with the conception of "model" advanced by each of these theories of science.

(10) Positivism as a philosophical tradition of the nineteenth century and in its reformulation in the first quarter of the twentieth century has been perhaps the most influential single philosophical school in Western culture. If its philosophical programme appears to be much discredited in contemporary philosophical debates, its methodological programme in association with much of its epistemology is still widely adhered to in the actual practice of social scientific research -- with the ensuing "straightjacketing" of conceptual categories and impoverishment of the meaning aspects of social life. A brief general account of the positivist and logical positivist programmes is given in the Appendix to Part II, entry: "Positivism and Logical Positivism". The positivist tradition which informs research undertakings in the modelling of social/spatial phenomena -- such as

"social physics", locational analyses, ecological theories of the city -- is discussed and criticised in Chapter two, sub-section 3.1. The positivist "Logic of science" which is also referred to as "scientific method" is discussed in Chapters six and seven (though not in terms restricted to positivism). Positivism as methodological naturalism in the social sciences is discussed in Chapter nine, in the context of the "methodological debate" in the social sciences. On these issues see also Appendix to Part II, entry: "Naturalism (in the social sciences)". Positivist views on epistemological issues of description, prediction, and explanation are reviewed, and contrasted with alternative accounts of the same issues, in the Appendix to Part II, entry: "Description versus explanation". Positivism as an orientation informing attempts at scientification of decision making and planning, postulating strict separation of factual and evaluative statements which roughly corresponds to the distinction between <u>means</u> and <u>ends</u> in planning, is discussed in Chapter ten.

(11) Cf. Chapter fourteen for these important distinctions.

(12) Cf. Chapter eight, sect.3; Chapter nine, sect.6.

(13) See the relevant discussion of aspects of the "methodological debate" in the social sciences in Chapters four, sect.2; and nine; see also Appendix to Part II, entry: "Naturalism (in the social sciences)".

(14) The nature of the subject matter of planning, and the disciplinary status of this field are discussed in Chapter ten.

(15) The meaning of "humanism" and various "humanistic" or human-centred approaches to the study of social life are discussed in Chapters three (sect.5), four (sect.2) and five. The contrast between scientific and"humanistic" approaches is reviewed in Chapter nine.

(16) Pragmatism as a set of loosely connected philosophical doctrines many of which extend to issues of social theorising, social inquiry and policy making has been recently revived in the context of planning as is obvious in the works of the so-called "new humanists" such as Dunn and Friedmann, but also in Ozbekhan's attempt to create a plausible world view cum philosophical framework for planning. These works are discussed and referenced below. Pragmatism takes a view of science and knowledge acquisition as guided by particular human interests and aimed at achieving human goals. In this sense its epistemology appears to be eminently applicable in planning for it conceives knowledge as a guide to action. There are also many affinities between pragmatism as "instrumentalism" and a widely accepted model of the planning process (cf. Chapter ten). The "newer" philosophy of science has also utilised several conceptual formulations of the pragmatists. Pragmatism as instrumentalism is briefly discussed in the Appendix to Part II, entry: "Instrumentalism". Various aspects of the social thought that was developed within the pragmatist tradition are reviewed in different sections of the thesis, including Chapter one, (sect.2, 3); Chapter three; Chapter four (sect. 1,3); Chapter ten(sect.3).

(17) A number of these issues are investigated in Chapters four (sect.2), five, and nine. Material relevant to the various humanistic

approaches being discussed is also included in the Appendix to Part II, entries: "Naturalism (in the social sciences)"; "The Mind/Body problem"; "Linguistic philosophy"; "The phenomenological method".

(18) These formulations relate to the work of the Critical Theorists of the Frankfurt School, especially to the contributions of Jurgen Habermas. Critical theory is discussed in Chapter five (sect.5) and it is also studied in relation to the kind of planning that would ensue under its guidance. It is also seen in relation to other interpretative approaches to planning, in Chapter five (sect.6).

(19) Some of the ways in which the metaphor of the machine informs social theorising and planning are discussed in Chapter two, sub-section (E).

(20) These issues are discussed in Chapters three and ten.

(21) See Chapters two (sub-sections (A),(D)), nine (sect.4), ten (sect.3), thirteen (sect.6).

(22) The issue of theory/"practice" interrelations in planning is discussed in various parts of the thesis, most notably in Chapter five (sect.5 and 6).

(23) A notable exception to this is Karl Popper's approach to technological planning which is not to be confused with positivism.

(24) See Chapters three (sect.3,4,5), four (sect.3), and ten (sect.4).

(25) These could be characterised as attitudes or orientations towards investigation of the processes and problems involved in effecting planned changes in society; cf. Chapter three (sect.4, 5).

(26) Cf. Chapter five (sect.5).

(27) On this issue, see Chapter two (sub-sections (D) and (E)); Chapter four (sect.2,6); Chapter nine; Chapter ten.

(28) Cf. Chapter two (sub-sections (A) to (E)).

(29) See Chapter seven, sect.2.

(30) See Chapter eleven, sect.5; Chapter fourteen; also Appendix to Part II, entry: "Realism".

(31) See Chapter fourteen.

(32) See Chapter five, sect.6; Chapter nine.

FOOTNOTES TO CHAPTERS ONE AND TWO

(1) The term "paradigm" is a relatively new addition to the vocabulary both of the philosophy of science and of the natural and social sciences. It was introduced by the historian and philosopher of science Thomas S.Kuhn in his (KUHN, 1962/1970). The term has been and is being used to denote a number of different meanings (even its originator is demonstrably responsible for such "multiple definitions" (MASTERMAN, 1970: pp.59-89)); and is discussed and explicated in greater detail below (later in Part I). For the purposes of this chapter suffice it to introduce the notion of "paradigm" as "an exemplary piece of scientific work which creates a research tradition within some specialised area of scientific activity. The paradigm ivestigation provides a working model of how to do science in some area, giving concrete guidance on experimental method, apparatus and theoretical interpretation" (BLOOR, 1976: p.50).

(2) Mathematics, astronomy and optics were assiduously cultivated areas of scientific thinking even before Classical Greece. However, they formed integral parts of the general framework of philosophy. For references, cf.(HEATH, 1949: pp.11-12).

(3) Opinions differ considerably in relation to the general characteristics of a metaphor and the precise definition of the metaphorical process. At the one extreme of the spectrum of views lies the claim that metaphor is the circumlocution of one idea in terms of another (BEARDSLEY, 1958); (BLACK, 1955: pp. 273-294). In this context,metaphors represent the conscious designation of the content of a thought using the name of another thought which is to some extent similar or analogous to the former.

At the other end of the spectrum is the notion of a metaphor as a tool for discovery. In this sense,it is taken to signify the act of associating two disparate ideas whose fusion results in a new creation (CASSIRER, 1946/1953); (RICHARDS, 1955). Because the problem of acquisition of human knowledge through the metaphor requires a more operational approach than such disparate views can provide, a concept of metaphor has been propounded which specifies it as a speculative reflection on a subject -- the metaphor being made explicitly available for testing and confirmation. This notion of a metaphor implies linking together (through analogy) in one's existing knowledge two thoughts from different sources. A new idea or insight is the creation resulting from that interaction (BLACK, 1955: pp.273-294); (EMBLER, 1951/1954); (PEPPER, 1942).

(4) The clock has been a dominant metaphor in science since the Middle Ages (WHITE, 1962: p.126). It is also referred to as "clockwork" or "mechanism" the source of numerous metaphorical connections in models and "theories" of urban phenomena. Such connections and their implications in terms of presuppositions inherent in the models are explored below.

(5) The ensuing discussion is informed by (HILLIER and LEAMAN, 1972: pp.40-41); (SIMON, 1969); and (HILLIER and LEAMAN, 1973) -- the order of the sources corresponding to the proportion of credits due to each of these works.

(6) The terms Rationalism and Empiricism are used to denote two great traditions in classical philosophy. Developed mainly by Descartes (1596-1650),Leibniz (1646-1716), and Spinoza (1632-1677),

Rationalism is a philosophical theory which claims that it is possible to arrive at substantial knowledge about the world by pure reasoning alone independently of sense preceptions or empirical premises. The general principles of Rationalism oppose the main theses of Empiricism which originated as a reaction against Rationalism. Empiricism has been developed by a succession of British philosophers, most notable among them being Locke (1632-1704), Berkeley (1685-1753), Hume (1711-1776), and J.S. Mill (1806-1873). Very roughly, the empiricist theory of knowledge claims that all knowledge is founded in experience and sense perception: that no means are available to man for acquiring knowledge of the world apart from the means of observing what actually happens. The rationalist and empiricist theories are discussed in greater detail in the Appendix to Part II, entry: "Empiricism"; where it is pointed out that neither of the terms "Rationalism" and "Empiricism" has precise meaning. The debate between empiricists and rationalists has recently come to prominence as a result of the pioneering work of Noam Chomsky and his associates in the field of linguistics. A brief outline of the debate in its modern version is given in Appendix to Part I. Chomsky's writings do not represent the only example of the recent resurgence of interest in the rationalist theory of knowledge; another interesting work is (HOLLIS and NELL, 1975) which advances a modern version of rationalism in economics.

(7) In Cartesian metaphysics, one of the main problems is to provide a satisfactory explanation of how the world of the mind and the world of nature can be in any way related (and how God acts on either of these worlds). Descartes's scheme postulates the

partition of the universe into three substances: God, mind and matter. Everything that happens in the realms of reason and matter is entirely dependent on God. The scheme treats physical realities, both organic (animals) and inorganic, mechanistically: the physical world "machine" operates according to God's invariable laws and has no purposeful tendencies. But mind is not part of that machine: mental substance differs sharply from physical substance. Mind is completely unextended and is therefore not in contact with the material world whose essential property is that it is extended. The Cartesian metaphysical theory of the entire universe ran into several difficulties mainly due to the postulated clear-cut division between the mental and the physical, or mind and matter; but also because of its alleged mysticism in ascribing all power to God alone and thus depriving mind or matter of any causal efficacy. The problems of Cartesian metaphysics attracted several philosophers who attempted to provide solutions in new formulations. Their approaches may be grouped into two distinct sets of views. One set of positions, generally known as "idealism", seek to develop a metaphysical system which is based solely on the mental or spiritual substance to the exclusion of the material element. Beginning with Berkeley's "immaterialism", these positions developed into Fichte's "subjective idealism" and Hegel's "absolute idealism". The other group of views, roughly known as "materialism", reject the spiritual element of the Cartesian system (and possibly God) and attempt to formulate an advanced form of "mechanism" which is founded on the element of matter and postulates that everything is to be explained in terms of material events and

causes. Thomas Hobbes (1588-1679), the French materialists of the Enlightenment, and Karl Marx (1818-1883) are among the proponents of materialist metaphysical schemes. Materialism is a restricted form of naturalism (q.v.in Appendix to Part II): i.e. a metaphysical scheme which allows explanation not only in terms of the concepts of physical science -- i.e. concepts of matter and motion -- but also in terms of concepts that arise from the study of nature and human experience. Thus naturalism (in its many versions) rejects the Cartesian division of mind and matter and argues that both are aspects of human experience. The Cartesian dualism between mind and body, between the spiritual and the material, is at the centre of one of the perennial problems of philosophy. This ongoing debate is commonly referred to as the "Mind/Body problem" (cf. Appendix to Part II, entry: "the mind/body problem"). It extends into questions of methodology in the context of the social sciences (as in the "methodological debate") and questions of ethics regarding the connections between statements of facts and evaluative statements (as in discussions of the fact/value dichotomy). Both methodological questions in the social sciences and issues relating to the passage from the factual to the evaluative and/or normative are very significant in urban planning. The former because urban planning applies knowledge of the world of social life and of nature to derive prescriptive statements about how things ought to be. In this sense it must, at least, make use of social theories regarding social, political, economic organisation in an urban environment composed of artifacts and natural elements. The latter because characterisation of the role of the urban planner and of the nature of his substantive and procedural contributions would

greatly depend on the view taken of the relation between facts and values.

(8) On the one side, rationalist (Cartesian) metaphysics views the physical world (both organic and inorganic) as a 'machine' whose operation is governed by the constant laws of God. However, mind (the element of human reasoning) is not included in that 'machine' for a sharp division is postulated between mental and physical (material) substance. On the other side, the empiricist views make it difficult to differentiate between man (or organism) and the physical world (the environment). For instance, take the opposing views that have been propounded by two of the principal British Empiricists. John Locke's thesis is that all human knowledge comes from experience and has just two sources: sensations registered in the mind and reflections by the mind upon these sensations. There is nothing in the mind except what was first in the senses. Since the senses can only be affected by material things, there follows that the mind cannot be separated from the physical world. Now, Bishop George Berkeley opposes Locke's view and argues that all that man can know about material objects, as these are perceived through his sensory apparatus, is merely the ideas he has of these objects in his mind. The appearances which man experiences are the very objects, and the appearances are sensations or perceptions of a thinking being. There follows that matter, as far as it is known to man, is nothing but a mental construct: a thing is merely a bundle of perceptions, of sensations that have been classified and interpreted by the mind. This theory is called "immaterialism" by its originator. It has led to philosophical positions known as

"idealist" which take the mind or spirit as the most important element in the nature of reality; they number among their main proponents Fichte and Hegel.

(9) (i) the forms of intuition: the very order or form of man's experience has an 'a priori' character which arises from the mind and not from the outside world. Properties of nature such as space, time and causality are not intrinsic to herself but are concepts ("forms of intuition") imposed by man on her. These "forms of intuition" are imposed upon everything that is given in experience: it is certain, for instance, that any awareness will have spatial and temporal characteristics.
(ii) the organising principles: since the mind structures and interprets the information which is acquired through sensory perception, there must be principles or concepts of such organisation and structuring. These organising principles are 'a priori' characteristics of the mind and their application to experiential material enables its recognition as a coherent datum.
(iii) the categories: these are the ways in which the human mind necessarily has to perceive and think about the sensory perceptions which reach it (the "appearances" or phenomena it is presented with). The categories are classified into four groups of three and can only be applied to material originating in experience.

(10) For example, Ancient Greek philosophers such as Anaximander (611-547? B.C.), Anaximenes (c.590-525 B.C.), both belonging to the Milesian school, Empedocles of Sicily (495-435 B.C.),and Democritus (460-360 B.C.).

(11) Both Plato and Aristotle had propounded theories which postulated a fixed, unchanging universe. For Plato, the real world is a realm of unchanging forms or "archetypes" ("the ideal forms") which are apprehended only by thought. In this view, the senses can only perceive imperfect copies -- subsequently called "models" -- of such archetypal forms. This view rejects evolutionary doctrines of changes over time in the characteristics of living organisms including man; and allows no scope for dynamic relationships between man and his environment
In a different context, the approach that this view entails with regard to the philosophical problem of universals has influenced the development of the model-theoretic sense of "model" in the formal sciences (logic and mathematics). This is discussed in some detail in Part II of this dissertation ("The model-theoretic notion of 'model' "); and the problem of universals is referred to in the Appendix to Part II, entry: "Realism".
Aristotle's view of the universe also takes it to be eternal and unchanging -- although this view differs from Plato's on important issues. On this account, every thing in the cosmos has its fixed nature which remains unaffected by the motion which brings about its actuality from a state of potency. This conception of "powers" has recently been employed by the Oxford philosopher Rom Harré in his "neo-realist" philosophy of science. The Appendix to Part II, entry: "Realism", contains a brief account of the main points of this philosophy in so far as they relate to the concept of "model".

(12) These were hypotheses concerning the way in which the physical universe and solar system had been produced; they were advanced by writers such as Descartes ("Principles of philosophy", 1644),

Kant ("Universal natural history and theory of the heavens", 1755), and Laplace ("Exposition of the system of the world", 1796).

(13) For instance theories of organic evolution result from application of evolutionist principles to living things alone. These offer accounts of human, mental, cultural, and moral evolution. Theories of physical evolution apply to non-living things and provide accounts of evolution of the earth, the solar system, the cosmos. Finally, metaphysical theories of evolution emerge from the application of the concept of evolution to the universe as a whole, encompassing both living and non-living things. Within these three broad groups of evolutionist theories there are further differentiations depending on the principles that are accepted as essential for evolutionism Inclusion or exclusion of general principles such as change, order, direction, progress, and prefectibility in the natural and social order gives rise to different versions of evolutionionism.

(14) For instance, Montesqieue (1689-1755) concerning himself with the issues of environmental versus social causation, advances his theory on the influence of climate, soils, and physical configuration upon man and society ("Esprit des lois", 1478: esp. Books 14-18). The work of Buffon (1707-1788), the French naturalist, contains explicit statement of the hypothesis of organic evolution (incidentally, a view not espoused by him) and associates changes in the animal species with the influences of the natural environment. However, the theories of biological evolution went through a period of temporary setback. During

that period, preformationist theories prevailed -- for example, the theory of "encapsulation", acording to which an organism is developed from a germ which contains that organism and all its potential descendants; a theory which implies rigidly fixed boundaries between species and rejects transformism. Biological evolutionist and transformist ideas came back to prominence with the work of Lamarck (1744- 1829).

(15) In the second half of the eighteenth century, the doctrine of universal progress towards greater perfection in the cosmos, so-called "progressionism", was elaborated by writers such as Rousseau (1712-1778), Robinet ("De la nature", 1761), and Herber ("Ideen zu einer Philosophie der Geschichte der Menschheit", 1784/91), and the German "Naturphilosophen". The latters' metaphysical explanation schemes were essentially teleological taking the process of ascent to greater perfection to be the manifestation of the nature of the Absolute Being, or God, in the evolving universe, including man. These views were influenced by German idealist philosophy.

(16) The linking of these two streams of thought can be clearly seen in the work of writers such as Erasmus Darwin (1731-1802) -- Charles Darwin's grandfather (in "Zoonomia" 1794/96), and Lamarck (in "Philosophie zoologique", 1809). Both attempt to explain progressionism and transformism in naturalist rather than metaphysical terms. Very roughly, their position is that living things change over time from simpler to more complex forms. This process of evolution can be explained by assuming that living things possess some vital force through

which they are able to respond to the changing conditions in their environment according to their needs. The process of adaptation results in the development of certain special features in the organisms -- characteristics of form and function -- which meet the particular needs imposed by the environment. Thus the concept of "function" seems to relate the organism and its environment.

(17) For instance, in late nineteenth century, Darwinism was employed by Herbert Spencer and others in discussing questions of social philosophy and ethics even though Darwin himself had shown no intention of drawing such implications from his theory. Spencer's "Social Darwinism" -- as his doctrine became known -- was employed to support arguments in favour of "laissez-faire" capitalism in the west, and to attack government intervention and planning.

(18) Incidentally, this argument reflects the kind of biological reasoning which is often evoked to refute the epistemological claims of the empiricist theory of knowledge. In this context, it is contended that it is not possible to have totally objective knowledge of the world founded on purely sensory impressions; and that the attitude of scientific neutrality and detachment in the process of observation of events in the world conflicts with the biological claims concerning man's participation in the act of knowing (POLANYI, 1950/1964).

(19) In its extreme versions, environmentalism -- or geographical determinism -- entails a mechanistic and deterministic view

of the world order by insisting that man's natural environment (including its expression through social institutions) necessarily conditions or even determines all his activities. It is opposed by the view known as possibilism which purports that there are no necessities in the world but everywhere possibilities whose master is man himself: he alone decides on the use of these possibilities. There are intelligible connections between this debate and the so-called "mind/body problem". Cf. Appendix to Part II, entry: "The mind/body problem", for an account of the context in which "physical determinist" solutions to problems of urban planning were sought.

(20) Cf. footnote (5), this Chapter.

(21) The ensuing discussion draws heavily on Stark's formulation.

(22) For the methodological consequences of this doctrine in the study of social life, cf. Appendix to Part II, entry: "Naturalism (in the social sciences)".

(23) Cf. Appendix to Part II, entry: "The mind/body problem".

(24) Methodological individualism is discussed later in this thesis.

(25) For a brief account of philosophical nominalism, cf. Appendix to Part II, entry: "Realism", discussion of universals.

(26) Cf. Appendix to Part II, entry: "Empiricism".

(27) Phenomenological and hermeneutic approaches to the study of social life are briefly discussed below.

(28) Methodological holism contrasts with individualism as a methodological doctrine in that it makes, at least, the demand that explanations of social phenomena be formulated so as to take account of any holistic properties that may be peculiar to the social wholes concerned over and above the properties of the individual members or their aggregates. Methodological individualism rejects the existence of holistic properties (DRAY,1967).

(29) Cf. Appendix to Part II, entry: "Realism", discussion of universals.

(30) Cf. Appendix to part II, entry: "Positivism and Logical Positivism".

(31) For two recent accounts of Spencer's organismic social philosophy and his views on societal planning cf. (ANDRESKI, 1971) and (PEEL, 1971).

(32) The philosophy of A.N.Whitehead (1861-1947) in its metaphysical explorations attempts to construct an all-encompassing metaphysical system. This is founded on the critique of the adequacy of the accepted scientific view of the world that was advanced in "The concept of nature". In his later metaphysical works, "Science and the modern world" and "Process and reality", both extremely difficult to interpret, Whitehead develops a strong attack on the "bifurcation of nature" which ensues from acceptance of the Cartesian dualism between mind and matter. He takes life and matter, organism and environment, not as two distinct things that somehow have to be reconciled, but rather

as two "interwoven threads in the pattern of active process which is the universe" (JOAD, 1936/1957: p.582). Thus, the universe is seen as a harmonious process of developing organisms of both life and nature, the latter being seen as not ultimately different. Though Whitehead's philosophy is referred to as a "philosophy of organism", his views are briefly discussed under (3), below, in the context of reconciling accounts of the relationship between man and environment.

(33) This issue is connected with the way in which models and analogies are employed in cognitive inquiries. It is discussed extensively below (Part II) in the context of the realist versus the instrumentalist account of metaphors, models, and analogies. Cf. also Appendix to Part II, entries: "Realism"; "Instrumentalism".

(34) Functionalism is a term employed to refer to a number of theories in various disciplines. With reference to the social sciences, the term has been originally connected with anthropology and social anthropology (especially in the 1920s and 1930s) and, in particular, with the influential work of Malinowski (1884-1942) and Radcliffe-Brown (1881-1955) (NADEL, 1951). The functionalist mode of social theorising has been extended to and adjusted for sociology where it is commonly referred to as "structural-functionalism" (SKIDMORE, 1975: Ch.5) or "normative functionalism" (STRASSER, 1976: pp.21 ff.) and is currently one of the principal sociological perspectives. The best known and most widely discussed version of the structural-functional model of society has been developed by Talcott Parsons (b.1902) and gradually refined in a succession

of works, notably (PARSONS, 1949) -- which deals with his "voluntaristic theory of action" -- and (PARSONS, 1951) where he advances a "systems view" of social action via a synthesis of the fundamentals of the functionalist perspective of social systems with his voluntaristic view of personal action. Very roughly, the structual-functional model -- not necessarily in terms of its Parsonian formulation -- postulates that a social entity such as a culture, a society, a community, an organisation, is to be seen as an integrated entity: as a whole or system of interrelated parts. All its constituent elements -- parts, sub-systems or sub-subsystems -- function to maintain both one another and the totality. Occasional disruption of one part initiates mechanisms (or processes) of readjustment among all other parts in a social system toward the end of maintaining the integrity (order) of the system. The end toward which a social system is (sometimes) said to move is <u>equilibrium</u> -- a mechanistic concept borrowed from physics. The implications of the notion of equilibrium for growth models of the city seen as an "urban system" are drawn in a paper by Britton Harris (HARRIS, 1966[a]). There is disagreement among functionalists as to whether there is in fact an <u>end</u> or <u>final state</u> toward which a social system may be said to evolve (social evolutionists); or whether there is simply a picture of adjustment, wandering, and alternation without linear progress (notion of "shifting equilibrium); or whether the "end-state hypothesis" should be rejected altogether. Proponents of the latter view focus on the interplay of functions internal to the social system and, in this context, the notion of equilibrium takes the form of either an emphasis on the process of adjustment -- diachronic

analyses giving rise, say, to dynamic systems models of urban growth -- or a stress on the states of the system at any one time -- synchronic analyses which foster static models of urban systems. The conceptualisation of social collectivities, communities, and even cities as systems provides the framework within which explanations are sought of particular aspects of their social structure in terms of the function they perform in maintaining the system as a viable entity. In the Parsonian account, emphasis is placed on <u>patterns</u> of purposive interaction; the results of such interaction are subjected to functional analyses in terms of their systemic properties. Explanations are formulated in terms of adaptive responses to social expectations (system of values) by "actors"/members of the society who are taken to have learned and accepted the norms associated with their roles in the social system. Social action, i.e. human activity seen from the perspective of its social context -- is investigated both with regard to recognised (manifest, intended) functions or effects and in terms of unrecognised (latent, unintended) consequences (MERTON, 1957: pp.60-66). Structural-functionalism employs the "order perspective" of society and is thus criticised as having politically conservative implications. It integrates positivistic organicism and functionalism in a normative view of social collectivities and seeks to establish the existence of laws or relations between facts following a positivist epistemology (STRASSER, 1976: pp.19-21); (GOULDNER, 1970: pp. 204-205); (KEAT and URRY, 1975: pp.90-95).

(35) Parsonian structural-functionalism (PARSONS, 1951) has been employed in spatial analyses and urban planning. In regional

science, (ISARD et al., 1969) expound a theory of social, political, economic and regional development which assimilates much of Parsonian theory. In urban planning, (CHAPIN, 1965) puts forward a theory of the city and urban development, and draws inferences for a conception of the "planning process", which is based on Parson's substantive and methodological contributions. An extensive discussion of the relevance of structural-functional perspectives in contemporary systems approaches to the study of cities, urban problems, and planning is to be found in (STEISS, 1974: Ch.3).

(36) General System Theory (GST) and the systems approaches and analyses that it fosters have been fashionable in urban planning (CHADWICK, 1971), (McLOUGHLIN, 1969) in the 1960s and early 1970s. However, their appeal seems to be currently receding in the wake of <u>disjointed incrementalist</u> modes of urban planning (BRAYBROOKE and LINDBLOM, 1963) which appear to have superseded the holistic, comprehensive approaches that are compatible with a systems view of the city and its planning (CHADWICK, 1971: p.84). The <u>disjointed incrementalist</u> strategy is very closely related to Karl Popper's "piecemeal social engineering" which connects with mechanicism (POPPER, 1957/1962: p.65) -- though it neither shares Popper's suspicion towards societal planning in general, nor his advocacy of a form of planning based on the instrumental approach of the applied sciences and technology (ibid. : pp.58-68). The epistemological implications of GST which, incidentally, is regarded as a "metaphysical platform" by Popper -- are summarised in (SUTHERLAND, 1973: pp.11-12). Thus, GST is said to :

(i) favour organic referents in the social and behavioural sciences in contrast to the mechanical referents of the physical sciences; (ii)prefer a holistic analytical modality predicated on hypothetico-deductive operations as against a reductionist/inductivist modality; (iii) require the full investigation of macro-properties of complex organic phenomena (or "macrodeterminacy" in systems parlance) which are holistic properties and not simply properties of constituent parts or their aggregates; (iv) believe in "proper", empirically tested theory as a prerequisite for scientific advances and scientific truth; (v) postulate a critical role to be played by models and analogies in the study of complex phenomenal domains. Such models and analogies are to be seen as "ideal types" (cf. Appendix to Part II, entry: "Ideal types") and taxonomic constructs and their significance is to be both theoretic and pragmatic . In the first sense, the theoretic contribution of models of systems would consist in hypothesising isomorphisms between different phenomena and testing these against empirical evidence. In the second sense, the pragmatic import of models and analogies would reveal itself in the search for analogically-based principles which explain the behaviour of classes of entities (wholes) or phenomena. This clearly indicates that the former, theoretic, use of models is consistent with a positivist view of models (and analogies); whereas their latter, pragmatic, use is connected with an instrumentalist view of models and analogies in scientific inquiries (cf. Part II, final Chapter, where these distinctions in the conceptions of models and analogies are drawn in connection with corresponding views of science). Thus, as an "instrument for analysis" GST

may be said to include part-positivist and part-instrumentalist studies of systemic phenomena throughout the universe (KEAT and URRY, 1975: p. 121). Moreover, it rejects both the Newtonian/ Laplacian conception of the world founded on mechanism and the humanistic conception of knowledge as a "personalised matter" (as in the rationalist theory of knowledge) irrespective of the nature of reality -- i.e. whether natural or social -- that is being investigated (SUTHERLAND, 1973: p.21). In this sense, its methodological principle is naturalism, viz. the postulation that the methods and procedures of the natural sciences are applicable and fruitful in the study of social life (cf. Appendix to Part II, entry: "Naturalism (in the social sciences) ") -- though the view taken of the "methods and procedures of science" differs between GST and other doctrines of naturalistic methodological monism.

(37) This idea can be found in Hegelian philosophy ("Phenomenology of mind") in the context of the Master/Slave relation but also in the Marxian critique of ideology. The peculiar brand of Marxism of the "critical theorists" of the Frankfurt School also reflects this concept in one of its uses of "criticism" (CONNERTON, 1976: pp.17-20). These issues are taken up in a later chapter.

(38) Certain perspectives of "humanistic" social thought are discussed below.

(39) This position is said to fall within what Popper has loosely identified as "historicism", and is severely criticised for the kind of holistic planning that it gives rise to (POPPER, 1957/1962).

(40) Clearly Whitehead's brand of organicism/holism cannot be grouped together with Dilthey's dualistic dichotomous universe of mind and matter. It is examined in this context merely for its insistence on interdependece of organism and environment and its stress on process or becoming, which are also features of Dilthean historicism.

(41) Pragmatism as a loosely connected set of doctrines rather than a well-integrated philosophical system is also referred to in a later chapter in the context of the contribution of humanistic social thought to the issue of interdependence between theory and practice, method of inquiry and substantive content of its subject matter. A very concise account of the main theses of pragmatism is included in Appendix to Part II, entry: "Instrumentalism".

(42) Pragmatism as a "lively but not living philosophy" (THAYER, 1968: p.416) is said to number among its proponents such well-known philosophers, logicians, and social thinkers as Charles S.Peirce (1839-1914), William James (1842-1910), C.I.Lewis (1883-1964), John Dewey (1859-1952), and George Herbert Mead (1880-1949). The philosopher and logician W.v.O.Quine is the best known contemporary thinker whose writings have been extensively influenced by pragmatism.

(43) The definitive formulation of Dewey's theory of inquiry referred to as "instrumentalism"is to be found in (DEWEY, 1938); while an earlier version is (DEWEY, 1931: pp.13-35) in the essay "The development of American pragmatism". The historical

connections between Dewey's work and a general movement of social thought in America, known as "institutionalism" and stressing historical, cultural, processual, contextual aspects of social life, are well detailed in (WHITE, 1949/1957).

(44) This account of model is associated with a positivist or a logical empiricist view of science; it is extensively discussed in Part II of the thesis. Cf. also Appendix to Part II, entries: "Positivism and Logical Positivism"; "Realism".

(45) This view is developed within a realist account of science; cf. Part II, main text and Appendix, entry: "Realism".

(46) This is an instrumentalist view of models which is associated with an instrumentalist account of science; cf. Part II, main text and Appendix, to Part II, entry: "Instrumentalism".

(47) Cf. Appendix to Part II, entry: "Ideal types".

(48) These considerations lead to the ancient philosophical problem of "universals"; cf. Appendix to Part II, entry: "Realism".

(49) This point is convincingly demonstrated in (POPPER, 1957/1961).

(50) The rational/comprehensive mode of planning, which might be said to be associated with a form of "positive organicism" and methodological holism is discussed below.

(51) The disjointed/incrementalist form of planning is said to arise within a mechanistic framework of social theorising, and is

conceptually linked with Popper's account of "piecemeal social engineering" (POPPER, 1957/1961). It is further discussed, in relation to mechanistic models of the city, later in the thesis.

(52) The uncritical extension and acceptance of the Kuhnian framework, originally developed in the philosophy of natural science, to the social sciences and to fields of social practices such as urban planning may not be endorsed by Kuhn and has been questioned (STUDDERT-KENNEDY, 1975: pp.53-54; 210; 213); (SMART, 1976: pp.151-152).

(53) These problems are extensively discussed in later chapters of the thesis.

(54) The Medieval period of science starts earlier and ends later than in other human history. Its conclusion did not coincide with the fifteenth or sixteenth century Renaissance in other fields of human cultural activity. Moreover, powerful nuclei of scientific medievalism existed even in the first half of the seventeenth century (deSANTILLANA, 1953). However, the cosmological part of the "Revolution of Science" had taken place by the middle of the sixteenth century through the work of Copernicus.

(55) "Rational Mechanics"comprised not only mechanics of finite systems and of rigid bodies, but also mechanics of continua whose main divisions are hydrodynamics, acoustics and elasticity. Other fields of physics, such as the theories of light, heat,

and electricity and magnetism did not receive the same amount of attention until the nineteenth century (BOCHNER, 1966:p.221).

(56) Mechanics was closely intergrown with the mathematics of functions a large part of which was developed for (or because of) rational mechanics (BOCHNER, 1966: p.221).

(57) For example, Bentham and his followers assumed that they could establish empirically the concept that men valued happiness and would pursue it. This implies that social, economic and political orders must be adjusted to satisfy this irrepressible impulse.

(58) Cf. Appendix to Part II, entry: "Empiricism".

(59) Cf. Appendix to Part II, entry "Positivism". Comte employed the term "positive" to communicate six features of things: being real, useful,certain, precise, organic, relative. He called his own brand of philosophy "positive philosophy" and stressed the application of the scientific attitude not only to natural science but also to the disciplines dealing with human affairs. He took scientific disciplines to form an evolving hierarchy which rested on mathematics and was developing, in order of logic and over time, through the physical and biological sciences to sociology and morals. He held an evolutionary view of thought, and argued that thought evolved historically from the theological attitude -- viz. from the phase of explaining things by introducing gods or other spiritual forces -- through the metaphysical attitude -- viz.

the phase involving search for things-in- themselves and causes -- to the scientific attitude or "positive" thought which stresses the observable. He saw the history of science, as a whole, as a progressive movement from disciplines studying phenomena furthest to man towards those which study man himself. In his account of the scientific or positive attitude, Comte placed great emphasis on synthesis both of reason, feeling and action, and of the various scientific disciplines; and even of the three attitudes, since not only the "scientific" but also the "theological" and "metaphysical" ones had their merits. After Comte, positivism maintained the emphasis on the unity of the sciences, and limited the scope of science to the observable and manipulable. Comte's evolutionary view of knowledge was in agreement with the biological developments of the nineteenth century and with programmes which extended such developments to the world of man and society, e.g. the work of Herbert Spencer.

(60) The meaning of "positivism" in the context of the social sciences is not very precise; indeed, there is no generally accepted and standard meaning of the term. Social scientists may have a very different conception of positivism from that of philosophers; and the latter also tend to disagree on the exact meaning and content of the philosophical programme of positivism. A highly informative account of the various issues involved in deciding on the meaning and programme of positivism in natural and social science is provided in (GIEDYMIN, 1975). The same author discusses elsewhere certain aspects of methodological naturalism, a doctrine which is often associated with positivist programmes in the social

sciences (GIEDYMIN, 1972). Useful contributions to these issues are also made by (KEAT, 1971), (KEAT and URRY, 1975), (BENTON, 1977), (STUDDERT-KENNEDY, 1975), and (GIDDENS, 1974).

(61) However, the claim of methodological naturalism that the natural and social sciences have basically the same aims and methods is not unambiguous if it is taken into account that there are different characterisations of those aims and methods by phenomenalists and their critics, by instrumentalists and by realists (cf. Appendix to Part II).The interaction between supporters of each of these doctrines is responsible for additional diversifications in the conception of science and its aims and methods. Consequently it may be quite misleading to conflate methodological naturalism with positivism in the social sciences. A notable example of a philosopher who advocates a form of methodological naturalism in social science while rejecting the positivist philosophical programme is Karl Popper. These points are further discussed in the Appendix to Part II, entry: "Positivism". They are also raised in (KEAT, 1971), and (KEAT and URRY, 1975: Chs. 1-3);they receive definitive treatement in (GIEDYMIN, 1972) and (GIEDYMIN, 1975). Most discussions and criticisms in contemporary antipositivist literature in the philosophy of the social sciences concentrate on the doctrine of methodological naturalism and identify it -- quite misleadingly -- with positivism.

(62) Cf. Appendix to Part II, entry: "Analytic and synthetic statements".

(63) Le Play's work filtered through into the emerging field of urban planning early in the twentieth century. Patrick Geddes, one of the pioneers of planning, had established contacts with some of Le Play's disciplines although he had never met him personally. See, for example: (BRANFORD and GEDDES, 1917); (BRANFORD and FARQUHARSON, 1924); (BOARDMAN, 1944).

(64) A range of such criticisms can be found in (ANSHEN, 1942); (BENDIX, 1951); (KNIGHT, 1935); (MORGENTAU, 1946). The so-called "methodological debate" concerning the extensibility of the "scientific method" to the study of man and society is discussed below.

(65) For a discussion of the concept and use of the term "spatial planning" cf. (FAMELIS, 1970).

(66) Britain was the first country in the world to reach the state of having 72% of her population living in areas defined by the census as "urban" (in 1891); (CLAWSON and HALL, 1973: p.32).

(67) The early Public Health Acts, introduced in Britain by the end of the nineteenth century, made legal provisions for minimum standards of light, air, drainage, and water supply for urban residential construction. In the United States, the "City Beautiful" movement of the 1890s led to the introduction of statutory zoning of all urban land uses. Thus, by the end of the first world war planning and zoning had become institutionalised municipal responsibilities in the USA (BASSETT, 1938). For example, the first American "Master Plan" was drafted in 1914.

(68) (OWEN, 1849); (HOWARD, 1902); (GEDDES, 1915).

(69) The Town Planning Institute was founded in 1914; the American Institute of Planners in 1917. For decades after their establishment both Institutes remained relatively small in numbers of members registered and in scope of activities.

(70) This subject is discussed more extensively later in this chapter.

(71) The suburban explosion of the 1920s and 1930s, which was assisted by revolutionary advances in transportation and construction technology (LEWIS, 1939), caused the rapid consumption of land suitable for urban development and produced vast expanses of residential areas around the most economically successful urban centres. A parallel trend was that of structural decline several of the older industrial regions. Emigration of large numbers of people to places of greater employment opportunities resulted in both severe regional economic imbalances and the perpetuation of the tendency toward hypertrophic growth of certain urban agglomerations. Finally the rapid technological advancement and economic development and the proliferation of service industries eventuated an explosion of urban incomes far more important than national averages, thus providing additional momentum to the forces that attracted population into the cities (BERRY, 1973: Ch.2 and 5); (BLAIR, 1974: pp.15,25); (DOXIADIS, 1974: pp.229-231).

(72) (i) The Barlow Report; HMSO (1940): <u>"Report of the Royal Commission on the distribution of the industrial population".</u>

Cmnd. 6153. London: H.M.S.O.

(ii) The Scott Committee; HMSO (1942): "Report of the Royal Commission on land utilisation in rural areas". Cmnd. 6378 London: H.M.S.O.

(iii) The Utwhatt Report; HMSO (1942): "Final Report of the Expert Committee on compensation and betterment". Cmnd. 6386. London: H.M.S.O.

(iv) The Reith Report on New Towns; HMSO (1945): "Final Report of the New Towns Committee". Cmnd. 6876. London: H.M.S.O.

(73) The New Towns Act (1946); the Town and Country Planning Act (1947).

(74) For example: ABERCROMBIE, P. (1945): "Greater London Plan". London : H.M.S.O.

(75) The ideology or "theory" of how the ideal urban and regional spatial structure ought to be was based on revisited pioneerinng work by Ebenezer Howard and Patrick Geddes, and on the ideas introduced by Mumford, Unwin, and Abercrombie.

(76) For example (CLAWSON and HALL, 1973: p.156) note the importance of the official title of the 1947 Town and Country Planning Act. This was borrowed from the organisation advocating the contemporary planning ideals and stressing for appropriate legislation. This direct borrowing implied some measure of concurrence of doctrinal attitudes.

(77) Strong cases supporting the concept of collective interest can be suggested in economic or military planning. However, in

the field of control of urban development the public interest concept has been expressed by such ambiguous notions as "amenity", professional requirements of good planning, a sense of community, etc.: terms that appear amenable to any number of interpretations (PAHL, 1970: pp.232, 239).

(78) Thus assuming a unidirectional relation between the planner and the subject of his professional interest: urban society (FALUDI, 1970: p.3).

(79) The starting point for the "Master Plan" professionalism (BASSETT, 1938); (DUNHAM, 1958: p.186); (KENT, 1964).

(80) The term "behavioural sciences" came into currency in 1949 for research funding purposes in the USA. Although there is some overlapping with the social sciences, only some of the latter are accounted for by this term (FORD FOUNDATION, 1953: pp.3-5).

(81) Constructs are ideas about experiences which impose preliminary order upon them (ABLER, et al., 1971: p.13).

(82) This sense of "paradigm" takes it to stand for those theoretical and experimental orientations shared by practitioners of a "scientific speciality" which enable research workers to concentrate upon fruitful "puzzle-solving". Cf. footnote (1), chapter one, for another sense of "paradigm" also expounded by Kuhn. It should be stressed, however, that the concept of "paradigm" has been introduced in the context of the natural sciences; and that its extension to the field of social science

is by no means established and not without its problems.

(83) A good general source of information on historical utopian thinking about the city is (MUMFORD, 1961). For Thomas More's "Utopia" the original work (MORE, 1516 and 1551) and an interpretation by (GOODEY, 1970) should be consulted. Interesting sample of early American utopian thinking about the city is (BELLAMY, 1888). Le Corbusier's ideas in "Ville Radieuse" are analysed and evaluated by (DREYFUS, 1965); and Frank Lloyd Wright's conception of "Broad Acre City" is expounded in (WRIGHT, 1958). Finally, (MEYERSON, 1961), (MUMFORD, 1965), and (COWAN, 1972) provide useful syntheses of utopian thought about human settlements.

(84) The debt of the ensuing discussion to the excellent paper by (COWAN, 1972 : pp.78-100) should be obvious.

(85) The foundations of this approach are described in the classic work of (QUETELET, 1835/1869). The social thinker H.C.Carey undertook to model the "science of society" on a special kind of mechanics, the mechanics of heavenly bodies -- or astronomy. His was an effort which was truly within the emerging tradition of the strong positivism of the mid-nineteenth century. Carey attempted to extend through analogy -- his critics remark that he took the analogy to be an actual description of reality -- the Newtonian Principles to society and social phenomena. For him, the "law of molecular gravitation" holds men together in society for man "is the molecule of society" (CAREY, 1858 and 1859: Vol. I; pp.41; 42). He assumes that all the

corollaries of the physical principle of gravitation apply equally to "social gravitation". "The greater the number collected in a given space, the greater is the attractive force there exerted, as is seen to have been the case with the great cities of the ancient world ..." (ibid.: pp.42; 43). Thus,gravitation creates foci of human aggregation, and these are the homologues of the heavenly bodies. The presence of a "gravitational force" in social phenomena was further extended to account for movements of population in the form of "laws" of population migration (RAVENSTEIN, 1885); (RAVENSTEIN, 1889). One of the best expositions of the basic concepts of "social gravitation" with strong spatial emphasis is given in (ISARD, et al., 1960: Ch.11), with numerous references to the original works of (REILLY, 1929), (STOUFFER, 1940), (STEWART, 1948), (ZIPF, 1949), (VOORHEES,1955), (CARROTHERS,1956), (WARNTZ, 1956), and others. Especially for urban planning applications of the "social physics" approach, more recent works include (DAVIES and STYLES, 1969), (WILSON, 1970), (WILSON, 1974), (SENIOR, 1973), and (BATTY, 1976).

(86) It may be useful to note that the distinction between individualistic and holistic approaches to the study of social organisation in geographical space does not coincide with the well-known "macro-micro" dichotomy in social theorising. It is possible to develop both macro- and micro-approaches within the individualistic/nominalistic scheme; the essential point being that both macro- and micro- approaches recognise only individuals and aggregations of individuals but not properties pertaining to wholes alone. Thus, macro- theorising of the type of the "social physics" approach, takes macro-properties as the mere aggregation of individual behaviour. Holistic

approaches attempt to discover and study properties of wholes in addition to properties of their constituent individual parts.

(87) The relevant literature is vast and well known cf. footnote (85), this chapter, and below.

(88) In a recent paper (ECHENIQUE, 1974: pp.40-41) there is a brief account of the origins of contemporary spatial interaction models in "social physics"; the same author traces lucidly the development of urban models in the last twenty years or so (ECHENIQUE, 1975). The origins of the "gravity model" and the "social physics" approach are discussed in (CARROTHERS, 1956).

(89) In a recent paper, in which he discusses modelling approaches to social/spatial phenomena and contrasts macro- with micro-behavioural levels of research, Lionel March criticises Mill's "psychologism" which he takes to have inspired the tendency to "examine patterns of activity from the standpoint of the individual as decision maker" (MARCH, 1975: p.303). He strongly advocates modelling at the level of observable aggregate behaviour and rejects micro-behavioural approaches as inappropriate for "planning and social engineering" (ibid.: p.302). The difficulty in this view is that first, it equates individualism with "psychologism", which should be rejected; and second, it implies that macro-analysis necessarily avoids considerations pertaining to individuals, which is also inaccurate. Regarding the first point, individualism as a methodological doctrine usually demands that all explanations of social phenomena be couched in terms of facts about individuals (LUKES, 1977: p.180). Popperian methodological individualism rejects Mill's "psychologism" (POPPER, 1957/1961:

pp.152-154) and requires that"all social phenomena ... should always be understood as resulting from the decisions, actions, attitudes, etc. of human individuals and ... we should never be satisfied by an explanation in terms of so-called 'collectives' " (POPPER, 1945/1973: vol.II; p.98). Hence Popper endorses individualism without"psychologism",the latter being a programme of reducing sociology to psychology. Thus, individualism as a methodological rule need not entail "psychologism" in the Millian sense. Secondly, modelling social/spatial phenomena at the level of aggregate behaviour does not necessarily eschew individualism. The problem at issue here is one of the oldest in philosophy and the answers it has received are briefly discussed in the Appendix to Part II, entry: "Realism" (discussion of "Universals"). Three main theses on the problem of universals may be distinguished and each of them tends to correspond to particular views of science (STANILAND, 1972). Thus, it may be maintained that: (i) Properties of wholes are real and either transcend their particulars or are <u>in</u> their particulars and exist independently of the human mind (realist view). (ii) Properties of wholes are in fact names or general terms applied to some collection of individual things and have no real existence (nominalist account). (iii) Properties of wholes are neither real nor merely names; they are general ideas or concepts constructed by the mind (conceptualist thesis). Now aggregates such as collections of individuals, societies, cities, are aggregates of individuals. Properties of such aggregates may be taken as real, nominal, or conceptual depending on the view taken of universals. Aggregates are aggregates of individuals, and their properties are those of their constituent parts <u>unless</u> they are taken as

real universals with independent existence transcending their particulars. That they are not so taken by March can be seen from his view of laws (MARCH, 1975: p.304): "Laws need not be thought of as actually governing observed behaviour so much as hypotheses which may usefully be used to govern our rational expectations of such behaviour occurring". This is not a realist account of laws hence the properties of aggregates which are to be sought on March's view do not refer to real universals. They can be either names or conventional expressions used to refer to collections of individual properties, or general concepts constructed by the investigator and deriving from the order which is revealed in inquiry. It seems unlikely that March would be interested in the former, nominalist account since he seeks properties of aggregates rather than, and irreducible to, those of individual parts. In this he appears to be in accordance with General System Theory which"demands that some awareness of the whole precede the attempt to appreciate the parts" (SUTHERLAND, 1973: p.39). This is a weak form of methodological holism which does not postulate the real existence of systemic properties but merely opposes the individualists' doctrinaire rejection of properties which are irreducible to properties of individuals (DRAY, 1967). Holism is strongly criticised in (POPPER, 1957/61) on grounds that it is impossible to ever arrive at a holistic conception of some set of phenomena for inquiry is always partial and problem-specific. Moreover, Hempel is highly critical of General System Theory's search for "various novel phenomena which are irreducible, which cannot be accounted for in terms of anything that is to be found on the preceding

levels" (HEMPEL, 1969: p.179). Philosophical statements of General System Theory are not particularly lucid on this problem. It is recognised, on the one hand, with Aristotle, that " a whole is more than the sum of its parts" (a version of Aristotelian realism) (SUTHERLAND, 1973: p.35). Wholes "are ascribed a phenomenal personality, as it were. This personality is unlikely to be a product of aggregation or simple multiplication" (ibid.). On the other hand, it is argued that the requisite comprehension of the entity as a whole prior to embarking on an investigation of it, "will serve as a reference for the selection of variables for empirical analysis; as a flexible empirically responsive heuristic" (ibid.: p.40). This view takes methodological holism as a mere heuristic device and not as predicated on the real existence of any irreducible holistic properties of collectivities. Now if the notion of a system is taken as a heuristic, fictional construct to aid investigation rather than as referring to potentially real things such as wholes and aggregates with real properties of their own, then its adoption or rejection rests on pragmatic grounds: if it is successful, it stands; if it is not, it falls. But if it is so taken, then there is no overriding consideration in its favour apart from its pragmatic justification in inquiry. Hence claims to the effect that: "in phenomena of life, the constituent parts are so interdependent that they lose their character, their meaning, and indeed their very existence when dissected from the functioning whole" (ibid.: p.39) -- which imply the existence of real holistic properties in social collectivities -- must be clearly qualified and preceded by some statement of the form: it is heuristically fruitful to conduct

social inquiry by regarding "phenomena of life" as if their constituent parts .... etc. The alternative, equally anti-realist, view would be to reject both that systems have an independent existence apart from their constituent elements and that they are mere names or conventions employed to economically describe a set of individuals. On this account, systems or collectivities would be"ascribed a potential for hierarchically oriented uniqueness following from structural and functional differentiation: potential for each new level of an entity evolving properties unique to it" (SUTHERLAND, 1973: p.36). Any such holistic properties are therefore constructed by the mind: not arbitrarily, as a name might be chosen, but rather after discovering relations and connections between particulars and so bringing to light what was implicit in the facts. In one version of this view, using models and analogies helps interpreting unfamiliar sets of relations in terms of what is already familiar. The above distinctions had to be introduced in order to clear the matter regarding the level at which modelling of social/spatial phenomena is to be carried out, viz. whether at the level of the collectivity, or aggregate or macro-level, or at that of the individual or micro-level. March's "aggregates" seem to be collections of individuals in the connections of which the mind discovers some "Gestalt" and takes it as irreducible to aggregated properties of component parts. But such holistic properties as may be discovered cannot be divorced from an understanding of individuals. These important distinctions, with ontological and epistemological ramifications, were also touched upon above, footnote (86). Individualism as an attitude and methodological doctrine is treated exhaustively in (LUKES, 1973), and the methodological

dispute between individualism and holism is well reviewed in (DRAY, 1967) -- though there are no references in these works to claims specifically connected with General System Theory. Individualism as a methodological doctrine in the study of social life has received various interpretations. Apart from Popper's conception referred to above, there is the principle of seeking to "understand", in the technical sense of "verstehen", à la Max Weber, the purposes, reasons, motives, etc. of social agents, which are not normally part of their overt behaviour. This notion is related to but is not identical with its phenomenological interpretations especially in the works of Alfred Schütz. Other "individualistic"—in the sense of human-centred -- approaches to social studies expound a different conception of "understanding" the individual social actor and relating him to some broader context. This so-called "hermeneutic verstehen" is associated with the work of writers such as Hans-Georg Gadamer, Paul Ricoeur, Martin Heidegger, and Jürgen Habermas. A brief account of some of these humanistic themes in social studies is given in a later chapter. The basic difference between, say, Popperian methodological individualism and that of the existentialist and phenomenological schools is that the latter approach attempts to intuitively apprehend or grasp through some form of introspection the phenomena or happenings of the individual's consciousness rather than overt manifestations of these in behaviour, or in terms of the way in which situations in which actors find themselves impinge upon their conduct. It seeks to relate interpretative understanding of individuals' actions to some broader whole, form of life, social reality, life-world, or historical dimension within which they would become meaningful.

To the extent that these views postulate some higher level of reality, some context or frame of meaning or whole to which parts are related, they may be referred to as holistic even though they place emphasis on interpretation of individuals' actions. Although both Max Weber and Alfred Schütz assert that the findings of "subjective" interpretation of human actions are to be subjected to empirical testing following some account of the "rules and procedures of scientific method", such linking of two mutually exclusive modes of knowing, an empiricist and an introspectionist, may not be warranted; or if so, it may not be at all obvious how to effect the desired epistemological reconciliation in a coherent way which is intelligible in terms of both systems.

(90) The expression "source of a model" is explicated later in the thesis, in the context of the discussion of epistemological issues of models(Part II). It derives from Harré's distinctions (HARRE, 1970), and is that which the model is based upon. The "subject of a model," on the same account, is that which the model undertakes to represent. Thus, a model may be said to have two referents: a subject, which may be initially unknown, to which it is applied; and a source, which is something already familiar, upon which the model "is modelled". Two broad classes of models may be distinguished according to whether their source and subject differ, or are identical or have the same form.

(91) The difference between description and explanation is in some views neglibible but in others highly significant. For a review of the philosophical theses on this important epistemological

issue, see Apendix to Part II, entry: "Description versus explanation".

(92) The Newtonian law states that two bodies in the universe attract each other in proportion to the product of their masses, and inversely to the square of the distance separating them. Its conventional symbolic representation is:

$$F = G(M_1M_2)D^{-2} \qquad (1)$$

where:

- F is the force exerted by each body on the other.
- M_1, M_2 is the mass or size of the two bodies.
- D is the distance between the bodies.
- G is a constant standing for the "pull" or "force" of gravity.

The relationship has been analogically transferred to the fields studying human movement and location in geographical space. The models that have been based on this analogy belong to the group of so-called "gravity models". The term is currently unfashionable but far from defunct. Its replacement with the more modern "spatial interaction models" helps remove part of the "social physics" image and provide a term that is recognisable in the context of spatial analysis. Apart from the conventional aspects of this change, other reasons for discarding the term are said to be the need for "theoretical consistency" given the newer and conceptually different derivations of the early model which was a direct application of the Newtonian principle. One such early formulation of the gravity model is:

$$I_{ij} = G\, P_i P_j d_{ij}^{-b} \qquad (2)$$

where:

I_{ij} is the interaction between locations or areas or zones i and j (subscripts).

P_i, P_j is the population at zones i and j.

d_{ij} distance separating zones i and j.

b exponent to which distance is raised (varies from 0.5 to 3.5, subject to calibration of model for local conditions).

G a constant of proportionality, empirically determined and used to relate the model to actual conditions.

i,j subscripts: i = 1,2,..,n and j = 1,2..,m, name zones.

Plainly stated, the model postulates: (i) a direct relationship between interaction between any pair of groups of people or locations and the number of people or sizes of the latter; (ii) a direct relationship between movements, contacts, trips, etc. originating from or attracted by a group of people (or a location) and the size (or attractiveness) of that group (or location); (iii) an inverse exponential relationship between interaction (number of contacts, journeys, etc. between groups of people or locations) and distance separating groups of people or locations (non-linear decay). If the interactions between one area and all its potential contacts are summed up for that area, then the so-called potential form of the gravity model ensues (STEWART, 1947):

$$\sum_j I_{ij} = GP_i \sum_j P_j\, d_{ij}^{-b} \qquad (3)$$

with notation as in (2), above. If P is taken as an activity consisting of an aggregate of units, then dividing the measure of total potential for that activity in that location by the number of units in that activity produces a measure of per unit potential at that location (LEE, 1968: p.3/8):

$$V_i = \sum_j I_{ij} / P_i = G \sum_j P_j d_{ij}^{-b} \qquad (4)$$

The wide application of "gravity" type or spatial interaction models in transportation studies has been induced by relatively successful predictive performance of the models but has also led to the introduction of a number of modifications in the original formulations to improve their internal consistency. The notation employed in transportation studies has been maintained in transferring these models to predictive use for urban planning purposes (for instance, for predicting location of activities):

$$T_{ij} = k\, O_i\, D_j\, f(c_{ij}) \qquad (5)$$

where:

- T_{ij} interaction (e.g. traffic) between zones i (e.g. residential) and j (e.g. employment).
- O_i activity at <u>origin</u> (producer) zone i (e.g. household).
- D_j activity at <u>destination</u> (attractor) zone j (e.g. number of jobs).
- $f(c_{ij})$ function of generalised travel cost (expressing "impedence" or "friction of space"), usually in the form of a negative exponential function of distance viz. $f(c_{ij}) = d_{ij}^{-b}$
- k constant of proportionality, securing

harmonisation of different dimensions involved and the summing up of interactions to known totals.

Spatial interaction models can be used for prediction of flows (traffic) of goods, people, etc. between locations as well as in land use studies in which predictions of the location of main activities are sought -- subject to a range of assumptions. This is justified by the observation that flows along transportation routes are in close interaction with location and characteristics of business firms and households. The formulation of the models in either case is identical, though there is an important difference: (i) in prediction of flows, location and intensity of both O_i and D_j (activities) is given (exogenously); (ii) in prediction of locations of, say, workers' residences (in residential location models), location and intensity of one activity is supplied exogenously and the other activity is derived from it through the interaction relationship. In the latter case, the model is fitted to factual data from past interaction. Depending on the kind of information that enters the model exogenously, four cases are distinguished: (i) unconstrained model with no exogenous estimates supplied; (ii) and (iii) singly constrained, with estimates either of total number of, say, workers resident in zone i, $\sum_i T_{ij}$, which constrains flows at the production point; or total number of, say, number of jobs in zone j, $\sum_j T_{ij}$, with flows attraction-constrained; and (iv) double-constraint cases where estimates of both $\sum_j T_{ij}$ and $\sum_i T_{ij}$ are exogenously provided. The models employed in transportation studies fail to preserve exogenously supplied estimates of O_i and D_j undistorted hence they are modified to enable consistency between exogenous and endogenous estimates.

Modification involved addition of two "balancing factors", A_i and B_j :

$$A_i = 1/ \sum_j B_j D_j f(d_{ij}) \qquad (6)$$

and

$$B_j = 1/ \sum_i A_i O_i f(d_{ij}) \qquad (7)$$

in order to obtain $\sum_j T_{ij} = O_i$ and $\sum_i T_{ij} = D_j$ respectively. Thus, (6) secures consistency of exogenous estimates of O_i (workers resident in residential zones i) with endogenously aggregated work-zone distributions $\sum_j T_{ij}$. Further, (7) ensures that there is consistency between exogenous derivations of D_j (number of jobs in employment zones j) and endogenous calculations of total job holders in zone j distributed to residence zones i, $\sum_i T_{ij}$. Formulation (5) thus becomes:

$$T_{ij} = A_i B_j O_i D_j f(d_{ij}) \qquad (8)$$

with notation as in (5),(6), and (7). This is known as the "journey to work" model. A single-constraint formulation, in which trips at the production point (origin in, say, residential zones) are not constrained and exogenously supplied can be employed as an elementary model of residence location:

$$T_{ij} = B_j W_i D_j f(c_{ij}) \qquad (9)$$

where:

A_i [(6)]	is removed
O_i	is replaced by W_i
W_i	residential attractiveness factor

and the rest of the notation as in (8). This extremely simple model merely postulates that workers tend to locate around their employment locations according to some cost function of

the journey to work. The residential attractiveness factor may be interpreted as referring to size of "residential opportunities" per zone. These standard formulations of spatial interaction models are extensively documented in (BATTY, 1976); (CORDEY-HAYES and WILSON, 1971); (MASSER, 1972); (LEE, 1973); (SENIOR, 1973); (WILSON, 1974); and (REIF, 1973).

(93) Cf. Part II, main text: "The logical status of correspondence rules". See also Appendix to Part II, entries: "Operationalism"; "Positivism"; "Realism"; "Correspondence rules".

(94) Cf. footnote (92) above.

(95) No further discussion of this issue will be undertaken at this stage for it is treated at length in Part II, of the thesis; see section on "Analogical relationships between ideas".

(96) This point raises another set of contentious issues regarding the distinction between description and explanation. This is treated in the Appendix to Part II, entry: "Description versus explanation".

(97) The metaphysical questions concerning the ontological status of "cause" are not examined in this thesis. Reference is made only to the Humean account of causation as "constant conjunction of events" and to a neo-realist interpretation of "cause" in the context of Harré's "generative theory of causality". On these issues, see Appendix to Part II, entries: "Empiricism"; "Realism";"Description versus explanation".

(98) These issues are further explored in a later chapter.

(99) The attempts to provide a sound theoretical basis for S.I.M.s were directed towards probabilistic statements of the deterministic relations postulated in the original "gravity model". Thus, Britton Harris derived the general gravity formulation by employing a probability expression of the principle of intervening opportunities whose reduced form is a "gravity model" (HARRIS, 1964). The work of Niedercorn and Bechdolt sought to logically derive the "gravity law" of spatial interaction from the economic principle of utility maximisation. They argued that "the number of trips taken from a given origin to a particular destination per unit time is the sum of the numbers of trips per unit time that maximises the utilities of spatial interaction of the individuals of the origin subject to some relevant constraints..." (NIEDERCORN and BECHDOLT, 1969). Finally, the work of A.G.Wilson commands, perhaps, greater attention for its novel treatment of the "gravity hypothesis" of spatial interaction by employing an approach of entropy maximisation analogically transferred from the physical theories of thermodynamics and statistical mechanics. Hence the field which provides the conceptual foundations of this approach is also physics as in the "gravity model". In thermodynamics, entropy expresses a quantity which pertains to the thermal state of a system. It reflects a measure of disorder -- or uncertainty regarding the trajectories -- among the atoms that constitute some system. The basic physical theory of statistical mechanics explains the behaviour of matter in bulk. Matter is constituted by vast quantities of molecules and atoms,

the interaction among which being accounted for by the laws of mechanics . But the precision of computation that these laws demand regarding initial positions and velocities of individual atoms and molecules is not attainable. Therefore the theory of statistical mechanics is invoked to enable accounting for the behaviour of bulk matter in terms of forces and collisions between the atoms and molecules it consists of whose trajectories are impossible to compute individually. This involves supplementing the laws of mechanics with elements of the theory of probability, and this makes possible the derivation of average aggregate values of rapidly changing quantities. When applied to thermodynamics, the theory of statistical mechanics enables to show that the laws of thermodynamics hold with very high probability rather than certainty, expressed in terms of atomic motions. Hence entropy is closely linked with the notion of probability as reflecting a description of imperfect knowledge. Now the second law of thermodynamics expresses the irreversibility of processes, or "the arrow of time", for it states that " a self-maintaining process of producing work by transferring heat from a cold to a hot body is not possible"; which in mathematically equivalent terms becomes: "entropy always increases in any closed system not in equilibrium, and remains constant for a system which is in equilibrium". In contrast, the laws of mechanics are reversible: any closed system must return to its original state, irrespective of the level of its order. This contradiction between the second law of thermodynamics and the laws of mechanics is overcome by statistical treatment. It is highly unlikely that a system will return to order within any finite measure of time. Thus,

its entropy is regarded as a measure of the disorder among the constituent atoms of that system: an initially ordered state is highly likely to become random over time. Entropy measures the tendency of the system to move from a less to a more probable state. Statistical mechanics enables derivation of macro-properties of some system without accounting for the behaviour (trajectories) of individual constituent atoms at the micro-level. The notion of entropy enables the linking of aggregate properties and micro-states of a system (NASH, 1965). Now, Wilson took as the source of his entropy derivation of the spatial interaction model this body of knowledge in thermodynamics and statistical mechanics and drew analogically on it. The plausible analogy of the trajectories of the atoms with the journey to work in an "urban system" suggested that similar techniques could be applied to derive the "most likely states" of the "urban system" in terms of the movements of individuals travelling to work. Information about the origins and destinations of each work trip of an individual in the system is not possible to obtain in any precise way. Therefore, the goal of predicting at the level of such "micro-states" is unrealistic, if not unattainable, and the spatial analyst encounters problems that are analogous with those faced by the physicist who seeks to predict the behaviour of large numbers of molecules in a gas. By transferring analysis to the level of a "meso-state" -- viz. level referring to total number of workers travelling between each pair of zones, one origin and one destination zone -- it is possible to predict aggregate properties of movement without having to account for the movements of each individual trip-maker. Given the same journey-to-work "meso-state", it is possible to derive

several "micro-states" based on the assumption that all the latter are equally probable. The "meso-state" which is connected with the largest number of "micro-states" is taken to be the most probable trip distribution. This is derived by a procedure of entropy maximisation: the desired probability distribution has maximum uncertainty (i.e. minimum information content) subject to representing some explicitly stated known information, e.g. regarding the journey to work pattern (origins and destinations for each zone for a homogeneous category of purpose of trip; total number of trips in a system) and expenditure on transport (cost of travelling between any pair of zones; fixed total expenditure on transport in the system) at a given point in time. This derivation will represent the most probable distribution of trips between zones (SENIOR, 1973); (REIF, 1973). Thus, subject to the usual constraints introduced in the modern formulations of the "gravity model", the general "gravity hypothesis" for the distribution of interaction in a system is shown to be the most probable (NEDO, 1970: p.18). The need for more detailed information regarding the behaviour of disaggregated groups is pointed out by many workers in this field as a prerequisite for theoretical improvement of spatial interaction models (BATTY, 1969), (OLSSON, 1965: p.151); (NEDO, 1970: p.50). The necessity for theoretical understanding cannot be overstressed, for the entropy approach is a probability formalism, devoid of empirical content. Probability is a derivative notion and depends on a solution to the classical problem of induction. If the empirical relationships it is applied to do not hold in experience, probability makes no substantive contributions in itself. This point will be further discussed below. It is also

raised in (KING, 1976: p.295).

(100) Cf. Appendix to Part II, entry: "Naturalism (in the social sciences)"

(101) See footnote (100), above.

(102) The literature on the use of models in planning is not as extensive as that relating to substantive and technical issues of model-building. Regarding the American experience with models one could refer to such contributions as the classic papers by Britton Harris (HARRIS, 1967), (HARRIS, 1968); the comprehensive review of model application in metropolitan planning by (BOYCE, et al., 1970); the critical assessment of the contribution of models of the city in urban policy-making by (PACK, et al., 1974); the review of large scale models employed in land use/transportation studies in the 1960s (BROWN, et al., 1972); the development and application of large scale simulation models for the city (INGRAM, et al., 1972), and the region (HAMILTON, et al., 1969); the review of the theoretical basis of urban models and of some well known large scale models in (KILBRIDGE, et al., 1970); and the critical assessment of models used in policy making in the city by (BREWER ,1973). Useful critical papers are (MARSONI, 1968) and (LEE, 1973). Among the works that relate specifically to the application of models in the U.K. one might refer to (BARRAS, et al., 1971); (BROADBENT, 1970); (BROADBENT, 1973); (CORDEY-HAYES, 1970); (CORDEY-HAYES and MASSEY, 1971); (MACKETT, 1977); (WADE, 1973); (WILSON, 1974); and in a systems framework (CHADWICK, 1971); to mention but a few.

(103) The field was first developed in the U.S.A., in the first quarter of the twentieth century, and the most important work was carried out in Chicago -- from where this research tradition obtains its name, as the "Chicago School". Most notable among the proponents of the ecological view of the city and community structure were Robert Park, R.D. Mackenzie, and E.W. Burgess. By the time that the collected views of the Chicago School theorists were formally presented in (PARK and BURGESS, 1925), the human ecologists had produced an impressive range of ecological monographs (ROBSON, 1969: pp.8-14).

(104) The organising principle of this conceptual scheme is the analogy between plant communities and human communities, drawn by Park. Influenced by the Darwinian concept of the "web of life", Park took man to be subject to the general laws of the organic world as concerns the interrelationships between man and man and between man and environment. He acknowledged the presence of two clearly distinct kinds of factors in such interrelationships: (i) Sub-social factors: the basic need for survival, or the "biotic" level of human activity, which gives rise to the "community" and is based on the sub-social forces of competition; and such aspects were to be studied by ecology. At this level, men were regarded as individuals without any properties characterising social wholes. (ii) Social factors : the social processes of communication and consensus in which people become "persons" with social characteristics. This was referred to as the "cultural" level of human activity which gives rise to "society" and distinguishes man from other organic elements of nature. It was seen as a "superstructure" resting upon the more basic competitive "biotic"

level of "community"; it was to be investigated by social psychology. Thus, on this account, ecological concern rested with the level of "community" which was taken to be the outcome of inevitable "natural" forces analogous to those operating upon plants and animals. Transalted into human terms, the processes recognised by plant ecologists were: (a) Competition both for limited space and for access to the most desirable location for residence and business activities. Competition processes were reflected in land values; the price mechanism of the land market was the "hidden hand" which arranged similar types of individuals into similar types of areas. These processes were taken to be the mechanism which accounted for the seggregation of the Central Busines District of the city, the areas of commerce and retail trade activity, and the residential areas of similar types of people, the latter being established according to financial ability of categories of people to pay the economic rent of the site. (b) Dominance of one type of species, or users of space, over others in terms of controls of environmental conditions which encourage or discourage other types of species. In this sense, the Central Business District in the city constitutes the dominant element within the whole urban area. Being of maximum accessibility, the C.B.D. bears the highest land value and thus repels other users of land. The same processes of dominance were recognised to obtain within other sub-areas of the city: e.g. high class residential use tends to repel lower income residents.
The concepts of "invasion" and "succession", closely associated with dominance processes in plant ecology, were also transferred into the field of human ecology. Further, the concept of

the "gradient" was employed, in the analogy from physiology, to account for the empirical observation that within the city there was a gradient of land values which declined outwards from their peak at the functional centre of the city (ROBSON, 1969: pp.8-14).

(105) This statement appears to take for granted the view that there exists an identifiable distinction between the notions of description and explanation. This, however, is not universally accepted. There is much contentious argument as to whether or not description and explanation differ in any significant respects. The issues involved are highly complex and concern the logical foundation and goals of scientific inquiry; and, as is usual in such cases, they are not amenable to conclusive answers. Given the vast scope of the subject, it is not possible to deal with the problem of "description versus explanation" in the context of this thesis. A brief discussion has been included in the Appendix to Part II, where some of the main points at issue are mentioned in a rough, rather intuitive way. For the purposes of this footnote, however, suffice it to state that <u>description</u> is usually contrasted with <u>explanation</u> in terms of the sorts of questions each provides answers to in scientific inquiry. Thus, description generally answers "what-questions" -- and, sometimes, "how-questions" -- whereas explanation answers "how-questions" and "why-questions" (on one account, scientific explanation ideally provides answers to "why-questions" by invoking "reasons" or "causes" responsible for the occurrences to be explained). In this sense, descriptions are often referred to as "mere" or "just",

in contrast to explanatory statements of one kind or another, usually (some say: essentially) including what are known as scientific laws (GIBSON, 1960: pp.3; 8); (HARRE, 1960: chs. 1;3;4); (HARRE, 1972: pp.23-27); (HEMPEL, 1965: IV, sec.2; 3); (HEMPEL and OPPENHEIM, 1953: p.319); (KAPLAN, 1964: p.329); (POPPER, 1972: pp.349-352; 355-356); (RESCHER, 1970: pp.1-24).

(106) An informative, systematic account of such critical reviews of the Park and Burgess approaches is to be found in (CARTER, 1972/1975 : pp.172-193); where various extensions to those models are briefly described -- the emphasis being on the Burgess model (which, of course, is founded on Park's conceptual scheme). As concerns the plausibility of the mechanism postulated in the ecological scheme, it has been argued by many writers that the "hidden hand" of the system of competition is a very partial account of the processes involved in the city. Competition for scarce resources takes place within non-static structures which provide opportunities for individuals and groups in their various locations within the city. Such opportunity structures are influenced by aspects of community power. If these opaquely described market mechanisms are not sufficient to produce a socially just and equitable allocation of resources in the urban context, then it is necessary to attempt to construct an administrative, governmental system of allocation which will promote fair distribution of resources among city inhabitants. Development of alternatives to the market mechanisms is thus identified as one of the main problems of contemporary advanced

societies (HARVEY, 1973: pp.107-118). These alternative schemes would be aimed at allowing the "transference of productive power and the distribution of surplus to sectors and territories where the social necessities are so painfully obvious" (ibid.).

(107) Within the framework of location theory, various studies have attempted to explain spatial patterns of industry, retail trade developments, agricultural land use types, urban residential development, and economic activities.

(108) "Geographical space" may refer to a variety of spatial scales, from regions (extended areas), to towns or industrial and shopping districts, the latter being taken as "point" concentrations in space. The range of "places" attracting the interest of location theory is restricted to those existing in advanced industrialised countries -- in contrast to earlier interest in agriculture oriented centres.

(109) Spatial scale of analysis and nature of "factors" determining locational behaviour of firms are said to have suggested the distinction of three main areas of location theory (WEBBER, 1972: pp.8-9): analysis of regions; analysis of points of activity concentration; and the latter is further separated into analysis of firms producing at points but having wider market areas (point production), and analysis of firms which produce over space but their production is addressed to supply areas located at points (areal production). The latter category of firms tend to decide on location and production by giving major consideration to price of land; such considerations give rise to land use theories.

(110) Older, classical approaches employ the micro-economic theory of the firm to explain aggregate location patterns. They investigate the behaviour of individual firms -- under certain assumptions -- with regard to production and location decisions and develop empirical generalisations concerning location patterns by building up from individual actions. One such classical model is central place theory which studies the behaviour of individual firms to predict size and spatial distribution of towns. However, smooth transition from the micro-level of individual actions to the macro-level of aggregate social location patterns is not possible except under highly simplified assumptions which hinder the testing of empirical hypotheses against factual evidence. More recent studies have tended to proceed from the other end by placing emphasis on aggregate rather than individual behaviour of firms. They make assumptions about"forces" operating to constrain location of towns, etc., but make no such assumptions concerning individuals. This results in a state of affairs where many forms of individual action may be consistent with an aggregate formulation. The lack of approaches which attempt to bridge this gap between individual acts and social-spatial patterns is succintly pointed out in (WEBBER, 1972: p.8); and the same problem appears in the forefront of every undertaking of theoretical research in the general field of urban studies; viz. the gap between the micro- and macro-level of analysis.

(111) Rent is usually assumed to be the payment made by a firm or household for a land site in order to obtain the privilege of locating in it. It is taken to be equal to the site's marginal revenue product.

(112) The last two features, viz. mutual determination of land uses and land values/rents, and conceptions of the "friction of space", are also peculiar characteristics of the part of location theory which deals with the patterns of land uses. So-called land use theory (WEBBER, 1972: ch.3) it differs from other locational studies in that it takes land as a factor of production in supply areas: the price of land constitutes an important "factor" affecting location and production decisions of firms. Land use models focus on overall location patterns of industries -- in contrast to point location models which study location points of particular firms. They also differ from the latter models in their postulation that rental payments for agricultural and urban land constrain location and production policies of firms. Land use studies may be broadly distinguished into those concerned with agricultural land uses and those dealing with urban land uses -- e.g. industrial, residential, retail trade. The conceptual foundations of agricultural and urban land use models appear to be the same -- traceable to economic theory -- although each group of models use different combinations of organising principles. Both groups of models employ the market mechanism to derive equilibrium conditions for aggregate location patterns of land uses. Thus, land rents are determined by the value of the marginal product of the land; and that value is influenced by the "factors" of fertility (in agricultural uses) or topography (in urban land uses) and distance from the market centre. Rents decline around a market centre with increasing distance from it (expressed in transport and commuting costs). Changes in rent levels are seen as the main determinants of land use patterns around the market centre.

(i) Models of agricultural location originate in nineteenth century

German studies of agricultural land use (von THUNEN, 1826), (HALL, 1966). The ideas in the von Thünen study, which is considered the common source for much of location theory (ISARD, 1956: p.27), received modern treatment in (LÖSCH, 1941/54) and (DUNN, 1954), and were further developed in (ISARD, 1956). The von Thünen model and its derivatives are abstractions which study location of agricultural production around a market as regards the effects of location upon production. Equilibrium statements for the whole industry concerned are derived by making a range of unrealistic and simplifying assumptions -- such as a static agrarian economy, existence of only one market centre, etc. -- which have been criticised by many writers (HAGGETT, 1965: pp.175-176), (HARVEY, 1966). Some of the criticisms are given due consideration in a family of more general models, the so-called interregional equilibrium models, which can incorporate variations in production costs and the existence of a number of markets (STEVENS, 1959).

(ii) Models of urban land uses reflect attempts to apply the principles of models originally formulated in terms of agricultural location, to land use allocation problems within cities. Early developments, such as (HURD, 1902) and (HAIG, 1926), provided more recent studies with many of their concepts and structural components. The mechanism which is postulated to underlie the process of land allocation in the city is extremely simple and derives from the operation of the market. Thus, potential users of land make offers (bids) for various sites in the city. These offers reflect locational advantages of the sites. The individual or firm making the highest offer (the highest bidder) secures the privilege to locate in the site, in each case. Haig's is the clearest early statement of these

principles organised as a theoretical whole with regard to a specifically urban metropolitan context (STEWART, 1972: p.21), (ALONSO, 1964: p.6). For Haig, rent for a site reflects its accessibility and arises from savings in transport costs. Costs due to the "friction of space" whithin the city are measured by the rent for the site plus costs of transport. The urban land use pattern is taken to be the result of the attempt of locators to minimise the costs due to the "friction of space". More recent models have focused on the cost of transport as determinant of urban land use patterns (WINGO, 1961); and have investigated more specifically urban residential land use patterns (MUTH, 1961), (ALONSO, 1964). The last two models have had some predictive success in terms of land values (WEBBER, 1972: p.65). A version of the Alonso "theory of land rent" has been employed in the linear programming model of (HERBERT and STEVENS, 1960) which was developed with specific urban planning application in mind -- in the context of the well-known Penn-Jersey Transportation Study of the early 1960s.

(113) Most frequently, the theory applies to patterns of location which are seen as the result of the influence of two kinds of "forces", viz. the locational decisions of firms, and the economic pressures of society. These "forces" determine the location where firms survive.

(114) In the classical analysis of point agglomerations, it is possible to distinguish three main sets of theoretical models (WEBBER, 1972: ch.2). (i) Weberian theory (FRIEDRICH, 1929), (HOOVER, 1937), (HOOVER, 1948), (ISARD, 1956), concerns itself

with the study of the location of individual firms under conditions of perfect competition, and assumes both markets and materials concentrated at points. Although such assumptions may be questionable, the main principle deriving from Weber's model of industrial location -- viz. that industries tend to locate near sources of raw materials or near markets depending on magnitude of their needs in materials -- does appear to have some applicability in actual situations. Further, the model attempts to sketch some mechanism of town formation in postulating that agglomeration economies is one factor "causing" growth in the city: towns are seen to operate initially as sites for agglomerated manufacturing industries. (ii) Central Place Theory (LÖSCH, 1941/1954), (CHRISTALLER, 1933/1976), (DACEY, 1965), (BERRY and GARRISON, 1958), (DICKINSON, 1964), concerns itself with the study of spatial organisation obtaining within and between places of activity concentration. It investigates the spatially efficient level of activities that are grouped in a central place (accepting the principle of agglomeration); the area that a central place can serve or control (functions of towns); and the spatial arrangement of several such places over an extended territory -- i.e. whether there exists an empirical order in such arrangement. These analyses yield certain statements concerning, say, the effects of town size on the size of market area, the spacing of the number of functions within towns, etc. Some of the statements have been shown to have empirical import in at least some areas of the world (in the sense that they provide adequate descriptions of actual situations). In a Löschian theoretical context, towns are seen to function primarily as service centres whose locations are determined by social optimising "forces". Models

of population migration and the diffusion of innovations (HÄGERSTRAND, 1952), (HÄGERSTRAND, 1957), and studies of retail trade in the context of urban land use theory (BERRY, 1961), (BERRY, 1963), (BERRY, 1967), are notable research contributions which proved important in the development of a number of theoretical models in urban planning (e.g. various "shopping" models which were founded on the concepts of central place theory (NEDO, 1970). (iii) Interdependence models (HOTELLING, 1929), (SMITHIES, 1941), (GREENHUT, 1956), focus on processes of locational decision making of individual firms as they are affected by competition with other firms, and show how similar firms tend to repel one another. One important result from these models is the indication that optimum behaviour by firms may result in non-optimal behaviour from a social point of view. Although use of these models in location theory has been limited, they seem to be important in that they suggest one aspect of an extremely simplified mechanism of town growth. For instance, Hotelling's model views the growth of towns as a result of competitive behaviour by interdependent service firms.

(115) Firms are not assumed to be necessarily within the "place".

(116) The concept of "economic man" and the weak assumptions about perfect knowledge, perfect markets, and totally rational behaviour that underlie it have been discussed elsewhere (FAMELIS, 1970: p.254). The usefulness of the "economic man" concept is roughly analogous to that of the concept of "equilibrium" in economic analysis. Consequently, its potential

contribution to developments in economic theory and decision analysis should not be negated on the grounds that it suggests an unrealistic model of human behaviour. Although the concept of"equilibrium" suffers from exactly the same deficiency, it has been central in the formulation of economic theory.

(117) At a general theoretical level, it is argued that the models are not connected into a unified theory of location which provides explanations for the formation of towns and the structuring of human activities in space. Notable isolated attempts at synthesis are reflected in the work of (ISARD, 1956), (GREENHUT, 1956); and (ISARD et al,. 1969) represents a more complete formulation. In the absence of such a general theory, the models are seen as partial, highly simplified approaches to the study of extremely complex processes. In fact the models do not generally refer to processes of change in the city, but treat the subject in a static manner without considering any time-dimension. However, most location studies attempt to describe aggregate location patterns rather than the dynamics of change and of individual decision making. In this sense, being static is no conceptual deficiency of the models, but rather results in restriction of their range of application and, therefore, of their usefulness. Models of agricultural and urban land use are also criticised for neglecting interaction between urban and rural land uses. A major difficulty in these models is their neglect of agglomeration economies and the way in which these induce the development of local nuclei,other than the principal market centre, within land use rings. Due to their simplistic conception, these models predict only concentric land use zones,

and thus fail to describe with sufficient accuracy empirically observable patterns such as those in cities with smaller nuclei interrupting the smoothness of gradients from the market centre. Moreover, the models visualise a uni-directional relationship between size and location of market centre, and land use patterns around the city. They ignore the potential influence of land use patterns on location and growth of the central market itself and of smaller nuclei (WEBBER, 1972:ch.3).

(118) Failure of the models to accurately describe empirically observable situations is claimed to be a direct consequence of the model's simplicity. The structure of the models may be internally consistent; but it is thought that it is insufficiently complex to account for the total urban land use pattern. The economic laws of the market for scarce urban (or agricultural) land, which are invariably invoked by these models as their organising principle, reflect only one aspect of the complex processes that operate in the city and in the spatial organisation of activities, in general. In this sense, the models may be said to neglect other important processes in the city, such as the political processes and distribution of power, the various constraints imposed by existing administrative (e.g. planning) and legal frameworks, social dispositions and attitudes prevalent at the time, etc. Thus, most of these models clearly set out premises and deductively develop statements which exclude all but purely quantifiable economic "factors". They involve rigorous, internally consistent "scientific" reasoning but fail to depict the empirical world in sufficient detail. They are claimed to be inadequate even as descriptions of actual

situations, and their explanatory and predictive value appears seriously diminished.

(119) For instance,Alonso's model of urban land use assumes, among other things, a featureless plain, all land ready for development without improvement, absence of any legal, planning, or social constraints, perfect knowledge possessed by both buyers and sellers in their land transactions, totally rational behaviour in terms of maximisation of revenue (sellers), profits or satisfaction (buyers) (ALONSO, 1964). It is argued (WEBBER, 1972 :pp. 38-40) that such assumptions impose limitations on empirical testing of predictions derived from the models. The extremely simplified, unrealistic assumptions upon which the models are based make it almost impossible to find a real world situation in which the assumptions actually hold, in order to test the predictions. Moreover, direct observation of actual behaviour of individuals or firms as a means of testing model predictions must be more or less ruled out. This points to the need for further theoretical development of the models to enable proper testing. Most of these models adopt a method of approach which involves building up from considerations of individual decision making to arrive at predictions of aggregate location patterns. But this movement from the micro- to the macro-level necessitates theoretical developments which are not yet available. As a result of such gaps in theory, location models have had to base their statements on grossly oversimplified assumptions concerning environmental conditions. Cf. also note (110), this chapter, on the same point.

(120) Cf. Appendix to Part II, entry: "Instrumentalism". The last chapter of Part II contains an account of the instrumentalist sense of model.

(121) For if they are taken literally, then they are probably false as general descriptions of the way in which individuals, households, or firms behave in a spatial context. However, it is trivially true that people do not, in principle, behave totally irrationally. Consequently, assuming that people behave "as if" they were totally rational, possessed perfect information, etc., is a useful approximation to the actual state of affairs. It emphasises certain aspects of economic behaviour that are of interest, and by so doing enables understanding of analogous points between assumption and empirical reality. Now advocacy of the "as if" approach and the associated view praising "unrealistic assumptions" in scientific theorising is frequently referred to as one of the points at issue in the context of the methodological controversy in economics -- begun in the 1960s, but still very much alive -- concerning admissibility of "unrealistic assumptions" in theories (and models). For instance, Milton Friedman's account of the methodology of "positive economics" (FRIEDMAN, 1953 pp.3-43) is said to reflect an instrumentalist view of scientifics theories (WONG, 1973: p.314) -- though not one which corresponds precisely to Popper's definition of "instrumentalism", as in (POPPER, 1963: pp.97-119). Friedman's account suggests that assumptions such as "perfect competition", "perfect monopoly", etc., though believed to be descriptively false, may be employed as useful "conventions" or "instruments of prediction". Such allegedly false statements

in a theory are not taken to be problematic if that theory can give sufficiently accurate predictions. Since a theory is said to be of value for"explaining" much by little, it will have to abstract from reality and its significance will vary inversely with the "realism" of its assumptions. The origins of this version of the "methodology of positive economics", with its reliance on the "as if" approach, may be traced back to Neo-Kantian views and to the "fictionalism" of Hans Vaihinger. Friedman's characterisation of the conceptual and methodological situation in economics has been accepted by many, but has also given rise to serious criticisms against it. One of its strongest critics has been Paul Samuelson (SAMUELSON, 1963); (SAMUELSON, 1965), who argues from a descriptivist viewpoint regarding the nature of scientific theories. Important contributions to this debate have been made by (BOLAND, 1970), (AGASSI, 1971), (SELIGMAN, 1967), (ROSENBERG, 1972), (CODDINGTON, 1972) -- the latter arguing from a realistic viewpoint. The positions referred to as "instrumentalism", "descriptivism", "realism", are discussed in the Appendix to Part II, entries: "Instrumentalism", "Positivism", "Realism", "Description versus explanation".

(122) Strong criticisms against such instrumentalist arguments are put forward by (HOLLIS and NELL, 1975) in their convincing philosophical critique of positivistic "positive economics", and of the pragmatist/instrumentalist variations on these themes -- although their arguments for an alternative, rationalist epistemology may appear somewhat overstressed. The point concerning the plausibility of assumptions that are built in models, and the epistemological problems involved in the drawing

of inferences from models are discussed in Part II.

(123) A brief account of this Humean view of causation is given in Appendix to Part II, entry: "Empiricism".

(124) Some of the aspects of the positivist programme are discussed in the Appendix to Part II, entry: "Positivism and Logical Positivism". It is not possible to consider all of these in detail in a thesis of this nature, and therefore there are many issues that have been left out of that and the present account. Such issues may be very important in an accurate philosphical account of positivism, though their inclusion in this dissertation would not add anything to the argument. Hence the selectivity and simplification that are purposely adhered to in the present discussion may be misunderstood as reflecting the real nature of the philosophical writings of a number of highly original scholars. This would undoubtedly give a false image of what is actually a very complex philosophical account of knowledge and science and of the highly technical discussions on logic and epistemology that have been carried out within the positivist tradition.

(125) Cf. Appendix to Part II, entry: "The mind/body problem".

(126) Phenomenalism stands for the claim that "physical objects can be analysed without residue into sentences about sense data" which makes the actual or possible appearances of objects central in epistemology and rejects the postulation of underlying unobservable objects (LACEY, 1976: p.157) -- such as, for

instance, realism would be likely to make (cf. Appendix to Part II, entries: "Positivism", "Realism", "Description versus explanation").

(127) Cf. Appendix to Part II, entry: "The mind/body problem". The term "physicalism" also refers to Rudolf Carnap's doctrine of the "unity of science".

(128) Cf. Appendix to Part II, entry: "Analytic and synthetic statements".

(129) The "verification theory of meaning" is referred to below. It has been developed by the Logical Positivists of the "Vienna Circle" and asserts, roughly, that the meaning of a statement is its method of verification.

(130) Cf. Appendix to Part II, entry: "Positivism and Logical Positivism".

(131) Tenet (iv) gives rise to methodological naturalism (q.v. in Appendix to Part II); while tenet (ii) has been associated with "descriptivist" and "instrumentalist" interpretations of the status of scientific theories (cf. Appendix to Part II, entry: "Description versus explanation"). It is possible to identify the following connections between "Instrumentalism" and other philosophical views : (a) with positivism, in terms of the predictivist account of explanation; (b) with conventionalism, in terms of the approach adopted towards the testing of hypotheses; (c) with pragmatism, in terms of emphasising predictive performance as a criterion of acceptance of theories; (d) with hermeneutics in the German tradition of

the philosophy of the "Geisteswissenschaften", in virtue of its nineteenth century Neo-Kantian connections, e.g. in Vaihinger's work on "as if" thinking and "fictionalism"; (e) with the work of writers influenced by the tradition of the later Wttgenstein, for instance Stephen Toulmin and T. S. Kuhn.

(132) These criticisms are to be encountered in various sections of the thesis, especially in the discussion on "scientific method" and on the "methodological debate" in the social sciences. Moreover, they are summarised in the Appendix to Part II, entries: "Positivism", "Realism", "Instrumentalism", "Operationalism", "Description versus explanation". Positivism as behaviourism is discussed in ibid., "The mind/body problem".

(133) See main text, Part I, discussion on "scientific method".

(134) See main text, Part II, "The logical status of correspondence rules".

(135) These issues are explored at length in Part II.

(136) That much seems to be conceded by Lionel March in his advocacy of models of spatial phenomena (MARCH, 1974: pp.12-13). Hence if his advice is to be heeded, planners have to develop theories or hypotheses to organise the search for data to put into models which will represent the urban world (whatever that might mean: is there a social reality that is specifically urban? or is this part of a general social process which is conventionally compartmentalised for the sake of analytical convenience ?

Many Marxist thinkers on urban affairs, e.g. (CASTELLS, 1977), take the latter view). This sounds like the hypothetico-deductive account of scientific theories and their interpretation in models. As an argument against inductivism or "mindless empiricism" it might be accepted. However, if facts are to be perceived differently, depending on the theory that is put forward, then the empirical foundation of knowledge dissolves into relativism. Apart from the intellectual discomfort that it might give rise to, relativism -- in the specific terms stated later in the thesis -- may not be as harmful as it sounds. But the point is that a hypothetico-deductivist is unlikely to be a relativist as well, for he would believe in the existence of objective, potentially true knowledge. Though he may put forward alternative hypotheses to account for the same set of "facts" he would not normally take more than one successful hypotheses as equivalent accounts but would try to sort out the most plausible one by way of decisive tests against the"facts".

(137) The positivist view of models and analogies is extensively discussed in Part II -- chapters twelve and fourteen -- and in Appendix to Part II, entries: "Positivism and Logical Positivism"; "Realism".

(138) The term "humanism" is loosely employed and suffers from many ambiguities though it is useful as a "catch all" name for a number of widely different doctrines. Some humanistic perspectives on social thought are explored in greater detail below -- chapters four, five, and nine -- and the term "humanism" is explicated in that context.

(139) It is necessary to make clear that not all social scientists who espouse this view would accept it 'in toto'. Some would only accept some of the rules and procedures of inquiry and reject others; others would not endorse the uncritical acceptance in social science of all the epistemological and methodological views developed in the natural sciences (so-called "scientism"). Yet others could reject the direct use of physical models in providing explanatory accounts of social phenomena, though they might insist on operationalisation of theoretical concepts, objective inquiry, or theory-free observation.

(140) The philosophical arguments for this statement are reviewed below, chapters seven, eight, and nine. Contributions to this debate have been made by Popper, Hanson, Kuhn and Feyerabend, to name but a few. It is claimed that : (i) theoretical beliefs and expectations somehow influence sensory perception; (ii) the meanings of so-called "brute facts" or observational terms depend in some way upon the meanings of theoretical terms or various statements forming a scientific theory. In (i), above it is shown (HANSON, 1958) that the view of science as based on some theory-neutral, value-free, uninterpreted realm of perceptual experience is untenable -- though some writers do not accept the full implications of this view regarding the perceptual differences that typically result from theoretical disagreements. In (ii), above, the theory-neutrality of observation is rejected (KUHN, 1962/1970), (POPPER, 1959/1972: sect.27-30; p.111); and the importance of human values in science is also acknowledged (FEYERABEND, 1970). However, such views have been developed in the context of the philosophy

of natural science and when they are transferred to discussions in the social sciences there is always the risk of misinterpretation. For to recognise theory-ladenness of observation and facts presupposes existence of well confirmed general theories which are not always available in the social sciences. This state of affairs seems to render the idea of the existence of two languages -- one of theory and one of observation, as in positivist epistemology and one of its social scientific versions: "behaviourism" -- more plausible in the social sciences, 'prima faciae'. However, the dual-language thesis in social inquiry faces additional problems that are peculiar to the "social" subject matter. For social data or allegedly "brute facts" are always <u>interpreted</u> not necessarily theoretically but in terms of a framework of culturally understood <u>meanings.</u> This invalidates the claim that an uninterpreted observation language is possible in social studies -- a claim that is widely held by "behaviourists". The conceptual distortions and difficulties that ensue from attempts to operationally define terms such as "accessibility" (STEGMAN, 1969) in social/spatial research clearly illustrate this point. In the absence of some general theory of "accessibility" which allows to place this theoretical term within a coherent system and so regard it as an intelligible datum, the concept acquires meaning as a "fact of life", associated with a range of background expectancies and assumptions of rational behaviour. This way of operationally defining the concept may be pragmatically accepted and the definition may indeed be found to correlate well with other "empirical variables". However, it is necessary to acknowledge

that the operational definition is founded on the assumption that human conduct is interpreted according to a culture-specific set of expectations, norms, and meanings. It is not a statement in some "pure" observation language, on the behaviourists' account. But this operational definition is not a theory-loaded statement of the kind that is discussed in the natural sciences.

(141) Cf. Appendix to Part II, entry: "The Mind/Body problem".

(142) Cf. chapter seven; see also footnote (150), this chapter.

(143) Cf. Appendix to Part II, entry: "The Mind/Body problem", where the doctrine of behaviourism is briefly described.

(144) These issues are dealt with below, chapter nine, in the context of examining questions of applicability of methods and procedures of natural science to the study of social life.

(145) Cf. Appendix to Part II, entry: "Variable".

(146) Cited in (SCHON, 1963/1969: pp.142-143).

(147) See below, chapter eleven; also cf. Appendix to Part II, entries: Positivism"; "Corespondence rules".

(148) Cf. Appendix to Part II, entry: "Operationalism".

(149) Cf. Appendix to Part II, entry: "Positivism and Logical Positivism".

(150) This aspect of the problem of induction has occupied many philosophers and their work is referred to later in Part I, discussion of the inductive/deductive scheme of scientific reasoning. The problem may be seen to arise in empiricist epistemology and hence has implications for all empirical studies of social/spatial phenomena leading to models and theories. This occurs because the statement that some regularity will persist over time is not sufficiently warranted by experience and observation. It cannot be known empirically that an observed correlation, say, between decline in land values and distance from the city center will continue to hold in the future in the same conditions. If all cases of spatial movement of people observed in the past indicate that the amount of interaction between population centres is regularly proportional to some inverse function of their distance apart (or of costs of travelling between them),and is regularly proportional to the number of people in each centre, then how can it be asserted on empirical grounds that future occurrences of this regularity will, in the same conditions, continue to take place. Is it logical to claim, on the basis of factual evidence, that this is a projectible generalisation and not a mere correlation which simply happened to have held in the past? Now there are two logical, mutually exclusive answers to this sort of question. One is to claim that the statement asserting continuation of the regularity in the future, other things being equal, is an empirical statement -- viz. synthetic. Since the regularity has almost always been observed to be the case it is empirically known that the regularity will continue to hold. But this is an argument by induction, i.e. the very

process which it is sought to logically justify, and leads one to infinite regress. Another reply is to maintain that the statement postulating continuation of a regularity in yet unobserved cases is known 'a priori' -- that is, it is analytic. But the empiricist epistemology in its modern version of logical positivism, takes such statements as devoid of factual content and true by definition. Thus, the former kind of answer leads to circular reasoning ; the latter may be taken to imply arbitrariness -- at least in the positivist account of knowledge. There have been attempts to bypass this well-known logical problem by introducing the notion of probability and agreeing to accept probable rather than certain outcomes of regular relations. However, this approach is unable to settle the issue, for probabilities presuppose inductive evidence that what has occurred in observed instances will occur in a percentege of others. Probability is a derivative notion and its application to some empirical relation presupposes that that relation will hold (in the proportion of cases stated in the statement of probabilities) in the future. For instance, it seems plausible enough to maintain that some hypothesis about spatial distribution of population becomes more probable with increasing number of instances in which the regularity it refers to has occurred. Nonetheless, the problem still remains but is now transformed to one of knowing a hypothesis to be probable. Since positivist epistemology rejects 'a priori' knowledge of some hypothesis being probable, probability statements are to be empirical. Now, the calculus of probability is a numerical and formal (tautological) theory: it guarantees that some arithmetical measure has been coherently derived within the calculus.

The theory itself is totally indifferent towards the substantive content of the material it is applied to and processes (STUDDERT-KENNEDY, 1975: p.79). Hence when the theory is applied to empirical data to calculate probability of occurrence of some regularity, it presupposes that the regularity in question is in fact as likely to occur as the numerical value ascribed to it. That is, unless it is in fact true that some relation or regularity is likely to hold in yet unknown cases, the calculus of probability will not bestow any factual status to the hypothesis postulating that relation. In the case of spatial interaction, unless it is true that the regularity: "interaction between two population or activity centres decays according to some exponential function of their distance apart -- distance being expressed in any way" is likely to hold in yet unknown cases, its statement in terms of probability will not alter the empirical status of the relation between spatial interaction of activity centres in space and distance separating them.
The hypothesis stating such a relation is an empirical statement: it is refuted by one disconfirming instance (allowing for "conventionalist stratagems"). However, the hypothesis which states -- in terms of probability -- that the regularity is likely to hold in the future is not empirical and not subject to empirical disconfirmation. To take an extreme example, the claim that some city is likely to be in the same location tomorrow morning as the one it occupied last night is not invalidated by the discovery that the city has in fact changed its location overnight. For the claim merely states that the city was in fact likely to remain in the same location. If by some strange and sudden change in the laws of nature cities began

to wander all over the place it would still be true that they were likely to maintain their regular state of immobility. Therefore, it is not the probability statement that is refuted empirically. Now, it is argued that probability statements of the form: "it has been observed that a% of X's are Y's; hence the probability that an X will be Y is a% ", are analytic, i.e. devoid of factual content (HOLLIS and NELL, 1975: ch.3). It is relatively simple to show that this claim is valid in cases where some numerical value of probability is derived simply by computation. Take the standard example of probability handbooks : if a fair die is tossed "the probability of throwing 1,2,...,6 is equal to 1/6". This is an analytic statement true in virtue of defining the sum of probabilities of all possible outcomes to be equal to 1 and taking the die to be fair, i.e. assuming equiprobable possibilities. Whether or not, say, 3 is in fact thrown in 1/6 of the total tosses, the probability statement is true by definition. To test it empirically is to test whether the die is fair or not, rather than the statement itself. However, the situation appears to be more complex in social statistics: to claim that probability statements are analytic in that context requires some evidence. In social statistics, some observed correlation between X and Y in a number of known cases forms the basis for statements like: "a% of all X's are Y's ". Expressing this statistical assertion involves some empirical evidence, for the probability statement is applied only when X's and Y's are observed to correlate significantly. Nevertheless, only formal computing procedures are involved in statistical extrapolation from known observed occurrences to total populations. Extrapolation must

presuppose that observed correlations will hold in yet unobserved instances; it does not confirm this. Unlike the previous case of the die, in this case there are two probabilistic measures to be computed: (i) probability that what is valid for the sample holds for the total population; and (ii) probability that the next X will be Y. But both measures are the product of calculation and are not contingent upon validity of empirical relations. This is taken to show that statements of probability involving deduction of probability from a statement of evidence are analytic and have no empirical content. If the confirmation of a hypothesis involves its withstanding the test of experience, then it is necessary to know what regularities that have been observed so far will in fact continue to hold. The above account was mainly based on (HOLLIS and NELL, 1975: ch.3).

(151) These issues impinge upon the well-known "mind/body problem" in philosophy. Some of the views that have been expressed and are currently held on this problem are discussed in the Appendix to Part II, entry: "The Mind/Body problem".

(152) Seen from the prespective of order, the "present" represents the last stage of the "past"; while seen from the viewpoint of "progress", the "present" is experienced as the beginning of the "future" (MANNHEIM, 1960: pp.21-21).

(153) The issue of incommensurability of paradigms is discussed later in Part I.

(154) Calls for multidisciplinary integration were heard as late as the mid-1960s (FAMELIS, 1970: Ch.1).

(155) Analytical thinking is a direct application of the concept of reductionism or atomism, that is, of the principle that every entity in the real world -- and the experience of that entity -- can be reduced to ultimately indivisible parts. Reductionism is regarded as one of the two fundamental doctrines of scientific thinking during what has been called "the Machine Age" (ACKOFF, 1973: p.661). The other doctrine was that of mechanism. The usage of the term mechanistic implies a predominantly deterministic view of the world in which there is no scope for teleological concepts. A cause is taken to be necessary and sufficient for its effect and is taken as environment-free. Specially designed environments (laboratories) enable exclusion of environmental effects on phenomena under study.

(156) For a brief account of the emergence of systems thinking see (ACKOFF, 1973: p.663).

(157) For a definition of the concept of a system, discussion of its general properties, its instrumental use within the framework of General System Theory, and relevant bibliographies see (SUTHERLAND, 1973). Footnote (36), chapter one, provides a brief outline of these themes.

(158) This is deduced from the supposition that "a set of elements that forms a system always has some characteristics, or can display some behaviour, that none of its elements can" (ACKOFF, 1973: p.664). There follows that the aggregate

of the performances of its elements is not always equal to the aggregate of the performance of a system.

(159) An early example of the sociologists' involvement in planning is the social survey movement in Britain (KRAUSZ, 1959). However, the interest in the social aspects of planning was two-directional: the planners' concern over social problems (inspired mainly by Geddes) provided the conceptual framework for the town and regional surveys (BUTTIMER, 1971: p.149)

(160) Engagement of economics in the planning of national economies took place much earlier. Economic planning was institutionalised in the Western countries after the depression years when it became obvious that "many things had gone wrong". Rooted in socialism, Keynesian theories, and anticyclical policy, in general, economic planning represented a desire to understand and influence the economy as a whole. Having been preceded by the introduction of the planning activity in large business establishments, economic planning succeeded in overcoming its socialist image and in focusing attention on aspects of national economic development.

(161) These developments are discussed below. Especially in relation to planning as a process or method independent of subject matter and context, the discussion concerning interdependence between theory and method of inquiry, in chapters four and five, is directly relevant.

FOOTNOTES TO CHAPTER THREE

(1) This issue is extensively discussed in the Appendix to Part II, entry: "Naturalism (in the social sciences)", where it is argued that the decision to apply the methods and procedures of the sciences to all fields of inquiry, including investigation of the world of man and society, rests on prior philosophies or beliefs and is not possible to justify as an empirical claim.

(2) See Part I, below; discussion of "scientific method".

(3) For example, the "growth pole" concept (BOUDEVILLE, 1967); (FAMELIS, 1970).

(4) Among the various proposed modifications of the comprehensive land use planning "model" it is worth mentioning the new way of looking at the "plan" as an ongoing process rather than as a "one-shot" activity culminating in the "master plan". This conception of planning involves continuous updating and revision of factual information (e.g. survey data) and of predictions based on these. Moreover, it allows for taking into account information deriving from feedback from planning activities taking place at higher or lower levels of the administrative hierarchy. The various planning activities are to be seen in a systematically organised and coordinated framework, and the time-horizons of the plans are to be shortened in view of the many problems involved in long-term fixed plans (GOODMAN and KAUFMAN, 1961), (KENT, 1964), (PERIN, 1967).

(5) Classic expositions of the systems approach in urban planning are (McLOUGHLIN, 1969) and (CHADWICK, 1971), keeping with

British experience. The American equivalents, say, (CATANESE and STEISS, 1970), (LAPATRA,1973), (STEISS,1974), do not seem to reach the conceptual elegance of the former. Systems approaches in urban planning may be regarded as one manifestation of methodological holism in social theorising. They are often associated with structural-functionalist theories of society and are, therefore, criticised for what structural-functionalism is allegedly misconstruing in its conception of society (BAILEY, 1975), (SIMMIE, 1974: pp.33-37). Alternatively, supporters of structural-functionalism do not see anything wrong in this association (STEISS, 1974). A different approach is adopted in (BROADBENT, 1977: chs.5,6) where systems analysis is seen as a valid instrument of analysis rather than as implying a functionalist theory of social organisation. That the notion of system need not entail "functionalism" is argued in (MARCHAL, 1975). Critiques of the structural-functionalist theory of society are no doubt legion, since this is a subject on which even first and second year sociology undergraduates test their capabilities of critical appraisal of theoretical perspectives. A general documentation of the debate on structural-functionalism in social theorising is to be found in (DEMERATH and PETERSON, 1967). So called "strong" or Parsonian functionalism is criticised convincingly in (GELLNER, 1970: pp. 115 ff.). For functionalist theories and planning, see (BAILEY, 1975), (STEISS, 1974), (CHAPIN, 1965). The latter advances a theory of planning based on structural-functionalist ideas; while (SIMMIE, 1974) takes"system theory" as the "latest version of the planning equivalent of structural functionalism" (p.33). He also claims that systems theory "inherits the positivist

tradition in the social sciences" like structural-functionalism, but for reasons stated earlier (cf.footnotes (34),(35), and (36), Chapter one) this is not entirely accurate. Parsonian structure-functionalism may be referred to as a positivist approach (KEAT and URRY, 1975: ch.4). However, the General System Theory which informs systems approaches in urban planning has very little in common with Parsonian structure-functionalism; and what it does have is the emphasis on systems and interdependencies rather than cause/effect analyses of atomic variables. However, General System Theory is claimed to be explicitly anti-positivist (SUTHERLAND, 1973) -- though its search for structural isomorphisms in its models with real world systems might be interpreted as a positivist influence. The differences are subtle but they are there: and the instrumentalism of systems approaches is not to be conflated with positivism. (See Appendix to Part II, entries: "Instrumentalism"; "Positivism and Logical Positivism"). Now, Simmie argues from a "conflict viewpoint" of society , and therefore he is unlikely to view with much sympathy the implications of equilibrium, order, and conservatism that are associated with systems views of the world. His is a perspective of normative change in society which opposes approaches that are founded on experience and observation of "what is the case" as perpetuating the 'status quo' rather than introducing change which removes underlying structures generating conflicts. The Popperian conception of "piecemeal social engineering" would be too conservative for him. Now, systems approaches carry with them the assumption of the principle of methodological naturalism -- cf. Appendix to Part II, entry: "Naturalism (in the social sciences)". Simmie seems to commit

the same error with many of his fellow sociologists in equating methodological naturalism and positivism, as if the decision to apply some version of the "methods and procedures" of science to the study of social life is inevitably an exercise in positivism. However, the contributions of the "newer" philosophy of science have clearly shown that this need not be so (see next chapter, and the discussion of "scientific method").

(6) Systems analysis was ".... construed simply as schemata for a normative theory of decision making ..." and implicitly involves the theory of rationality (BERLINSKI, 1970: p.106).

(7) The emphasis on "scientific" explanation upon which to base the prescriptions of a policy science precludes other modes of knowing (DYE, 1975: p.281): "there is also general agreement that explanation is best achieved through systematic analysis rather than rhetoric or polemics or introspection or dialectics". This involves searching "rigorously for the causes and consequences of public policy ...(utilising) scientific standards of inference in this search, and .. (endeavouring) to develop and test general propositions about public policy". This view seems to regard as feasible the scientification of planning and policy making, though there are strong objections to such an account which will be discussed below (later in Part I).

(8) With the entrance of social scientists into the field of urban planning -- a process that started in the 1930s -- various academic establishments began to stress social science rather than architectural or engineering techniques in the profession.

The University of Chicago was first in establishing a planning school following the social science direction. This curriculum subsequently spread to other universities and students with backgrounds in the social sciences streamed into these institutions (PERLOFF, 1957).

(9) The correspondence between these views and those expressed in Chapter one, regarding the fundamental forms of social thought, should be obvious.

(10) The peculiarities and difficulties involved in defining the notion of "the public interest" or "communal goals" have been discussed extensively in the field of politics with excellent contributions from (BARRY, 1964: pp.1-18) and (MILLER, 1962). In the field of urban planning, the work of (ALTSHULER, 1965) deserves special consideration. He regards the democratic identification of overall goals in pluralist societies as an almost unresolvable problem: "going to the public" and extracting their views as concerns their needs and wants is not a very successful excercise in the context of planning. Not all "interest/groups" show any positive interest, or if they do it is not sufficiently crystallised to enable derivation of the kind of concrete goals and objectives required in planning.
An equally pessimistic view is that of (ALLISON, 1975) who argues that although augmenting the participation of individuals in the process of structure planning is an honourable objective, what public participation exercises have shown so far is that society largely consists of egoistic, short-sighted utilitarians.
A more optimistic view is that of (DAVIDOFF and REINER, 1962) who

propose a number of ways of identifying "communal goals". On their account, there is the option of a statistical approach which would involve the selection of a random sample of population concerned and identification of their values and interests. Alternatively, a taxonomic approach would require the construction of a classification of the population into groups and the sampling of these categories; or even the assignment of values to those categories following assessment by the investigators.

The inevitable goal conflicts that emerge when different interest groups compete for the goods and services that are provided through social policies will have to be faced somehow and be resolved ultimately by resort to political processes. Moreover the relation between values -- e.g. cultural, social, or political norms, systems of beliefs, world views -- and explicit goals that are to be pursued through planning and policy making is not at all straightforward and clear; and here, too, the role of the dialectics of political life, negotiation, and arbitration, will be crucial in settling conflicts of interests and goals and establishing consensus. In Western pluralist democracies goal priorities are usually expressible in terms of majority preferences; though at the operational level of urban planning it is often the technical experts who are furnishing the goals and specific objectives for regulation. The extent to which the planner is well positioned to determine ends for action and standards to be adhered to varies considerably. It would depend on a number of conditions, such as the planner's ability to interpretatively understand other people and the problems they are facing in urban living and social interaction in terms of their own interpretations of social/spatial reality; as well as

his mastery of his subject matter so as to be able to trace possible consequences of pursuing specific value-goal combinations and effect reconciliation of conflicting goals. The difficulties involved in attempting to aggregate different individual preferences into a preference function for a group of individuals (a so-called "social welfare function") if such a function is to meet certain specific elementary conditions, have been demonstrated in (ARROW, 1951) in terms of the well-known "impossibility theorem". According to this "theorem", if certain plausible demands are made on a"social choice function" mapping -- e.g. demands like no one's preference is to count more than anyone else's preference -- then it is possible to prove that no function exists for uniquely specifying a "social choice" as a function of the individual choices. Hence all decisions about the "social good" are arbitrary. Useful contributions to this subject have been made by J.W.N. Watkins, e.g. (WATKINS, 1972); and the collection of papers in (HOOK, 1967), especially the articles by John Ladd, R.B. Brandt, and K.Baier. (The author of this thesis is indebted to Mr. Larry Briskman, Dept. of Philosophy, Edinburgh University, for drawing his attention to these questions).

(11) Normative statements are those which involve explicit or implicit prescriptions of norms or standards, recommendations, and proposals, and not simply descriptions of or statements pertaining to matters of fact. Statements containing terms such as "ought" or "good" are so characterised; and are referred to as value-judgments by those who claim that it is not possible to assess the truth or falsity of such statements, so-called emotivists, who postulate a sharp distinction between facts and values.

However, "ought" is not strictly a value term. It is usually employed in situations where there is scope for guiding action and thus may be said to relate to the closing of a gap between some existing state of affairs (what is) and some prescribed course of action affecting that state (what ought to be).

(12) See Chapter one above, and Part II, for various views of models, including the instrumentalist account.

(13) Implicit in, e.g. (CHADWICK, 1971: p.19); though the set of "human values" is allowed for as a sub-system within a man-nature system.

(14) The concept of planning as an "institutionalised science" was propounded by (DYCKMAN, 1961: p.335). A naive view of planning -- as well as a naive conception of "scientific method" -- is advanced in (BLUMENFELD, 1967/1971: p.291): "Essentially, planning is the application of scientific method to the entire complex of human activities within the framework of a given physical area . Its success depends on the degree of acceptance of the scientific spirit by society". No further comment should be needed to see that such a view of planning originates from the "scientism" of the mid-1950s (when that paper was originally written) and regards science and "scientific method" as if it were a 'deus ex machina' whose appearance on stage would bring to expedient and felicitous conclusion the human "drama".

(15) The concept of "bounded rationality" was subsequently adopted by (CHADWICK, 1971).

(16) The incrementalist mode of planning has already been introduced earlier (in Chapter two , sub-section (E)). A reconciling programme has been proposed by A.Etzioni , referred to as the strategy of "mixed scanning". This account acknowledges the limits of rationality; but this is not allowed to degenerate into a state of affairs in which ideological orientations towards normative choice are devalued in favour of incremental steps and piecemeal action as the best possible course of introducing change given such limits to rationality. It postulates that it is possible to arrive at some "informal scale of values" and differentiates between fundamental decisions and incremental ones. There are certain desirable changes which could not have come about as a result of "muddling through" and incremental adjustment but only as the short- or long-term consequences of widespread ideological conceptions leading to fundamental rather than incremental decisions. On the other hand, incrementalism and muddling through can operate as they do only because of strong and wide ideological consensus that happens to rule in the pluralist societies where they are pursued. "Mixed scanning" involves making "fundamental" decisions on the basis of societal ends and available knowledge, deliberately avoiding detailed analyses and aiming at an overview of the situation. It proceeds by reducing the coarseness of resolution and carries out "scanning" of alternatives at various levels and even different time-horizons.

(17) The issues regarding the relationship between theory and practice are highly complex and could be discussed at a level of philosophical abstraction and technicality that would be inappropriate for this thesis. The problem extends to questions

about relations between philosophy and methodology, theory and method of inquiry, substantive and procedural aspects of planning and, at a general epistemological level, between the "knower" and the "known". These "opposites", on some accounts, or integrated entities, on other views, do not mean quite the same things but they mark a range of great divides or dualisms with which philosophers have traditionally been dealing. A range of such views and their implications for planning are explored in the next chapters.

(18) For example, the world economy tends to function as neither planned nor unplanned. Moreover, the world culture is characterised by two conflicting trends: on the one hand, national features and values are submerged in a flood of homogenising goods and bureaucratic-professional styles; and on the other hand, the existence of considerable value differences and value conflicts cancel out the homogeneity of culture.

(19) It is debatable whether these areas are suitable for technologies at all. To obtain a technological question it is imperative to settle first questions of <u>ends</u> as well as questions of constraints such as budgetary, time, etc. Only then can the technological question be put in the form: find "technique" T for achieving the ends E within the limits of the constraints C. Now, in areas such as housing or education, reaching agreement on ends is the largest part of the problem (e.g. Labour versus Conservative views on the subject of comprehensive schools in the U.K.).

(20) Fast economic development and significant rises in living standards over the past few decades have generated a complex of aspiration crises. Thus, aspirations towards equity in the distribution of wealth and material goods; aspirations to freedom from historic forms of institutionalised injustice; aspirations to satisfaction that go beyond the dominant materialism of the past (e.g. fulfilling employment rather than only a job for earning a living wage); all these non-accomplished expectations have resulted in cumulative frustration and alienation of society. This is partially evidenced in frequent outbursts of violence, delinquency deviation, and cynicism of the young (GROSS, 1971: p.280). Crises of fragmentation are manifested in the structuring of technological knowledge, in community life within an expanding "urbanism", in responsibility and accountability within organisational complexes, in social roles, skills and culture within the contemporary extended professionalism, and finally within the very nucleus of the social system: the family. Crises originating from the erosion of authority start in the family and spread in ever widening circles towards higher levels of an established hierarchy of authority and power.

(21) Planning here is synonymous with formal rational methods.

(22) The term has probably been introduced into urban planning by (READE, 1968).

(23) The 1968 Town and Country Planning Act makes provisions for the setting up of "Planning Inquiry Commissions"by the Minister in cases where such problematic issues emerge. But Commissions

can only be seen as broad administrative structures within which criteria for judgments of the kind mentioned above could be developed and applied as the circumstances permit or demand. They do not make any theoretical contributions in the sense of expounding a range of aesthetic and ideologically consistent criteria to guide planners in the multiplicity of similar cases that occur in current planning practice.

(24) Most notably in the approaches of the Critical Theorists which are referred to in later chapters.

(25) The arguments for this are developed at length in Appendix to Part II, entry: "Naturalism (in the social sciences)". Interesting comments on this issue are also made in (HARVEY, 1974: pp.256 ff.).

(26) On these issues see next chapter and those on "scientific method".

(27) Such criticisms were voiced mainly by sociologists such as (DAVIES, 1972: pp.93-112), (DENNIS, 1970: ch.9), (EVERSLEY,1972: pp.9-14), (GANS, 1968: pp.188-216), (PAHL, 1970:pp.3-9).

(28) Britton Harris actually suggests that by using richer data and models planners ultimately succeed in establishing planning theory which is free from ideological implications.

(29) Questions of <u>social justice</u> seem to be central in most normative social theories, and this is also the case for the few such theories that are currently available in the social/spatial

context of the city -- e.g. (HARVEY, 1973). Value commitment toward specific moral and empirical states of affairs is characteristic of normative theories. There is always the risk that commitment will acquire doctrinal status and, transcending the limits of the relationship between theory and evidence, will degenerate into overt propaganda. Hence normative thinking is a ground upon which one ought to tread with extreme caution if integrity of the thinker and public appeal of the thought are to be criteria for assessing normative theory. It is difficult to conceive of academics or professionals in the field of planning who would not be concerned with creation, preservation and extension of social justice -- hence there is a starting commitment to this value in most planning operations. However, there are several "models" of social justice put forward by (moral) philosophers, each of which have different implications for the normative theory to be developed. It is impossible to establish that any of these "models" is the correct one or that others are incorrect. It is, nonetheless, possible to argue plausibly and intelligently for or against such moral stands, by subjecting to critical analysis the social ends that are taken to be desirable in each "model" and drawing the consequences of such ends in order to assess whether or not such consequences would be generally acceptable. Thus, rational debate and the logic of arguments is no less compatible with normative stands than dogmatic adherence to values. A normative theory would take the form of stating what is likely to happen if course of action (A) is taken rather than course of action (B), but would also assume a particular viewpoint regarding the goals of action in cases in which there is choice of ends.

Hence the theory could postulate quasi-causal relationships between relevant entities, structures, etc. but it would not be a strictly empirical matter to derive these. In so far as the investigator is concerned that some such relationships ought to pertain, that some social ends are to be preferred to others, the normative perspective is introduced into the empirical set of relations between "variables". Normative theory is particularly suited to those realms which deal with the connection between thought and action and is thus naturally an area for exploration in urban planning (KLOSTERMAN, 1978).

(30) The term means "scientific rationality" in the sense that this is employed by epistemological rationalists such as Descartes and Leibniz, but also by such empiricists as Francis Bacon and the positivist schools of nineteenth ant twentieth century philosophy.

(31) See Chapter One, discussion of the implications of the cultural tradition for theories of planning. The philosophical debts of this view to pragmatist doctrines of late nineteenth and early twentieth century should be obvious -- though these are not acknowledged.

(32) "Humanism" is a loosely applied term referring generally to approaches which might be called anthropocentric or human-centred, viz. they start from man and his thoughts, beliefs, and values as indispensable elements in any intelligent and credible study of social life. However, there are wide variations among humanists regarding the ways in which irreducibly human characteristics are to be investigated, captured and depicted in

discussion, analysis, theorising, or formal models -- depending on whether or not methods and procedures of natural science are taken to be compatible with the "humanistic" attitude. The term is further discussed later.

(33) There are many traditional ways in which the antinomy or alleged conflict between science and humanism has been perceived in the past. Concentration of science on generalisation and abstraction contrasts with the humanists' preoccupation with tangible and distinctive qualities in humans, and their life and work patterns. The essentially quantitative nature of science, involving extensive use of mathematics and other formal languages, conflicts with humanistic concepts which appear unquantifiable, in general, and lie traditionally in the realm of philosophy, ethics, aesthetics, and the arts. Science, and its application in technology, presupposes that causation can be known and that cause and effect follow each other in linear chains. This tends to contradict the approach of the humanists which reject the view that it is possible to predict future human conduct and social behaviour. Moreover, it varies in epistemological terms from the views held by many humanists that it is necessary to account for human conduct in terms that refer explicitly to individuals' reasons, purposes, motives, etc. for action. These accounts should be couched in terms that are intelligible to the actors and should not consist solely of categories constructed by the investigator and not related in some basic way to the accounts given by social agents themselves for their actions. These humanistic views imply that fixed, "natural" laws of social evolution are impossible to derive from past events (NORTHROP, 1947); (NAGEL, 1961: pp.504-510); (REICHENBACH, 1951).

(34) Interpreting the term literally, that is, establishing problem-solving as an activity in which there exists a one-to-one correspondence between a defined problem and its solution limits the scope of application of this concept only to problems of "... physical systems which are regular, orderly and highly predictable in their behaviour ..." (POPPER, 1965/1969: p.491). The above characterisation would logically foreclose any description of spatial planning as a partaker of the problem-solving activity since the systems with which planning is concerned are unlike the ones that resemble clockwork mechanisms in their functioning. It would, further, fail to account for most of the scientific discoveries and advances, in terms of providing explanations of physical phenomena, which are essentially based on intuitive and heuristic search procedures as well as purely scientific reasoning principles (LANDAU, 1969: p.479). A broader description of the problem-solving activity becomes necessary in the context of both the discussion of the paradigm for urban planning and the more general application of that activity to the solution of problems in physical and social systems. Thus, problem-solving here denotes the invention of a solution or solutions to a problem, i.e. the <u>heuristic search process</u>. This <u>does not necessarily coincide with the method of science</u>. The intellectual and cognitive qualities inherent to this activity distinguish it from both science and humanism (HARRIS, 1969).

(35) The opposition may be said to arise because science almost always possesses a better way to solve any given problem. Problem-solving technology, which supplements the style of

discovery denoted by the problem-solving activity, essentially relates to a specific point in time after which it may be superseded.

FOOTNOTES TO CHAPTERS FOUR AND FIVE

(1) "Method" (of inquiry) may be distinguished from "technique". The former is usually employed to refer to the processes of formulation and logical relation of concepts, while the latter is most often reserved to designate the means by which data (empirical information) are gathered and manipulated (SARTORI, 1970 : pp.1033-53).

(2) For instance, on the formalist side, Carnap and Hempel -- qua logical empiricists -- accept a strict separation between the logical (or formal) and the empirical (or factual) : methods are seen as neutral, atheoretical devices (CARNAP, 1953 : pp. 123-128); (HEMPEL, 1966). On the interdependence side, Aristotelian realism recognises universal forms to reside in the instantiation of the things themselves (cf. dicussion on "Universals", in the Appendix to Part II, entry: "Realism"). Further, Hegelian idealism claims that form and content, reason and matter, subject and object, not only exist in separate unity, but, in the last analysis of reality, where the 'Absolute' reigns, are even identical with one another: this version of 'absolute idealism' proclaims the supremacy of mind over matter. The same view on form/content interdependence is held by Marxist philosophers who claim that forms of any kind are inseparable from objective content. However, turning Hegel upside-down, they stress that material and historical conditioning (reflected in the influence of forces of production and domination upon human life) is determinative of the methods of inquiry and/or forms of thought. On the same side, but different from the above views, lies Dewey's pragmatism and instrumentalism (cf. Appendix to Part II, entry: "Instrumentalism") which shares

with Hegel the conviction "that the severance of the forms of thought from their objective content is an inadmissible distortion of reality" (NOVACK, 1975 : p.119). The preceding views do not represent an exhaustive listing of all positions on this issue.

(3) It is clearly not possible to present the necessary arguments in support of the adopted view since such a discussion would lead far beyond the scope of this dissertation. Firstly, on the issue of "formalism" versus "interdependence", most contributions to the debate are highly technical and exceedingly philosophical in orientation. However, one or two arguments will be glimpsed at below -- especially those originating from studies in the history of science and the sociology of knowledge. Secondly, on the issue of a preferred philosophical outlook that is compatible with the "interdependence" thesis, it is not reasonable to seek to justify one view without investigating what is involved in accepting its alternatives. Obviously, such an undertaking would not be possible in the context of this thesis. Even if it were feasible, it is doubtful whether there would be any ultimate reasons for justifying one world outlook as against all others : reasons which would be independent of any one such outlook. A decision on that issue might have to be seen as involving something like a prior philosophy. Such fundamental ontological and epistemological decisions could be seen as reflecting systems of "basic beliefs" (FORD, 1975 : ch.1) which inform proposals for different research policies.

(4) Obviously this presupposes not only that urban planning may be legitimately discussed in the context of the social sciences -- as against the arts or even technology -- but also the much stronger claim that it is one of the social science disciplines rather than a "mere" professional activity "located ... at the interface between knowledge and action" (FRIEDMANN and HUDSON, 1974). Now, these claims are not such that can be accepted as self-evident; indeed, if accepted at all they are bound to have implications for the way in which urban planning is, or ought to be, conducted. These would be implications regarding procedures for acquiring and legitimating knowledge which is to be used in informing and guiding planned action in urban affairs. The issues involved in these questions will be discussed in a later chapter of the thesis.

(5) What seems to further complicate matters is that "method of science" refers to "method of natural science"; and "natural science" may be understood to either include or exclude mathematics and logic (i.e. the so-called formal sciences) -- as the above discussion on the form/content dichotomy has hinted at. As a result, there are diverging views on whether or not the construction of "conceptual frameworks" without the experimental part of the "method of science" is to be taken as an application of the "method of science". ("Conceptual frameworks" here refer to mental constructs employed for descriptive or evaluative purposes -- e.g. for "probability", "rationality", "planning" -- for the analysis of meaning, viz. the analytical method of Socrates, and for critical arguments). Evaluation based on such "conceptual frameworks" may or may not be accepted

as legitimate scientific knowledge. Thus, there are those who advocate the use of "scientific method" in, say, the social sciences but not in ethics or mathematics. Differences in the construal of the rules of empirical method are notable among physicalists such as Neurath, marxists who espouse the principle of historical materialism, and hypothetico-deductivists such as Popper who adds the rules of rationality and social engineering. Moreover, in methodological discussions in psychology and linguistics, the empirical method of natural science is interpreted as "behaviourism" by Quine(QUINE, 1969 : pp.76-90) and as "rationalism" by Chomsky (cf. Appendix to Part I) who opposes "behaviourism".

(6) The distrust of metaphysical elements such as values (moral, political, religious, etc. beliefs) exhibited by classical, nineteenth century positivism influenced the account of scientific inquiry fostered by that philosophical outlook. Further, the so-called "emotive theory of value" was developed within logical positivism and took statements of value as expressing matters of personal (individual) preference, hence impossible to intersubjectively verify and unacceptable in scientific discourse. Although there are still those who advocate "objective", "value-neutral", scientific inquiry -- whatever that might mean -- the view of metaphysics as "nonsense" has been subjected to damaging criticism and has generally been abandoned,and the idea of value-free scientific inquiry has been questioned by many writers (mainly conventionalist philosophers).

(7) The following are some of the arguments offered in support of this claim : (a) that the social inquirer cannot be a "spectator" of "social facts" existing "out there"; (b) unlike the natural scientist who stands in a subject-object relation to his field of study,he deals with a subject-subject relation ; (c) that being a member of society himself he interacts with the social world he endeavours to study; (d) that he interprets the aspects of that social world that fall within his cognitive interests : he makes social life available as a "phenomenon" for observation by drawing upon his knowledge of it and thus constituting it as a "topic for investigation" ; (e) that he deals with a pre-interpreted world which is already constituted within frames of meaning by social actors themselves, and hence he has to re-interpret these frames of meaning within his own theoretical schemes. On one version of this view of interrelated social world and social inquiry, criteria of reality and of rationality are specific to different forms of social life (WINCH, 1958). The view indicates important analogies with the claims of relativism in scientific knowledge made by Kuhn, Feyerabend and others (to be discussed below) -- e.g. that there is no theory-free observation language ; that values tend to influence the choice between theories ; that there are no universally applicable standards of objectivity and rationality ; that the conception of a real world existing independently of beliefs and theories about it should be rejected.

(8) Practice (or practical activity) is seen as the work human individuals do in changing nature and social life. It is put in the centre of Marxist epistemology. Practical activity is related to the promotion of knowledge of the natural and social world : it is the starting point of such knowledge; its foundation and moving force ; it constitutes the purpose of learning about the world; and is the decisive test of the validity of knowledge (NOVACK, 1975 : pp. 192-198). Man both structures and is being structured by the object of his inquiry. Now, this epistemological position differs from empiricist accounts of the theory of knowledge in which it is assumed that the "known" is located in objects outside of man, the "knower". It is also different from rationalist accounts which take the "knower", the subject, as possessing from the beginning (i.e. a priori) certain inherent structures which he imposes upon the "known", viz. the objects of his inquiry. Although Marxian approaches to social inquiry cannot be termed anti-naturalist since they employ some conception of the "method of science" in the study of both man and nature, they are nonetheless radically different from other predominantly empiricist versions of "scientific method".

(9) Reification is a concept that has been forcefully employed in Marxian theory. In that context, it refers to a state of affairs in which the social relations between human agents are regarded as relations between things : that is, something abstract is regarded as a concrete object or material thing. Reification is said to be associated with the situation in which members of some society "forget" that the world in which

they live has been produced by themselves — the classic statement of this notion of "alienation" is to be found in (MARX and ENGELS, 1975 : Vol.3,pp. 270-282). The result is that human agents form a view of objective reality as comprised only of material things (BERGER and PULLBERG, 1966 : pp.56-71) which they cannot understand and which become an alien power over them (BERGER and LUCKMANN, 1967). Reification of the social world has also been seen as amounting to submission to a conservative, scientific ideology (GOLDMANN, 1969 : pp.36-42); (ZEITLIN, 1968: pp. 234-280).

(10) Notable among such "theoretical" undertakings are : (i) Faludi's "planning theory" (FALUDI, 1973[a]) which is advanced as an "instrument for prediction" and is based on an instrumentalist interpretation of science and scientific method; (ii) Ozbekhan's sketch of a "general theory of planning" (OZBEKHAN, 1969: pp.47-155) which is formulated on the basis of a pragmatist/ instrumentalist interpretation of science and its method of inquiry (for the sense of "instrumentalism" in this context, cf.Appendix to Part II, entry: "Instrumentalism"); and appears to be a hybrid of "methodological holism", systems approaches, and an account of the pragmatic theory of value.

(11) One way of viewing planning is as a process or programme of inquiry (GALE, 1975). Evidently, such an inquiry would not be aimed at the derivation of true statements about the world -- in the sense of strict correspondence with observable facts -- but rather at the formulation of policy statements seen as coherent accounts, within specific social contexts, depicting

possible societal arrangements in terms of considerations such as : (i) what has happened in the past and what exists now; (ii) what is feasible given some set of constraints (moral, social, economic, etc.); (iii) estimates of what is likely to bear intended results; (iv) the nature and timing of the sequences of changes that are proposed in order to effect certain intended states; (v) the development of appropriate institutional (legal, political) and organisational (administrative, social) arrangements.

(12) A brief account of the main principles of Logical Empiricism (or Logical Positivism) is given in the Appendix to Part II, under the general entry "Positivism". It should be stressed that not all philosophers who support the view that there is a "method of science" and that it should be adhered to by practising scientists, defend the Logical Empiricist position. The influential writings of Popper, especially (POPPER, 1934/1957), represent an essentially non-Positivist thesis which advocates the pursuance of scientific truth within the (normative) framework of "scientific method".

(13) This is of course, one of the main problem areas of the field known as the "sociology of knowledge" : see, for example, (BARNES, 1974 : Ch.1); and the interpretation which is advanced above is open to the frequently pronounced charge of "relativism". Some of the relevant issues in this debate are taken up at the end of the discussion on "scientific method" in conjunction with the discussion of the work of T.S.Kuhn with which that view has many affinities.

(14) However, these two writers defend a philosophical outlook which takes methods of acquiring and validating knowledge to be independent of the substantive content of inquiry.

(15) One might notice at this point, an inconsistency with Feyerabend's earlier claim that it is not possible to discern good from bad theories (GELLNER, 1975 : p.333).

(16) Feyerabend explicitly denies that the epistemological and methodological anarchism advocated in his work presupposes that anarchism is a political philosophy which ought to be preferred (FEYERABEND, 1970 : p.17). However, there are intelligible connections between his views and the views of social and political philosophers. As suggested by one reviewer of his work (KOERTGE, 1972 : p.280) : "He would very much like his theory of science to grow out of a general theory about man and society".

(17) The problems surrounding the hypothesised interrelations between theories of knowledge and moral, political, cultural theories of society -- which lead into questions of government, social justice, historical determination, and public planning of societal affairs -- have been traditionally dealt with in the context of the sociology of knowledge. Thus, Merton argues that questions of the social nature of knowledge ought to be distinguished from proper epistemological questions (MERTON, 1957: p.508). Max Weber contends that the scientific status of social inquiries and the objectivity of their results is not impaired by the social position of the inquirer and by

his selection of problems to be investigated -- a selection which is not value-irrelevant (WEBER, 1947); (WEBER, 1949). In contrast, Mannheim states that (MANNHEIM,1966: pp.70-71): "Epistemology is as intimately enmeshed in the social process as is the totality of our thinking, and it will make progress to the extent that it can master the complications arising out of the changing structure of thought .... The vain hope of discovering truth in a form which is independent of an historically and socially determined set of meanings will have to be given up". Many views of science take it to be a social activity which cannot be divorced from considerations of community (the community of scientists, but also society). Moreover, belief systems do tend to suggest epistemological theories which are compatible with them (BARNES, 1974). More extremely, phenomenologically oriented social scientists argue that (DOUGLAS, 1970: p.25): "all knowledge of meaningful human phenomena is ultimately grounded in our commonsense experience and, therefore, can never be totally examined and purged of 'unrationalised' or political elements and relations ...the foundations of all classical science, the absolutist conception of objectivity, can never be achieved". In this view, questions of knowledge might avoid the charge of relativism by gradual separation of the knowledge of facts from the situation in which they are known -- this being a basic premiss of the phenomenological method which aims at a presuppositionless inquiry (cf. Appendix to Part II, entry: "The Phenomenological Method"). This would be attained through, say, close scrutiny of the methods of inquiry that were employed in acquiring knowledge of those facts (DOUGLAS, 1970: pp.29-30).

A reconciling view is put forward in (GURVITCH, 1971: pp.11;19): "To deduce an epistemology from the sociology of knowledge would be as illfated as to link the fate of the sociology of knowledge to a particular philosophical position ... It is therefore a question of joint collaboration between the sociology of knowledge and epistemology which, though remaining irreducible, render mutual service".

(18) The view of science informing the technological model is invariably referred to as "positivist". This may be imprecise for the following reasons. (1) Many writers of logical positivist persuasion have modified their positions towards logical empiricist and "liberal empiricist" views, especially in the last twenty five years; not all modern empiricist philosophers share the same conception of science though the differences may be of detail rather than substance. (2) there are writers, such as Popper, who criticise positivism and empiricism while supporting a technological approach to the planning of societal affairs; the label "positivist" cannot unambiguously apply to them. It appears that these two distinct positions are conflated under the banner of "positivism" because they place emphasis on objective knowledge of the world and separate it from actual "practice" or application and from social and historical influences. If they must be so grouped, then it is more precise to employ the term "objectivist" to refer to them. (3) Other writers, for instance Kuhn and Feyerabend, expound conceptions of science which acknowledge the pervasive influence of social, cultural, historical interests in the cognitive activities

of scientists -- often referred to as historical or subjectivist accounts of science. The critics of a technological policy science ususally call these views "neo-positivist". They take them to be committed to the scientific world outlook which pursues explanatory accounts of phenomena in terms of nomological understanding of cause and effect. Fundamental differences between these writers and other "positivists" are conceded -- e.g. in terms of how explanations relate to theories; how explanations are assessed; how to determine the meanings of terms employed in them; how one explanation is selected over another of the same set of phenomena. Moreover, their implications for the kind of knowledge of the world of nature and of man and society that is attainable by science so conceived could be taken to lead to a different conception of a policy science and, by eventual extension, to a different account of planning. However, such conventionalist views of science are claimed to share with the positivists the belief in some kind of causal explanation of phenomena of nature and social life. It might be interesting to speculate how a Kuhnian or even Feyerabendian view of science could influence the kind of policy scientific approach that informs the planning of urban social/spatial affairs. This is undertaken later in this dissertation.

(19) This distinction is discussed later in this Part. It was first introduced in (REICHENBACH, 1938 : pp.5-7), and was subsequently accepted by many writers (cf.(RUDNER, 1966) for a discussion in the framework of the social sciences).

(20) A brief account of such approaches in sociology is given below. For a more detailed summary, cf. Appendix to Part II, entry: "The phenomenological method".

(21) This is based on a quotation from (HOIJER, 1954: pp.93-94) cited in (CICOUREL, 1964 : pp.34-35). The original works are (SAPIR, 1921) and (WHORF, 1969). A useful discussion of the hypothesis that "language is not just an element of culture which interacts with other elements but is the very forge from which cultures emerge in the forms they do" is given in (COOPER, 1973 : Ch.5).

(22) The various styles of linguistic philosophy can be distinguished on the basis of their different views of language and of its relevance to philosophy. For example, linguistic or ordinary language philosophy attempts to analyse what is involved in everyday ways of speaking and thinking without trying to judge between them ; linguistic phenomenology is the name sometimes given to linguistic philosophy which focuses on the actual workings of language by studying and describing how they appear. Developments of linguistic philosophy are discussed in (URMSON, 1956), and (PASSMORE, 1968). Recent work by Noam Chomsky and others in the field of linguistics has been aimed at establishing the argument that natural languages have an underlying reality very different from their surface form, which can be discovered and substantiated by the same method of hypothesising and empirical testing employed in scientific inquiry. The results of this research are being used to develop arguments purporting to solve some traditional philosophical problems especially in relation to the contrasting philosophical schools of Empiricism and Rationalism (KATZ, 1971 : Chs. 1; 6) (cf. Appendix to Part

II for a brief account of the main theses of these schools). The Chomskyan thesis is briefly discussed in the Appendix to Part I.

(23) Cf. Appendix to Part II, entry: "Linguistic philosophy".

(24) Cf. Appendix to Part II, entry: "The Mind/Body problem.

(25) Cf. Appendix to Part II, entry: "The phenomenological method".

(26) It is an almost impossible task to seek to summarise in a few paragraphs both phenomenological philosophy and its complex relations to phenomenological sociology; and the task is not made any easier by the heterogeneous nature of both approaches. Consequently, the discussion will focus on aspects of phenomenological sociology wich have a bearing on the general theme of language. It will be attempted to do as little violence to the subject as possible, but reference to at least the major works in this domain of thought is a prerequisite for minimal comprehension of the writings of some contemporary social scientists who pursue this direction of research. The philosophical foundations of the phenomenological movement in the social sciences can be traced to the German philosopher Edmund Husserl; (SPIEGELBERG, 1965) provides a good account of the historical development of the phenomenological movement with extensive bibliography. Many analyses of Husserlian phenomenology are available among which a most interesting one is (RICOEUR, 1967) focusing on (HUSSERL,

1931) and (HUSSERL, 1964). The application of phenomenological ideas to sociology was primarily undertaken by one of Husserl's disciples, Alfred Schutz (SCHUTZ, 1967), (SCHUTZ, 1964/66/67), who was concerned with the scientific understanding of the social interaction of free, creative actors (BERGER and LUCKMANN,1966: Ch.1). Comprehensive accounts of the phenomenological tradition in the social sciences are provided in (ROCHE, 1973) and (NATANSON, 1973); and (NATANSON, 1963) presents a collection of papers bearing on philosophical and methodological issues in social science, where phenomenological points of view are contrasted with so-called "conventional" approaches to the study of human phenomena. Harold Garfinkel's important, if difficult to understand, writings on Ethnomethodology represent a different (American) version of a phenomenological approach to studying human activities of daily life, and appear to have been influenced also by ordinary language philosophy (GARFINKEL, 1967). A representative collection of recent work carried out in this tradition is to be found in (DOUGLAS, 1970). Finally, Giddens discusses the common origins of some recent "subjective idealist" approaches to sociology in (GIDDENS, 1976: Ch.1) and (GIDDENS, 1974: Introduction). All the works cited above provide comprehensive bibliographical lists.

(27) The expression "phenomenological sociology" is commonly employed to refer to phenomenologically oriented social studies. However, it is ambiguous for there is not one phenomenological sociology but several, with different orientations and emphases -- though most of these are predicated on Alfred Schutz's work

on a phenomenology of the social world (SMART,1976: p.79).

(28) The issue of interdependence of methods of inquiry and theorising about social reality has been discussed above in relation to phenomenological approaches.

(29) The terms 'intentional' and 'intentionality' are key concepts in Husserlian phenomenology where they do not have the ordinary English denotation of 'intended action'. Husserl acknowledges his debt to Brentano for the concept of intentionality. The latter created the concept to distinguish between mental activities (comprising development of ideas and judgments, emotions such as love or hatred, etc.) and physical phenomena. Mental activities were taken to possess the distinctive characteristic of 'intending' their object in the sense of focusing consciousness on it and thus bringing it to the attention of the subject. In his attempts to analyse the intentional structure of consciousness and describe objects as they present themselves to consciousness, Husserl contends that all acts of perception, in which a subject becomes conscious of something, have a directional character. They imply the movement of consciousness in a way which transcends itself to include, in the sense of 'intend', an object within its sphere. Thus, on this account (GIDDENS, 1976: p.26): "intentionality is an internal relation of subject and object and the whole method of phenomenological reduction, whereby the ego, in a grandiose mental act, is able to shed the empirical world, is dependent upon this beginning-point". The subject in the act of perception is included within

the process of cognition as a social act.

(30) The Weberian notion of "value relevance" merely refers to the way in which social scientists tend to select problems for investigation from the realm of social life. Such choice is said to be necessarily value-oriented and "subjective" to a much greater extent than can be claimed to be the case in the natural sciences (WEBER, 1949: pp.149-152). The concept of "verstehen" or "interpretative understanding" is discussed below; the notion of "ideal type" is explicated in the Appendix to Part II, entry: "Ideal types".

(31) The term "typification" refers to the process whereby a social agent or actor attempts to understand the conduct of others by applying learned schemes to interpret the meaning of their actions.

(32) Cf. footnote (2) in the chapter dealing with "Aspects of the methodological debate in the social sciences", Part I of the thesis.

(33) Cf. footnote (3) in the chapter dealing with "Aspects of the methodological debate in the social sciences", Part I of the thesis.

(34) The origins of modern hermeneutic philosophy are traced to Schleiermacher, Wolf, and Dilthey (PALMER, 1969: pp.81ff.). A German philosopher whose work has been very influential in the evolution of the notion of "verstehen", Dilthey (1833-1911)

contends that there is a dichotomy in reality: on the one side, there are the phenomena of nature and the inanimate world of matter existing apart from humanity; on the other side, there are spiritual phenomena expressed in culture, history, and social life. The latter are constructions of the human mind, mental products of human consciousness which appears subjective and immersed in emotion and intellect. The differences between social-cultural and natural reality are such as to necessiate a different method of study for each reality. For Dilthey, society is a product of unique subjective intentions of spiritual actors. It can be explained only by recourse to an abstract process of creative understanding which is not attainable by means of the method of the natural sciences. The observer of human conduct, as a human being studying other human beings, has access to the inner world of the experiences of others. Thus, by imaginatively creating the experiences of the others in terms of his own experience and identifying the two by a kind of analogical inference, the observer attains a sympathetic understanding (or "verstehen") of particular actors and cultures. The empathetic reconstruction of the forms that constitute the spirit of an age (or "Zeitgeist"), which determine the meaning that each act has for the actor, leads to an understanding of human conduct "from within". Moreover, such understanding can be "objective". The study of history and society is no less scientific than that of physical phenomena: but it pertains to a different kind of "science" where criteria of objectivity are spiritual rather than empirical (OUTHWAITE, 1975: Ch.3); (PELZ, 1974: Ch.2); (SALOMON, 1945); (DILTHEY, 1954).

Dilthey's writings have had a profound influence on all later arguments concerning the methodological debate in the social sciences. His contemporaries, Windelband and Rickert, both reject his view of a fragmented dichotomous reality as a metaphysical speculation; but they also reject the conflation of the phenomena of nature and of human conduct and thus accept methodological dualism. They contend that the essential differences in the methods of inquiry in the social and natural sciences are due to logic. The peculiar nature of the subject matter of the disciplines which study cultural acts logically requires a different method of inquiry, so-called "idiographic" (Windelband) or "individualising" (Rickert), which is appropriate for the study of unique events (e.g. historical occurrences) and explains these in terms of the features that make them unique. In contrast, the study of natural phenomena concentrates on regularities and invariances; its method is "nomothetic" (Windelband)or "generalising"(Rickert)and attemptsto explain phenomena by subsuming them under general laws of universal applicability (ARON, 1967).

(35) The notion of "empathy" or "sympathic understanding" is a complex one; it is critically discussed in (SCHELER, 1970).

(36) Max Weber, who was influenced by Dilthey's writings on the concept of "verstehen", endeavours to avoid Dilthey's metaphysics by denying that reality is dichotomous. He concedes that there is logical separation between the sciences of nature and the sciences of culture and history -- though he rejects the view that this implies methodological dualism.

He argues that both the natural and social sciences may employ either "nomothetic" or "idiographic" approaches depending on the specific circumstances and goals of the inquiry. However, although it is possible in principle to study society by following a "nomothetic" approach, this is not the only approach that has to be adopted to the exclusion of "idiographic" methods (as positivist/naturalist views would suggest). In his efforts to reconcile scientific method with the study of unique, meaningful conduct of human individuals characterised by inherently subjective qualities, Weber developed his general sociological method which attempts to take such subjective aspects of human conduct into account (WEBER, 1969: pp.87-157). Weber's method comprises three main components: (i) the concept of "value relevance", (ii) the process of "verstehen" or "interpretative understanding", and (iii) the formulation of "ideal types" which are used to link factual information with subjective meaning. Items (i) and (iii) are discussed elsewhere (cf. footnote (30), this chapter). The remainder of this note deals with the Weberian concept of "verstehen". Weber's approach to the study of the unique characteristics of a social event (rather than those that can be subsumed under some general laws)makes use of the concept of "verstehen" or "interpretative understanding". It is aimed at maintaining the scientific validity of the explanation of an observed event. For Weber, the scientific study of the social world must come to grips with the meaning observed social acts have for the individuals involved in them (WEBER, 1969: pp.101-107). The goal of the process of interpretative understanding is to enable the observer of events of social life to create the meaning which is experienced at the moment of action by social actors.

partaking of the observed phenomena. In this way, the values of social actors become the focus of social inquiry. Thus, "verstehen" (NAGEL, 1953: p.155): " ...consists in supplying interpretations and explanations of social action by imputing to social agents 'subjective states of mind', 'motivational attitudes', and 'intended meanings' ". On Weber's account, the investigation of social reality must refer back to the conduct of the individual social agent which is directed by his subjectively intended meanings. Action by a social agent is claimed to be essentially characterised by subjectively meaningful relatedness to actions of others; and the scientific explanation of that action has to concentrate on the subjective meaning-complex of action. "Interpretative understanding" as a tool for comprehending subjective meanings of social actors is facilitated if the observer goes through a process of empathetic reliving of social acts (the expression "putting oneself into the other's shoes" is often used to refer to this process). However, information obtained by means of "verstehen" is not taken to be sufficient in itself for scientific explanation of observed social events, but contributes only certain aspects pertaining to subjective meaning of social acts. Keeping within the empiricist tradition, Weber attempts to reconcile the idealist notion of "verstehen" with an objective, scientific framework of inquiry by contending that interpretation is valid only when accompanied by supporting empirical evidence. His method of social inquiry is expounded as an endeavour to integrate social knowledge, concerned with the subjective meaning-complexes of social action, with intersubjectively verifiable, scientifically valid

knowledge based on observation and experience. For a critical discussion and clarification of the concept of "verstehen", (ABEL, 1953) and (BECKER, 1945) are particularly informative; cf. also Thelma Lavine's writings on the possibility of associating the method of "verstehen" with naturalist approaches (scientific method in the study of social phenomena) (LAVINE, 1953[a]: pp.145-154), and her reply to Nagel's strictures (LAVINE, 1953[b]: pp.157-161). Nagel's criticisms of the concept of "verstehen" are elaborated in his later writings (NAGEL, 1961: pp.481-485) where he argues that it is at best a useful heuristic technique in the "context of discovery" -- a view shared by Abel. He concedes that it might be possible to generate hypotheses about the actions of social agents by trying to interpretatively understand them. However,he does not accept that the method of "verstehen" has any contribution to make in the "context of justification" for it affords no means of testing hypotheses; and this view is also held by Hempel (HEMPEL, 1963: pp.218-219). This is taken to be the standard positivistic critique of approaches employing the method of "verstehen"; and those who reject a positivist/ naturalist social science argue that it is founded on a misunderstanding of the meaning of the notion of "verstehen" (SCHUTZ, 1963: p.235). For if the notion of interpretative understanding, as seen by Weber,"were a matter of uncheckable intuitions of the private inner states of others, then it could have no legitimate place in scientific theory"(EMMET and MACINTYRE, 1970: p.xiii). Thus Schutz claims that "verstehen" is not primarily a method used by social scientists (as Nagel and Hempel contend) but should be viewed as "the particular

experiential form in which commonsense thinking takes cognizance of the social cultural world" (SCHUTZ, 1963: p.239). On this account, an explanation of human conduct is acceptable only if it is couched in terms of the commonsense categories and concepts of the actors themselves, i.e. it must be an explanation based on "verstehen", referring to the subjective meaning of the actions of human beings from which social reality originates (ibid.: p.245). By limiting social science to explanations based on interpretative understanding and being in agreement with the commonsense beliefs about the social world, this view seems to impose a corresponding condition -- basic to phenomenological social studies -- on the explanation of social conduct which may not be warranted. For the commonsense categories or beliefs of the social agents involved are not always precise, and therefore should not be "immune from correction and modification by the discoveries of social science" (EMMET and MACINTYRE, 1970 p.xiv).

(37) The differences between the notion of "hermeneutic verstehen" as expounded in, say (GADAMER, 1965/1975), and the conception of "verstehen" advanced by Dilthey, Weber, and phenomenologically oriented social thinkers are very significant (WOLFF, 1975: p. 107) : ".... hermeneutic verstehen differs radically both from Dilthey's empathic but ahistorical transference, and from the Weberian notion of a more objective kind of understanding of meanings (in terms of ideal types of rationality, for example) with its typically obsessive emphasis on subsequent scientific verification. Furthermore, it goes beyond the pure phenomenology of inter-personal or cross-cultural understanding,

existential or otherwise, for it allows the mind to see itself in a context, rather than bracketing off any world or context perceived other than through the mind. The emphasis is still on the consciousness of the interpreter; .... hermeneutic philosophy forces the interpreter to begin by grasping the place of his own consciousness in its historico-cultural context". The same point is forcibly made in (RICOEUR, 1978: pp.145-150).

(38) It is however pointed out (WOLFF, 1975: p.113) that for sociology hermeneutics can be assessed only as a method, and its extension by Gadamer into ontology and metaphysics tends to limit the adoption of a critical attitude which is necessary for an empirical discipline such a sociology.

(39) For example, Gadamer applies his hermeneutic philosophy exclusively to historical understanding, hence it is reasonable to question whether this philosophy is equally applicable and fruitful in sociological understanding. Although hermeneutics as a method and a philosophy may have much to contribute to the solution of many issues relating to theoretical, conceptual, and methodological difficulties in studies of social life, it is claimed that the study of human conduct cannot be purely hermeneutic (HABERMAS,1967/1971: p.289). Further criticisms have been raised with respect to Gadamer's epistemological positions. His total rejection of the empiricist principles of scientific method leads to the abandonment of the notion of objectivity, with the resulting lack of any reliable criterion for assessing the correctness of the inquirer's

interpretation, and the associated problems of relativism in the knowledge of social life. Moreover, his notion of the "cultural totality of an age" (or of a society), which originates in Hegel's philosophy, seems very difficult to define and locate, though it appears to be an appealing and useful concept in a theory of society.

(40) The development of critical theory and the intellectual debts of the latter to earlier philosophical traditions and social theories is well documented in (JAY, 1972); while (SCHROYER, 1975) traces the evolution of the Frankfurt School as a whole. A metacritique of certain contributions of the School is attempted in (SLATER, 1977) from a Marxian perspective.

(41) Recent interest in language, manifested in the developments in linguistic philosophy (especially the work of the later Wittgenstein) and in the field of linguistics (particularly the formulations of Chomsky -- cf. Appendix to Part I -- and Levi-Strauss), is concerned with the understanding of the generative nature of linguistic rules and the universal and essential properties of human language.

(42) On this point, there seems to be close connection between the hermeneutic tradition and phenomenological sociology. Hermeneutic thought takes the observer/scientist and his research object to be linked by a context of tradition. Further, it stresses the interconnections between "hermeneutic understanding" and the practical life-interests of the "observer". "Hermeneutic understanding ties the interpreter to the role

of a partner in dialogue. Only this model of participation in communication learned in interaction can explain the specific achievement for hermeneutics" (HABERMAS,1968/1971: pp.179-180). The "observer" cannot isolate himself from his own horizon, but can achieve objective understanding only through a process of "melting of horizons" in communication. Similarly, phenomenological sociology identifies a theme in the necessarily intimate relation of the social inquirer/observer and the observed social agents in a common lifeworld of meanings: social phenomena are meaningful to both the participating social actors and the investigators of the phenomena (PHILLIPSON and ROCHE, 1974: pp.141-142).

(43) Cf. footnote (34), this chapter.

(44) Cited in (OUTHWAITE, 1975: pp.99-100).

(45) Habermas argues that what is essential to true"verstehen", which is overlooked by transcendental phenomenology, is language. In his (1967/1971: pp.54; 214-222) a number of arguments are advanced to suggest why language should be so important in any approach to studying social life. Very roughly, he concurs with the claims of the later Wittgenstein ("Philosophical Investigations") that: (a) the individual's action and language are strongly interrelated, and (b) the rules of language reflect the world view. Further, he contends that the intentions, motives, etc. of the social actor derive, to a certain extent, from linguistic meanings. Finally he claims that considerations of language must enter in the process

of social inquiry: (i) as part of the communication between social inquirer (sociologist) and his subject, essential for understanding, which is achieved through the medium of language; and (ii) as part of the actor's definition both of his situation and his self-understanding which is itself interpreted by him in terms of his communication with his fellow actors. The rules of interpretation which the actor adheres to direct the communication (ibid.: p.214).
It should be noted that Habermas' main concern in this work is with the methods the social sciences must employ to acquire understanding of and describe social consciousness and individual perspectives, rather than with the conditions giving rise to these latter.

(46) The introduction of decision-theoretic, rationalised procedures of reaching decisions results in an "expanded decionistic model" (HABERMAS, 1971: p.65)which describes how the practice of scientifically informed decisions are attained. However, even though it comes close to what is happening in actual procedures of rational decision making it is criticised for introducing a disjunction between issues of objective necessity and aspects of value and practical activities of everyday life. Values arise in situations of interest, while techniques of rational decision making are employed to satisfy goals that are rooted in such values: hence the two are interdependent. If they are taken as disjointed, the values "become functionless and die out as ideologies" (ibid.: p.66).

(47) Reference to the "practical", and "practice" in general, in the context of "critical theory" is associated with the particular

conception of "practice" explicated above (see footnote (8), above) which takes it as the work human individuals engage in changing nature and social life. See also footnote (49), this chapter. In one view (HABERMAS, 1971/1974: p.3) : "Practical questions ... are posed with a view to the acceptance or rejection of norms, especially norms for action, the claims to validity of which we can support or oppose with reasons".

(48) See above for a brief outline of some key pragmatist concepts; see also Appendix to Part II, entry: "Instrumentalism".

(49) The pragmatists' philosophical versions of the interplay between man and environment, between "pure" reasoning and sense-experience were preceded by the Kantian synthesis of "rationalist" and "empiricist" accounts of epistemology -- to which the pragmatists owe a direct debt. However, Kant's distinction between ethical and "pragmatic" rules entails a sharp separation between "theory" and "practice" which is not acceptable to pragmatists such as Peirce and Dewey. They seek a closer and more organic relationship between morality and ethics, on the one side, and other intellectual and cultural endeavours of human individuals, on the other side. The disagreement arises out of the Kantian separation of subjective from objective considerations; ends and goals (subjective) from means (objective); "pure" reason from "social practice" -- which has been extended into, but does not correspond precisely with, the fact/value dichotomy. Kant's ethical rule is a "categorical imperative" founded on an individual's inner "pure practical" reason, free will, and universal consciousness of one's 'a priori' duty to respect

all persons -- pursued as ends in themselves. The "categorical imperative" is unconditional: of the form "do X". The principal issue involved is that one should act only in ways which are universalisable, viz. that a moral or ethical judgment that is right for one person must be right for anyone else in the same position (HARE, 1952/1972); (HARE, 1963/1972). It thus derives ethical conclusions from reason alone. However, his pragmatic rule ("hypothetical imperative") is practical in the different sense of involving only "rules of prudence" regarding the selection of appropriate means that are required to attain certain desired goals. This "imperative" is conditional on some end, having the form: "if you want Z, do X" -- though it could be interpreted as a statement that total commitment to a goal involves willing the means to attain it. Thus, on Kant's account, questions of ends are decided independently of questions of means that are needed to satisfy given ends. The former are subject to 'a priori' reasoning; the latter involve statements that are testable in experience. Now, pragmatists such as Peirce, James, and Dewey are critical of the 'a priori' elements in Kant's "categorical imperative" in ethics. They contend that all value judgments are hypothetical of the form: if men desire to attain certain ends in any harmonious way, then they will probably achieve these ends by acting in accordance with certain specifiable empirical conditions. The question of whether or not ends are desirable can only be settled by way of "trial and error" experience and learning from its consequences. This involves close interdependence between questions of goals and questions of means required to attain them. The Hegelian attempt to establish unity of means and ends; of objective and subjective aspects

of experience and reason, action and thought; of particular events and universal reason; of the individual being and the collectivity, community, society, the state or "whole"; constitutes part of the intellectual tradition of pragmatism and its concern with integrating the theoretical and the practical. But this is a different conception of the "practical" or "practice" to that which informs the tradition of "critical theory" -- the latter deriving from the early Marx. Dewey's "instrumemtalism" affirms the unity of theory and action and gives priority to practice in their interaction: putting ideas to particular uses in changing problematic situations in society (or scientific research) and removing obstacles to progress -- an essentially experimentalist conception of practice. Plans are seen as action hypotheses which are tested in practice to discover whether "they work" in the sense of removing problems and ascertaining that attained goals are indeed desirable (NOVACK 1975: Ch.9). But it is the will of the individual (seen in context) rather than the practice of the collective, the class, the "whole", which is taken as the "ultimate agency of change". This is basically a different conception of "practice" to that of Marxian theory (cf. footnote (8), above). The common Hegelian influence in pragmatism and Marxism, and their shared opposition to formalism often misleads people towards attributing stronger links between these very different positions than is appropriate. The pragmatists' fallibilistic, probabilistic treatment of natural and social phenomena; their views of the goals of planning as tentative empirical hypotheses; of plans themselves as action hypotheses to be tested in practice and altered in the light of things learned from this experimentation; of liberalism and democratic

pluralism in politics combined with increased public participation in decision making and planning; clearly differentiates pragmatist thought from Marxian dialectical necessity, historical materialism, and determinism, the commitment to fixed gcals and values and the effort to plan the whole society and change it so as to conform to those predetermined ends. Thus, these positions hold diametrically opposite views on the process of planning of societal affairs. Moreover, their accounts of the dialectical approach differ -- the dialogue between the planners and the planned. Dewey does not espouse Hegel's 'a priori' dialectical method -- according to which the world develops dialectically by the interplay of opposites -- because it is not experimental and has too fixed a conception of human nature, society, and history. He accepts evolution in nature and history in terms of specifying an uninterrupted forward movement from less to more "civilised" states. Thus, Dewey's evolutionism is compatible with his liberalism and pluralism in politics. It is based on orderly development through experimental learning . In this sense, the dialectical process or experimental dialogue that he advocates presupposes <u>order</u> in society and harmonious experimentation and exchange of views. This conception contrasts with the dialectical process postulated in the dialectical materialism of Engels (LICHTHEIM, 1973: p.454) which stresses the self-contradictory nature of the process and puts forward a notion of progress through <u>conflict</u> between opposing forces which implies the necessity of class conflict.

(50) Cf. footnote (49), this Chapter.

(51) The raised eyebrows that the mention of the profession of "planner" evokes among ordinary people is a significant comment of how the "planned" view this one-way institutionalised approach to solving their problems.

(52) This is said to take place as follows. A first rough formulation of goals and objectives, or definition of problematic situations provides the starting point of the communication process which leads to increasingly refined versions of problem and goal definition upon which the search for programmes of action is to be based. Communication does not cease during the search process, but will conclude only when problem resolution has been in principle anticipated. For only then will the programme goals and objectives be crystallised. The practical needs, goals, objectives that originated the search for a programme of action find their articulation "in the measure that theoretical solutions, and consequently techniques of execution, crystallise in rigorously constructed models" (HABERMAS, 1971: pp.70-71). In this way the dialectical process establishes a web of rational argumentation which stretches between practical and technical questions and is to be maintained throughout programme planning.

(53) There may be some confusion on this point between the way in which goals are formulated and arrived at in a technological model of planning and what a "critical theorist" might accept. In the case of fixing goals "from above", either the expert or the politician or both together propose them. This would be objectionable to the "critical theorist" for reasons that were

made explicit in the main text -- viz. that the public does not have active participation in the particular decisions. If goals are fixed "from below", then the people concerned have to be somehow understood as regards their beliefs, needs, and value-orientations. For the technologist/planner this would be the more or less straightforward task of obtaining the right data from a representative sample of population. This presents enough problems in itself, apart from the strictures of the "critical theorist". Basically there are methodological and epistemological problems. One methodological problem concerns the systematic methods of surveying the population concerned and the statistical treatement of their answers. Questionnaire surveying requires the fixing of categories of questions which individuals are asked to answer. However, these fixed categories may not correspond conceptually to what the people wish to express. They merely direct them to see the problem in the particular way in which it was conceived by the questionnaire designer, and not in other ways or in their own. Moreover, this procedure of "asking the people" which is presented as "public participation" results in yet another uni-directional relationship between the "experts" and the "planned": the latter answer questions fixed by the former. But even if it is assumed that the people will be left both to pose and answer the questions -- leaving aside the statistical and taxonomic problems that would ensue -- their involvement in this exercise would be academic rather than practical. For there is no provision in this scheme for mutual guidance as an essential component of the dialectical process of unhindered communication. An epistemological problem that might arise in this context is that action is

to be based on what the people as social agents believe is meaningful, needed, valuable. But it is not certain that what the social agents believe to be their interests is in fact so: false beliefs in the minds of the actors may also give rise to actions. The technological approach might overcome this problem by granting the investigator the prerogative to probe the validity of beliefs and interests of the people involved. The "critical theorist" would argue that this is to be solved in the dialectical process where various distortions in communication are removed, and by hermeneutically understanding the forms of life, or social life-world in which planned action is to take place -- paying special attention to its historical context.

(54) Cited in (FRISBY, 1974: p.211).

(55) For Habermas, public participation means "a general taking part, on the basis of equal opportunity, in discursive processes of will-formation" (HABERMAS, 1973/1976 : p.134).

(56) Technical questions involve considerations of rational arrangements of means so as to meet given ends, and selection from among alternative means specifications of a preferred one (HABERMAS, 1971/1974: p.3).

(57) On a "weak programme" a policy science would address itself to analyses aiming at tracing the consequences of specific courses of action and express them in terms of a common denominator, say, pecuniary costs and benefits, thus enabling comparison of alternatives and informed decision making. Eminent

instrumentalities in this context would be so-called "cost/benefit analysis", "cost/effectiveness studies", "threshold analysis", etc. A "strong programme" of social policy science would go beyond a "mere" advisory contribution to political decision making and subsume under its mantle the whole process of analysis of data, exploration of consequences of alternative courses of action which are specified so as to attain externally supplied goals, evaluation of such consequences and choice of one course of action as the "best", or "optimum", or "satisficing" -- depending on some agreed criterion of "optimality". In this sense, it would be compatible with a thoroughgoing technologism in planning, following the "technological model".

(58) If a justification of rationality must transcend the boundaries of a mere definition of what it is to be rational, and also avoid exposing itself to the charge of "arbitrary commitment", then the problem arises that the reasons given for the pursuance of rationality must themselves be subject to rational assessment. This lends to infinite regress and to claims that it is impossible, in a logically rigorous sense, to justify being rational, and further that the commitment to rationality is itself irrational or extra-rational and is founded on some prior set of beliefs. However, on a different view it might be argued that the idea of"justifying" rationality is itself an idea from within rationality itself. Thus one faces the incoherent situation of trying to maintain a position outside the framework of rationality in order to assess it while at the same time being within that framework (TRIGG, 1973: pp.146-149).

(59) The last three references, above, are to works whose authors do not develop their ideas necessarily in the context of "critical theory" of the type of the Frankfurt School, though by virtue of their Marxian approach to the substantive issues they are dealing with they do exhibit affinities with the critical theorists.

(60) The notion of "irreversibility" is explicated in a brief but informative paper by (COWAN, 1969) and is linked with the study of the "urban system".

(61) Cf. Appendix to Part II, entry: "Realism".

(62) Partly or quasi-causal laws are introduced in (WRIGHT, 1971: ch.4) and are "causal" in the highly restricted sense of referring to a set of conditions whose occurrence would not cause individuals to behave in specific ways, as in a positivist/naturalist social science, but rather would render certain responses of human actors towards such conditions as more justified, appropriate, reasonable, given their needs, expectations, and desires. Hence human individuals are not taken as determined by external conditions but as intepreting these in the light of their situation.

(63) The notion of "narrative" is central in historiography both as a cognitive and a communicative device. The construction of narratives as historical descriptions is an aspect of the story-telling which is encountered in literature. Not anything can go into a narrative and there are certain evidential criteria

that have to be satisfied by any story to regard it as a narrative. Causal accounts are not narratives: the latter if successful are able to direct attention to a range of different, but not obviously so, relationships which a strictly causal explanatory account could neglect or be incapable of capturing (DRAY, 1969). A narrative is not necessarily an account of the only possible or potential course of events. It is made credible in terms of the perspectives, beliefs and knowledge of the participants. Narratives would be regarded as interpretations, rather than explanations, of action which would be based on constructed distinctions between underlying conditions, actions and consequences -- the latter essentially forming a totality. Specific actions would be assessed within some broader frame of meaning. Judgment of the interpreter of the material to be included in the narrative becomes manifest in the elements that are in fact entering the narrative and in the perspective chosen to view the material and is related to available cultural resources. There is no general agreement as to the role of narratives in history. Some writers regard them as the basic instrument of historical writings (GALLIE, 1964) and take explanation as subsidiary. Others accept them as one form of historiographic discourse: either as equally valid, but mutually exclusive, with analysis; or as interdependent; or as appropriate to corresponding ranges of problems (HEXTER, 1971). Finally, there are those who regard narratives as inferior to analysis and scientific explanation proper -- as is outlined in (DONAGAN, 1964).

(64) This sketch of a "critical theory" of planning was based on several sources most of which have been referred to in the course of discussing aspects of hermeneutics and the views of the Critical Theorists of the Frankfurt School. Other sources that have informed this account are (BIRNBAUM, 1971), (WELLMER, 1971); and especially (FAY, 1975) and (GOLDSTEIN, 1975).

(65) See above, p.347.

(66) On this issue see the brief but convincing critique of Habermas' "Knowledge and human interests" in (BARNES, 1977:ch.1).

(67) The views of radical societal reconstruction and normative organicism and the moral issues that they give rise to have been briefly discussed above; cf. chapter one, pp.20-22.

(68) That is, following either the deductive/nomological or the inductive/statistical model of scientific explanation. Cf. Part I, discussion of "scientific method"; also Part II, Appendix, entry: "Description versus explanation".

(69) Indeed, the activity of interpretative understanding (or "verstehen") is not aimed at establishing the correct reading of some social action framework. For alternative interpretations may be quite plausible; and there is no process of verification, analogous to that employed in the physical sciences, with which to assess the validity of alternative interpretations. Hermeneutic understanding rather involves a creative process of interpretation through which the

investigator offers his account, in the present time-horizon, of historical or alien -- hitherto obscured -- aspects of society and culture (OUTHWAITE, 1975: p.103).

(70) The term "conventionalism" can be given highly varied definitions but usually pertains to any view purporting that "scientific laws and theories are conventions that depend upon our more or less free choice from among alternative ways of "describing" the natural world. The chosen alternative is said to be no truer than others, only more convenient" (ALEXANDER, 1967: p.216). According to Kolakowski, "conventionalists agree with empiricists on the origin of knowledge, but reject empiricism as a norm that allows us to justify all accepted judgments by appealing to experience, conceived of as a sufficient criterion of their truth. Or to put the same point somewhat more accurately, the data of experience always leave scope for more than one explanatory hypothesis, and which one is to be chosen cannot be determined by experience" (KOLAKOWSKI, 1972: pp.158-159). Other views that might be characterised as "conventionalist" are those which claim that the considerations relevant in the acceptance or rejection of a scientific theory are, to some extent, "subjective". On one account (FEYERABEND,1975), such considerations depend on the individual scientist's aesthetic or moral values, practical interests, attitudes, and the like. On another account (Kuhn), these considerations relate to the shared standards of the community of scientists, which are relative to an accepted paradigm or way of looking at the world. These positions, together with Quine's objections to the simple logical model of falsification as expounded in, say

(QUINE, 1961), and his conception of"truth" (QUINE, 1960), are also characterised as "relativist" in that they defend a view of"truth" (and logic) which takes it to be relative to particular systems of thought (or language) (LUKES, 1977: ch.8). Cf. Appendix to Part II, entry: "Description versus explanation" for a brief account of some conventionalist views; cf. ibid., entry: "Instrumentalism" for an account of a view of science that is not dissimilar to conventionalism.

(71) Cf. Appendix to Part II, entry: "Instrumentalism".

(72) Clearly pragmatism cannot be said to belong to the "newer" philosophy of science for it is a philosophical movement which emerged towards the end of the nineteenth century. Though it is not a living philosophy today, there is a recent revival of pragmatist social thought in the disciplines dealing with social policy and planning. However, a number of the core ideas of pragmatist philosophers may be found in the writings of contemporary philosphers of science such as Ernest Nagel and especially W.v.O.Quine.

(73) This statement obviously does not account for the important contributions of Weber and Schutz. Both have employed the method of "verstehen" (or interpretative understanding) in their attempts to reconcile "objective" and "subjective" viewpoints in social inquiry,the former within an empiricist tradition and the latter in association with the phenomenological philosophy of Edmund Husserl. Although their philosophical and methodological orientation differs, both pursue the

ideal of reconciling individuality in human conduct with a rigorous scientific method.

(74) The philosophical debate is still an ongoing one and is commonly referred to as the "Mind/Body problem" in discussions in the philosophy of mind, philosophy of the social sciences and psychology. Cf. Appendix to Part II, entry: "The Mind/Body problem ", for a brief account of some of the views that have been expressed on issues such as: what is the "stuff" of which mind and body are constituted; whether there can be a question of knowing other minds; whether mind exists as a non-material entity, and if it does where it resides; whether mental states could be said to result solely from certain states of the nervous system; etc.

(75) For brief accounts of materialist, physicalist and behaviourist views on this issue, see Appendix to Part II, entry: "The Mind/Body problem". For naturalist views, see ibid., entry: "Naturalism (in the social sciences)".

(76) The statement regarding the "systemic" perspective on social action must be qualified to apply only to interlinkages of constitutive meanings at various hierarchical levels. This distinction is necessary since an interpretative approach to social action does not account for system-wide <u>unintended</u> consequences of action but rather concentrates only on intentional action and anticipated results. This may be seen, say, in the perspective of phenomenological inquiry adopted by Alfred Schütz. The principal, organising notion in his account is the "life-plan" which involves the location

of "practical purposes" and individual "mundane projects" within higher order "life-plans". Study of an individual social agent in different contexts entails regarding his actions, motives, ends and means, and consequently his projects and purposes, only as elements among other elements forming a system. Any end is merely a means towards some other end; any project is projected within a system of higher order. Any selection between projects refers to some pre-chosen system of connected projects of a higher order. All these pre-conceived particular plans are informed and guided by a plan for life as the most universal one which determines the lower-level plans even if the latter conflict with one another. Such normative "life-plans", world views, or ideologies constitute the linking agent which sustains the beliefs necessary for the maintenance of social wholes (SCHUTZ, 1951: pp. 151-184).

(77) This issue is admirably handled in (SEARLE, 1969). Considering the facts of social studies Searle distinguishes brute and institutional facts. The former are records of simple sense experiences and do not require "social" knowledge for their understanding -- e.g. "this book is on top of that book"; "I feel dizzy" -- and employ physical, or either physical or mental concepts. The latter kind of facts involves more than sense experience -- e.g. "Celtic beat Rangers 3-0"; "Ms. Brown was married to Mr. Pearson". There is no simple set of statements about physical or psychological states of affairs or properties to which the statements of institutional facts could be related (ibid.: pp.50-51). The distinction between

brute and institutional facts has also been construed as the actual observed appearances of an object (brute facts) as against the object that is intended by the particular actual appearances (GARFINKEL, 1963: p.194). Now, constitutive rules (see main text, p.374) indicate the correspondences between brute facts and institutional facts (some human institution). That is, they establish what some brute facts are to count as in terms of a human institution given some context (SEARLE, 1969: pp.33-42). For example:

"In context (Z), (y) counts as (Y)"

This can be interpreted as:

"In the game of chess (Z), the pawn-that-reaches-the-eighth-rank (y) counts as a 'piece' -- e.g. a 'Queen' -- (Y)".

To relate this to urban planning:

"In the context of urban planning (Z), the act of demolishing obsolete buildings (y) counts as slum clearance (Y)".

Thus, constitutive rules translate brute facts into social institutions; behaviour into meaningful action; nature into culture. Institutions are systems of constitutive rules (ibid.: pp.51-52). To account for some social phenomenon or act is to state the rules which provide for the orderliness of the phenomenon. For without making explicit the taken-for-granted rules of the game, there can be no accounting for regularities in play in the game (ibid.: p.53). Some of these "rules of the game" will be constitutive rules; they determine the other rules (ibid.: p.69). Inquiry into institutional facts involves a multiplicity of rules and this creates the need

to explore the ways in which such rules are related (ibid.: p.63). Rules are ordered in a grammar. The relation between grammar and rules is analogous to that between theory and regularity (CHOMSKY, 1970) (cf.Appendix to Part I for an account of Chomsky's definition and use of grammar and the implications he draws for method of inquiry in social science). The specification of the context of an action to which constitutive rules refer is problematic for contexts as such are not available to observation and ispection. Constitutive rules depend themselves on an underlying operation of interpretation. For their explanatory role can only be accomplished if they are understood by others. Since these rules relate to particular contexts and "particular settings" they are indexical and so require interpretation: there is no guarantee that social agents in concrete settings construct their lives and the rules which govern them in a similar fashion (COULTER, 1971).

(78) This is based on Charles Peirce's view of knowledge and inquiry (PEIRCE, 1931-1958:Vol.V,p.197) according to which knowledge emerges only in the context of action and experience, where the context of inquiry serves specific pragmatic functions:the settlement of arguments,the elimination of paradox, the avoidance of unanticipated results, the fulfilment of expectations,and the fixation of beliefs. There are many common interests and threads between pragmatist social thought and interpretative approaches to social studies such as ordinary language analysis, phenomenology, and hermeneutics.

(79) This is not a connection which is immediately obvious. As stated above (see main text, chapters one and two) there are certain seminal ideas of the pragmatists that have been assimilated into the formulations

of the "new humanists". Moreover, there are intelligible links between the pragmatists and other traditions of humanistic social thought stressing interpretative understanding of human action in its social context and attempting to explore the relations between thought and action. Thus, pragmatists refer to human conduct (which refers to meanings) rather than behaviour (which refers to overt manifestations in physical movement and speech). Writers in the tradition of analysis of ordinary language speek of intentional action. These and hermeneutic philosophers speek of understanding of particular acts in some broader context of meaning or of culture and accept a dialogue model of inquiry in which truth is what coheres within some context and hence relative to that context.

(80) See footnote (70), above, for a characterisation of the writers who expound these views.

(81) Most of Habermas' discussion relating to this aspect of hermeneutic/historical knowledge is rather abstract and unduly obscure for it does not go into any clear description of how interests of enhanced communication and consensus are to structure assessment of such knowledge. If the latter is to be guided by interests in dialectical interaction and consensus then it might be argued (BARNES, 1977: p.14) that history could find itself being interpreted along the lines of what some audience (some community) would wish to hear in a way which best serves the cause of social solidarity. But is history to prefer this cognitive mode instead of the evidence to be found in its sources? Moreover, the implications of hermeneutic "verstehen"

for the ways in which knowledge or insight is to be gained into human conduct -- intentional action, norms, meanings -- are not at all clear; and its alleged differences from understanding and interpreting the data of science is not made explicit as it ought to have been, given that it is not an unproblematic notion (HESSE, 1972: p.279).

(82) The dialectical model of knowledge with its corresponding conception of "objectivity" is bound to appear alien and even disturbing to those thinkers who take for granted an empiricist theory of knowledge. It is, however, widely applied in historical studies. For instance, take a fictitious example from the history of town planning. In attempting to assess the impact of utopian and reformist thinking in contemporary urban planning tradition, e.g. the thinking of Howard and Geddes, it is improper to seek to interpret the thought of the past solely from a point of view which points forward to the direction of modern developments in planning ideology and theory. For this would result in detaching from some hypothesised whole, i.e. the historical social context in which the thinking of those individuals emerged, the particular elements that have a bearing on modern formulations. The dialogue model would require, in addition to such an interpretation, an oscillation between past and present horizons, between the historical context of the thinking that is being investigated and some present reconstruction of particular facts in the light of current theories and modern evidence with a view to revealing hitherto obscured aspects of the thought of that period. Thus, a historical investigator following the dialogue

model would not restrict himself to going back in time and attempting to "feel" in the same way as those individuals did at the time, but rather would seek to penetrate into and grasp forms of thought of that period being fully conscious of modern developments. The past may be interpreted only from some present point of view. This is taken by some to imply that each age will interpret differently a past age (cf. main text, p.305) for points of view and conditions of knowledge never remain static over time. Others concede that historical knowledge is relative to time but do not accept the full relativist implications of the former view.

FOOTNOTES TO CHAPTER SIX

(1) A useful analysis of established views about reality is afforded by Emmet. He discusses extensively the positions of Berkeley, Hume, and Locke, and debates the concept of 'ultimate'reality which may probably be revealed after successive layers of appearances have been removed. His findings reflect the impossibility of arriving at any conclusive statement with regard to the ultimate nature of reality, but only at operational statements (EMMET, 1964: Ch.6).

(2) Use of the word 'things' must be preferred to the word 'events' or 'processes' in the discussion of what reality consists of. 'Events' and/or 'processes' will be taken to represent the changing properties of 'things'. The word 'event' usually describes something which exists for only a short period of time. As reality is always changing and as human beings are also constantly changing their standpoint, points of reference or attachment are needed such that they be identifiably the same through change. Without such points of attachment all statements would be unrestricted general statements, unrelated to reality by any indication of particular segments of reality: this is a self-contradictory hypothesis. Therefore, no conceivable alternative exists to some distinction that roughly corresponds to the distinction between a thing and its changing properties (events, processes), however various the types of thing distinguished may be (HAMPSHIRE, 1959: Ch.I). A different view is expounded in (HARRE, 1970: p.10) where 'event' is used to denote both instances and processes; and this is considered to be its ordinary signification. Nevertheless, for the purposes of the ensuing discussion, it is essential to use one term to designate anything that has existed, does exist, or

might exist in the future. The word 'event' appears to be comprehensive enough and to create a single class which embraces all possible occurrences by intelligent beings.

(3) This is one of the main theses of linguistic philosophy; cf. Appendix to Part II, entry: "Linguistic Philosophy".

(4) A contrasting set of views is known as rationalism -- or, more precisely, "apriorism". The main issues involved in this debate are briefly referred to in Appendix I where the views that have recently been put forward by Noan Chomsky are also considered.

(5) The criticisms of the logical positivist view concerning the debate about theoretical versus observational terms seem to be conclusive in their claim that "... terms interpreted as referring to items described as unobservable need not express unintelligible concepts" (ACHINSTEIN, 1968: Ch.3).

(6) For example myths about creation, various systems indicating how human lives should be ordered and what the reasons for human existence are, all attempt to provide satisfactory answers to the questions man asks about his experiences. Such systems attempt to establish a sense of order. Contexts for ordering human experiences are created by developing conceptual frameworks. A first step in ordering the experience of an event is to locate that event in the spatio-temporal continuum. Many other contexts can be postulated and used as frameworks to locate and order events.

(7) Obviously this view contrasts with the empiricist account of knowing in that it recognises the possibility of alternative descriptions of the same set of experiences.

(8) The scheme that is presented in this discussion is referred to in (ABLER, et al., 1974: pp.12-14). It has been selected by those authors after an examination of a variety of accounts of the processes involved in ordering experience. This scheme is based on work by (VAN DUJIN, 1965) and Margenau (a Yale philosopher).

(9) Microscopes and other instruments do extend this observational barrier. However, the additional experiences that result from using such instruments are channelled to the human brain through the same media. Perception "is regarded as a gross smoothing over of the surface of reality (owing to the crudity of our sense organs)..." (CAWS, 1965: p.69). This view is, of course, associated with an empiricist theory of knowledge which is not accepted by all, though it commands great support.

(10) The events that cross the sensory frontier of an individual and become his own experiences are only a subset of the universal set of all possible events; while other sets of events may cross the P-Planes of other intelligent beings.

(11) Constructs are ideas about experience which impose some preliminary order upon it and have empirical content.
The cognitive status of a 'construct', as the latter is employed in the scheme that is being discussed, is frequently reserved

for the notion of a 'concept'. For example, Kuhn states that: "... the brain connects various inputs of sensory information into groups which are called concepts ..."; and adds that : "... either we cannot perceive things umtil we have already formed concepts of them, or we cannot decode a group of incoming signals unless we have already formed the code" (KUHN, 1963/66: pp. 28-29). However, the position occupied by the term 'concept' in the scheme under consideration is that of a higher order of abstraction and generality in comparison with the notion of a 'contruct' as used in the same scheme. The conceptual scheme for ordering experience, developed in (CAWS, 1965: Ch.10) and referred to in (HARVEY, 1969: pp.18-22), envisages a set of connections starting from 'percepts' (or 'sense perceptions') through 'concepts' (or mental constructs and images), to 'terms' (or linguistic interpretations). It is pointed out that these entities possess, to a certain extent, an independent existence and cannot be considered isomorphic to each other.

(12) This is essentially a taxonomic process: experiences are assigned to categories of greater or lesser generality. E.g. the construct 'cat' is closer to the P-Plane than the construct 'animal'.

(13) Experiences of the P-Plane are connected to constructs through definitions. These are "rules of correspondence" between experiences and the constructs developed for them (q.v. Appendix to Part II).

(14) Use of language in thought and communication entails the acceptance of the particular division of reality into segments which the vocabulary and grammar of that particular language impose (HAMPSHIRE, 1959: p.12).

(15) It has been strongly suggested that the process of concept formation is essentially identical to the process of inductive generalisation (KUHN, 1961: pp.127-153). Although this view is not widely accepted by philosophers, Feigl put forward a related, but not equivalent, argument by stating that: "knowledge, both on the level of common sense and on that of science, is now being regarded as a network of concepts and propositions tied only in a few places to the data of immediate experience, and for the rest a matter of 'free contruction' " (FEIGL, 1956: p.16).

(16) All possible questions that may concern an event can be subsumed under six types:

(i) 'what' questions relate to semantics, essence, occurence; or combinations of these.

(ii) and (iii) 'when' and 'where' questions are associated with temporal and spatial coordinates of an event.

(iv) 'how' questions refer to the origin of the experience that is being investigated, or to the processes which produce that experience.

(v) 'why' questions can be classified into two categories: true 'why' questions and disguised 'why' questions. True 'why' (or ultimate) questions, whether asked about human or physical phenomena, reduce in the end to theology or metaphysics. This type of question cannot be completely answered by any event

chain no matter how long. Such questions ultimately exhaust human knowledge. At that point it is possible to either admit ignorance and speculate about the events required to complete the explanatory chain (metaphysics), or argue that God designed the world that way. Disguised 'why' questions can always be referred to any other member of the set of possible question types.

(vi) 'Who' questions can be broken down to two types: disguised 'what' questions relating to identity and concerning people rather than non-human phenomena, and hidden 'how' questions.

This basic set of questions is applied to past, present, and potential future experiences. Answers to questions about the future are most important as accurate prediction of potential events enables man to manipulate both his behaviour and these events so as to experience only those that are most beneficial to him.

(17) Further problems are generated by historical and current misusage of the word "science" and its linguistic variants. Lack of discrimination in employing the term has resulted in applying the words "science" and "scientific" as labels which confer some kind of honorific distinction on various cognitive entities.

(18) Indeed, some writers tend to equate scientific with common-sense knowledge, especially as regards knowledge in the realm of human and social relations.

(19) Arguments to the effect that science can be distinguished only by its method and not by its content have been successfully refuted (MORGENBESSER, 1963: p.41).

(20) There are many 'nonscientific' approaches to obtaining knowledge. The following is an attempted systematic account of such approaches that range from the purely speculative and logically weaker to the nearly (but not quite) scientific, as given by (HELMSTADTER, 1970: pp.8-14)

(i) The method of tenacity refers to the holding of a belief as being true because it has traditionally been accepted as such;

(ii) The method of intuition establishes the'truth' of a statement by intuitively considering it as self-evident;

(iii) The method of authority involves accepting a fact, or a statement about it, because it originates from a highly respected source of information;

(iv) The rationalistic method contends that 'properly true' statements can be arrived at through reasoning. But even though the latter is absolutely essential, using it alone without the necessary testing provides no guarantee of the 'truth' of a statement.

(v) The empirical method entertains the argument that the 'truth' of a fact or statement can be established solely on its correspondence with experience. However, fallibility of the memory of the observer, influence of past experiences on present perceptions, and limitations in the perception of personal experiences tend to prejudice the success of this method alone in formulating "true" statements.

Peirce's discussion of alternative methods of inquiry -- or

of "fixation of beliefs" -- seems to have provided the inspiration for the above account. Exploring the relative effectiveness of different methods which are employed to carry out the function of inquiry, Peirce (1839-1914) compares four such methods:

(i) the method of tenacity "as willful adherence to a belief" (PEIRCE, 1931-58: vol.V, para.377ff.);

(ii) the method of authority as the "arbitrary forcing of a belief upon others" (ibid.: para.380 ff.);

(iii)the 'a priori' method as the effort to formulate what seems agreeable to reason (ibid. : para.382 ff.); and lastly,

(iv) the method of science as the formation of beliefs by reference to external permanencies, rather than human causes. The basic contrast between it and all the other alternative methods is that the method of science is the only one that presents "any distinction of a right and a wrong way" (ibid.: para.384 ff.). It is self-corrective in the sense that errors in its application may be identified and rectified by employing the self-same method. The other three methods cannot achieve such self-correction for according to them their application is necessarily correct and, as a result, no errors can be acknowledged and corrected by these methods themselves. Although Peirce recognises that the first three non-scientific methods have their own advantages, he remarks that if one "wishes his opinion to coincide with the fact" then "there is no reason why the results of those first three methods should do so. To bring about this effect is the prerogative of the method of science" (ibid.: para.387). A different account of extra-scientific reasoning is given by Wartofsky.

He distinguishes three types of knowledge:

(i) That of mythopoeic explanation, that is, explanation in terms of some imaginary powers or beings.

(ii) That of generalisations from experience (in the form of inductive generalisations from well-observed uniformities).

(iii)That of rules of operation or techniques of a well-ordered type (e.g. rules for driving a car or building a bridge).

These ways of knowing , it is claimed, are all attempts to order experience in some way, to attain control over an environment; and all use the medium of symbolic formulation in one or another kind of language. However, they do not fit within the scope of scientific knowledge (WARTOFSKY, 1968: pp.44-46).

(21) For example, (BRAITHWAITE, 1960: p.1) purports that science aims at making ".... reliable predictions of events as yet unknown ...". Indeed, a number of writers maintain that prediction is the ultimate goal of science. However, there can be perfectly straightforward natural systems of the stochastic type the prediction of whose specific future states is, in principle, impossible. Other researchers contend that, because predictability is not essential to science, the main goal of science is better construed in terms of explanation rather than prediction (NAGEL, 1961), (HEMPEL, 1965). But even this position is rendered untenable by the recognition of cases in which "scientific understanding" of a system is perfectly possible even in the total absence of a capacity to"explain" its states (RESCHER, 1970: pp.130-131); as is the case with, for example, stochastic systems. Yet another view about the ultimate goal of science is that science aims at control

over nature for man's benefit (HANDY, 1964: p.15). Finally, some authors have expressed the opinion that problem-solving is the key concept in science (DEWEY, 1938), (ACKOFF, et al.,1962).

(22) This relates to the recent revival of the argument concerning 'ultimate facts'. The issue dates back to the time of Aristotle ('Posterior Analytics', Book I, Section 3) and revolves around the concept of explaining one fact by using other facts whose truth content is taken as established. This results in an infinite regress which terminates only if there are certain 'ultimate' facts that need not be explained, upon which all other explanations are based. These 'ultimate' facts would represent basic premises in science and would constitute the limits of scientific explanation (RESCHER, 1970: p.139).

(23) This was envisaged as an area of investigation which would provide "positive" knowledge of the way "science is done".

(24) It is doubtful whether it is possible to assign a date when the philosophy of science began to exist as a discipline. While reference to the publication of seminal works in the field would provide a convenient starting point, the choices appear to be many and not obvious; and any selection would tend to be arbitrary. Poincaré's "Science et hypothèse" (POINCARE, 1952) is a classic in the subject and antedates the writings of the logical positivists of the first quarter of this century, which contributed significantly to the refinement and advancement of certain problems. Reference to still earlier work by mathematical logicians like G.Peano(1858-1932), G.Frege

(1848-1925), and G.Boole (1815-1864) promptly leads to yet earlier efforts by J.Bolyai (1802-1860) and N.Lobachewski (1793-1856). In the area of the inductive sciences the important studies of (MILL, 1841), (COMTE, 1830/42-1877), (COMTE, 1851/54-1875/77), and (WHEWELL, 1837/1967) were no more startling or definitive than, for example, Newton's "Principia" or Bacon's "Novum Organum" (BENJAMIN, 1950/65: p.540). Given the uncertainty about its origins, it is reasonable to refrain from claiming that the philosophy of science is an established new discipline. It is obvious that such a type of philosophical activity has emerged out of the need to study philosophically certain problems about the sciences, which have become distinguishable from the problems of closely related areas. This position is further reinforced by a survey of current contributions to that branch of philosophy. Sharply contrasting aims and methods, and wide heterogeneity of problems that are commonly classified as belonging collectively to the field (but have instead been traditionally studied by philosophy) dispel the impression that the philosophy of science is a clearly delimited discipline which is concerned with a group of closely interrelated questions.

(25) For example, questions about what can be expected from science and what limits, if any, circumscribe the results of scientific endeavours.

(26) Each specific science makes use of three types of concepts: (a) those peculiar to its subject matter (e.g. force,motion in, say, physics); (b) those that are taken from another science

and presupposed as valid (e.g. number, quantity as used by, say, physicists); and (c) concepts that are presupposed by a science but not subjected to analysis by any science (e.g. the concept of 'time' in, say, physics). Provided it is not purely methodological, each of these concepts is presumed to have some empirical reference. One philosophical task is to determine the precise empirical content of these terms. Further, the concepts tend to assume meanings which appear very remote from their empirical basis through use in the sciences (e.g. through idealisation, abstraction, generalisation). Philosophy of science seeks to establish the meaning of these interpreted terms as functioning concepts in science, and to identify the various operations through which an interpreted concept has been derived from its original empirical content (BENJAMIN, 1950/65: pp.544-45).

(27) Including problems that might be termed metaphysical, this grouping is composed of questions concerned with the theoretical relations of the sciences to one another, and of the sciences to man's other attempts to grasp the meaning of the world surrounding him. Moreover, issues arising from the theoretical implications of certain truths in science, which tend to modify judgments in other areas of human experience, fall within this grouping. Examples are the contrast between the concept of lawfulness in nature and that of free will (and especially the various questions that were raised by the development of quantum mechanics, with regard to such issues as causality, determinism, indeterminism and free will); and the classical issues of vitalism (the doctrine that there is a vital force

differentiating living from non-living matter) and teleology (the principle that goals are causally efficacious). Finally, the set of problems connected with the practical effects of science on society and nature also falls within this grouping.

(28) This grouping is discussed more extensively in the next two chapters.

(29) For example,whether space and time -- or, perhaps, space-time -- should be thought of as absolute or relational; why time appears unidirectional; questions about freedom of the will which may be illuminated by modern neuro-physiology and by cybernetics.

(30) Especially about this second component of the philosophy of science, there exist a range of arguments, originating in the ideas of (WITTGENSTEIN, 1962), to the effect that science is in fact irrelevant in the solution of philosophical problems. These arguments are best described by (WATSON, 1938) and are well refuted by (SMART, 1968: pp.11-16).

(31) A good account of these trends is provided by (ALEXANDER, 1963).

(32) Caws provides an excellent account of the importance of simplicity and economy as methodological criteria in science as a whole (CAWS, 1963: pp.158-164).

(33) The significant feature of a deductive scheme, such as the proof of a theorem of mathematics, is its independence of external considerations. No idea may be introduced into the theorem, which is incapable of definition in terms of the previously admitted system of ideas; and no theorem must be introduced which is incapable of proof either in terms of other theorems in the scheme or in terms of certain of the axioms and postulates. Whether the latter are true in any empirical sense is irrelevant to the deductive truth of the theorems, though it may influence the application of the formal system of propositions to a certain subject-matter (cf. Appendix to Part II, entries: "Deductive-system"; "Axiomatic system"; "Calculus").

(34) The concept of testability is associated with a long history of problems and, to date, there is no general agreement concerning its merits. Researchers who have recently commented on the testability principle include T.S.Kuhn, who suggested that astrology also makes predictions which are testable although they are not accepted as scientific statements (KUHN, 1970: pp.3-24).

(35) See Section 1, this chapter , pp. 410-411 ; cf. also Appendix to Part II, entries: "Positivism and Logical Positivism"; "Operationalism".

(36) Cf. Appendix to Part II, entry: "Operationalism".

(37) Cf. Appendix to Part II, entries: "Positivism and Logical Positivism"; "Description versus explanation".

(38) In a recent paper, Suppe exhaustively examines the 'operational imperative' within a different, non-positivist account of scientific theories. His findings suggest that: "...the supposed epistemic pay-offs of following the operational imperative fail to accrue: operational definitions do not enable one to go deductively from knowledge of observables to knowledge of unobservables, and operational definitions do not provide a means for testing theories about unobservable phenomena. As such, the operational imperative should be rejected in both its weak and strong versions" (SUPPE, 1972[b]: p.159).

(39) An interesting analysis of the distinguishing characteristics of the logico-mathematical method contrasted with those of the experimental method is provided in (SKELLAM, 1969: pp.458-463). Formal scientific method is viewed in terms of an analogy with the closed system concept; and, it is claimed, is characterised by closed-end thinking. Further, it is argued that the experimental method is analogous to the concept of an open system and is permeated by open-ended thinking with numerous feed-back loops to the world of experience. It should be noted that the concept of a system is used in its cybernetic context and not in contexts associated with the so-called General System Theory. Distinction between the two contexts, and problems of 'black-box' theory that abound in the latter context, have been convincingly discussed in (BERLINSKI, 1970: pp.108-116).

FOOTNOTES TO CHAPTERS SEVEN AND EIGHT

(1) Mehlberg continues by establishing the meaning of the 'range' and 'reliability' of a method. The former is claimed to encompass the class of all objects to which the method could possibly be applied; whereas reliability of a method represents the probability that a single application of that method, chosen at random, will be successful in attaining the objective of the method (MEHLBERG, 1958: pp.67-68).

(2) Given the fact that opinions vary among philosophers of science as to whether the "scientific method" should encompass the formulation of hypotheses and their testing or it should be confined only to the process of testing of scientific statements against empirical evidence, it is proposed to accept the above general statement as a starting point and to qualify it in the course of the ensuing analysis.

(3) There is a branch of literature on the general subject of the philosophy of science, which could be entitled 'science criticism', which studies actual science in a very concrete and constructive manner and provides valuable insights into issues that are relatively burdened by complicated and controversial philosophical debate. In this category belong works such as (MEDAWAR, 1967),(KUHN,1962/70),(KOESTLER, 1961), (NORTH, 1965), (POLANYI, 1950), and (TOULMIN, 1961).

(4) Mehlberg views a scientific method as any method employed by scientists in the process of validating scientific theories. Thus, according to him, "a validating method is a procedure which is destined to, and capable of, providing adequate

evidence in support of a statement of some particular kind, or of a system of such particular statements" (MEHLBERG, 1958: p.69). He then qualifies this account by substituting "adequate evidence" with " a reliably correct answer" because the concept of evidence may be associated with various levels of inquiry (MEHLBERG, 1958: pp.70-71). The operations involved in a validating method may consist of observations; measurements; experiments; deductive, inductive, or statistical inferences, etc.

(5) Philosophy of science is concerned with the investigation of three, quite distinctive types of reduction. The first kind relates to the attempts to reduce theoretical terms into purely observational terms, and has already been referred to above. The second type is the one known as the ' Campbellian' reduction (HESSE, 1963); it focuses on the principle of the translation of unfamiliar or not clearly understood concepts into familiar concepts known beforehand. This principle is founded on the thesis that a scientific theory should be interpreted by means of well-understood concepts irrespective of the direct observability of the latter. In this sense, models and analogies are said to enhance such interpretations. Finally, the third kind of reduction is the one referred to by Medawar, and aims at a unifying programme which encompasses the vocabulary and conceptual bases of particular sciences. This is to be achieved by reducing "derivative" disciplines into their "primitive" ones. According to some writers, so-called General System Theory is a first approximation to such a unifying scheme.

(6) Cf. Appendix to Part II, entries: "Description versus explanation"; "Empiricism"; "Realism"; for some accounts of causation in nature.

(7) Discovery entails the operation of examining a body of empirical data, and of eliciting the law or theory which will render that body of data comprehensible (KYBURG, 1968:p.5). It has been correctly pointed out by Diesing that the term 'discovery' tends to be misleading to the extent that it implies that scientists find something which already exists. Given the fact that the development of new scientific knowledge is in large part an invention, it may be preferable to employ the term 'heuristic' in lieu of discovery, but not without essential qualifications (DIESING, 1971: p.15). The term 'patterns of discovery' coined by Hanson to refer to the whole process of scientific inquiry seems to be more suitable in describing "scientific method", if it is assumed that the latter encompasses both discovery and validation aspects (HANSON, 1958/1961). The terms 'logic of discovery' and 'logic of justification' were first introduced by (REICHENBACH, 1938: pp.5-7).

(8) Thus, Kyburg considers its existence "problematic" (KYBURG, 1968: p.5); while Mehlberg states that "verification, not discovery, is the core of scientific method and ... only verificatory methods are inherently universal" (MEHLBERG, 1958: p.75). Further, Cohen and Nagel argue that "primitive" (or prior) propositions in scientific theories (e.g. axioms or postulates of the formal sciences; hypotheses or natural laws of the empirical sciences) were not necessarily discovered

before their logical consequences, that is, the so-called "derivative" or "defined" propositions (e.g. theorems of the formal sciences; empirical generalisations of the factual sciences). Indeed, to suggest that "primitive" knowledge temporally preceded "derivative" knowledge would be naive and mistaken (COHEN and NAGEL, 1963: p.132). Nagel states that " ... the practice of scientific method (does not) consist in following prescribed rules for making experimental discoveries ..."; and that "... there are no rules of discovery and invention in science, any more than there are such rules in the arts" (NAGEL, 1961: p.12). Bunge points out that there are at least three crucial steps in scientific research "which are not rule-directed, namely: the choice of problems, the invention of conjectures, and the assessment of solutions" (BUNGE, 1973: p.16). Popper stresses the point that actual discoveries essentially depend on the intuition of the scientist, and that there is no logical path to them. He claims that intuition cannot be studied scientifically; and that to establidh a logic that can provide clues as to the kinds of hypotheses which are worth developing and testing involves the risk of introducing elements of a psychology of theory-creating or law-finding into scientific epistemology (POPPER, 1959/1972). Popper's view is endorsed by Hempel who surmises that the psychological processes scientists engage in when they arrive at a hypothesis do not involve reasoning or inferring but guessing or conjecturing; and that there is no logic discovery, only a logic of justification (ACHINSTEIN, 1971: p.137).

(9) Hanson bases his view on a different conception of the role of induction. Instead of attributing to induction its ordinary function of generalisation, he introduces the notion of "abduction". This is a form of inference which, though not clearly expounded interms of its logical structure by Hanson, is taken to denote a transition from facts to possible explanations. In this sense, it could be viewed as some from of ordinary induction. However, Hanson's view of induction diverges from the established one. Thus, he argues that induction is the logical process of measuring the degree of correspondence of an existing theory with factual evidence; whereas deduction should be confined to prediction of phenomea on the basis of scientific hypotheses. The position held by Kaplan with respect to the methods employed in the social sciences (KAPLAN, 1964: pp.8-18) postulates that the term "logic" may be interpreted as the procedures which scientists follow when they achieve successful results in their scientific activities. This is, evidently, an odd view of "logic" of discovery. The history of science provides examples of scientific discoveries which followed, say, a dream the sleeping scientist was having -- e.g. Kekulé is said to have "achieved a successful result", viz. the ring structure of benzene, through having a dream in front of a fire. In an empirical context, this seems to be a "procedure" which scientists have followed in order to "achieve success". If Kaplan's intepretation of "logic of discovery" is accepted, then "dreaming" may be taken as part of such "logic".

(10) In this context, reference should be made to De Bono's attempt to approach creative thinking in a systematic way (DE BONO 1967/

1971). His starting point is the establishment of an analogy between the human brain and a physical landscape. Patterns are inscribed on the brain through the senses, and once so impressed they tend to set the rules for further inscriptions; just as rivers and other physiographical features influence subsequent formations on a landscape. De Bono calls the process of organisation of new information on the basis of existing mental patterns "vertical" thinking. However, he distinguishes a different type of thought process which is based on deliberate efforts (that could be consiously illogical) to restructure preconceived and induce totally new patterns. This he entitles "lateral" thinking. While "vertical" thinking corresponds to deductive reasoning and concerns itself with development and testing of existing mental patterns, "lateral" thinking represents insight, intuition, and creativity, and complements strictly logical, deduction processes by focusing on invention of wholly novel mental constructs which are not directly derivable from existing patterns through deduction. Having identified these types of reasoning, De Bono then proceeds to develop a set of techniques which are designed to abet and sustain creative, "lateral" thinking. The techniques suggest processes of dealing with information. It is maintained that skill in "lateral" thinking may be acquired by studying these processes, in a way that is directly analogous to the development of the skills of "vertical" thinking which takes place during normal education in schools and universities. De Bono also introduces a third "type" of thinking, called "strategic" thinking which involves the selection of the most appropriate course of action from a multitude of alternative possibilities.

It reflects the search for a policy of behaviour that is more reflective than others, rather than the pursuance of a definite solution(DE BONO, 1967/1969: p.9).

(11) The term 'heuristic' is not used with the connotation of a haphazard trial-and error process. Instead, a 'heuristic' is held here to describe a loosely systematic procedure for investigation or inquiry, which gives satisfactory results eventually and on the whole, but does not guarantee them in any particular case and cannot promise 'optimum' results. Heuristic is opposed to algorithm and is similar to search or inquiry investigation.

(12) The classic account of experimental method and the testing of hypotheses is Francis Bacon's "Novum Organum" (1620), which proposed the departure from speculative and deductive methods ("anticipations of the mind") in favour of "genuine induction" based on sense observation of particulars, which he called the "interpretation of nature". Bacon's work gives the original account of the experimental methods of agreement and difference (later reformulated by J.S.Mill) and argues for the role of so-called crucial experiments ("experiments of the cross") as means of deciding upon alternative hypotheses. A recent argument in favour of such a methodological approach to scientific problems has been expounded by (PLATT, 1964: pp. 347-352). Original treatises on the subject of induction in "scientific method" have been expounded by (MILL, 1841) -- with an abridged edition by (NAGEL, 1950) -- (NEIL, 1850/1851), (JEVONS, 1873), (VENN, 1889/1907), and (COHEN and NAGEL, 1934/1963).

These theses were more recently analysed and evaluated (in a rather implicit manner) by (HEMPEL, 1952), (TATON, 1957), (POPPER, 1959/1972), (KEMENY, 1959), (PAP, 1962), (KEMENY, and SNELL, 1962), (WARTOFSKY, 1968), (ACHINSTEIN, 1971) and others. In fact, there are few works concerned with issues in the field of the philosophy of science, in general, and "scientific method", in particular, which do not touch upon the problems of inductive reasoning. The works cited above tend to contain more complete discussions and critiques of the inductive/deductive scheme. However, particularly useful among recent influential publications dealing with the subject of induction are the following monographs and collections of readings; (CARNAP, 1951); (HARROD, 1957); (BARKER, 1957); (MADDEN, 1960); (KYBURG and NAGEL, 1963); (FOSTERand MARTIN, 1966). Two interesting, and relatively contradictory, papers should also be mentioned: (HARMAN, 1965) and (HARMAN, 1968). Further references can be found in most of the above mentioned works.

(13) The concepts of 'inference' and 'reasoning' require some clarification. Two slightly different uses of 'inference' may be distinguished. In one use, the inference of a proposition (p) as true or probable, based on the fact (or alleged fact) that (q) is true, implies the <u>emergence</u> of the <u>belief</u> that (p) is true or probable. In another use, inference simply implies the belief that (p) is true or probable. Further, it is implicit in both uses that the reason for inferring that (p) is true or probable is the fact (or alleged fact) that (q) is true. It is, however, essential to discriminate between <u>evidential</u> reasons and <u>pragmatic or utilitarian</u> ones (example

of the latter being the belief in God developed on the grounds of impending punishment from God in the absence of such belief). Only evidential reasons are involved in inferences. Reasoning is a broader concept and involves thinking about something and drawing certain conclusions. This implies that reasoning is thinking leading to an inference; and also examining a reason to see if it does support a belief (ACHINSTEIN, 1971: pp.112-113).

(14) The process of inductive reasoning can best be presented as follows (ACHINSTEIN, 1971: p.126):

Premiss: Evidence (E) is obtained in the light of background information (B). The evidence (E) shows that (F)'s have been examined: and all those examined have been observed to be (G)'s.

Inductive inference: It is plausible to assume that "all (F)'s are (G)'s".

Justification: Hypotheses H_1, H_2, ...H_n which conflict with "all (F)'s are (G)'s " are explicitly considered and tested against (E) and (B) to establish their plausibility.

Conclusions: The general statement "all (F)'s are (G)'s" is warranted to the extent that : (a) hypotheses H_1, H_2, ...H_n are not plausible, given (E) and (B); and (b) other hypotheses that are reasonable to consider, given (E) and (B), which are not compatible with "all (F)'s are (G)'s", are not plausible.

It is clear that a major premiss has been omitted in this account. This is the premiss that: "whatever is true of the observed members F_1, F_2, ...F_r belonging to the class (F) is true of all members of the class (F)". This premiss, if explicitly stated in the argument, would make the inference

deductive. The above has been pointed out by Cohen and Nagel in their attempt to show that induction is not a mode of reasoning antithetical to deduction (COHEN and NAGEL, 1934/1963: pp.273-277).

(15) Induction from observed phenomena must be preceded by some kind of theoretical structure: it requires guidance through hypotheses based on previous experience. These will suggest ranges of observations to be dealt with (HARRIS, 1966: p.262).

(16) Accepting Hume's conclusion that induction cannot be reduced to deduction, Popper claims that there is no logic other than deductive logic, and therefore no logical problem of induction. For him the philosophical problem of induction, as dinstinct from the logical problem which he answers negatively, is a facet of the problem of demarcation of science from non-science. One of the fundamental, and as yet without solution, problems of philosophy is the "problem of induction". It was stated by Hume in his "Treatise" and after having been given extensive consideration, was founded intractable. Hume's main argument is that it is not possible to show that there are strong logical reasons for accepting inductive inferences in a manner which is similar to that of accepting deductive inferences from undisputed hypotheses. Further, it is considered impossible to sustain the claim that inductive inferences are probably rather than deductively true, given the evidence. This is shown by examining the notion of probability in the statement "p is probable given q" (which is an equivalent statement to the one in the example of inductive reasoning given in footnote(13)

above ; that is, the same as "It is plausible to assume that 'all (F)'s are (G)'s' given evidence (E)"). Whatever interpretation is given to the concept of probability in this statement, it remains essential to know some non-probabilistic premiss before claiming that the statement is logically sound. Since this premiss will not be deducible from the evidence, it will require further inductive justification independently. (The premiss referred to here is the same premiss that is mentioned in footnote(14)). Consequently, the inductive inference cannot be logically demonstrated unless this premiss is shown to be true and not merely probable; and in case of failure to furnish such proof a state of infinite regress is reached. Feigl is referring to Hume's formulation of the "problem of induction" as the "problem of validation" in contradistinction to Peirce's schematisation of the same problem which Feigl entitles "the problem of vindication" (FEIGL, 1950: p.116). The latter formulation was introduced to replace Hume's argumentation, and consists in the attempt to show that if it is possible for <u>any</u> method of predicting future occurrences to be successful, then the inductive methods must be successful. The preceding exposition was mainly based on (HESSE, 1974: Ch.4) where a more detailed treatment of the subject can be found.

(17) Undertaking a comprehensive criticism of Popper's position on induction, Kotarbińska states that Popper's arguments intended to discredit the inductive methods fail in their principal purpose. She admits, however, that he has made a number of valid observations concerning errors, shortcomings, and abuses

that often mark actual inductive procedures (KOTARBINSKA, 1962: pp.273-274). The views on induction held by Popper are further criticised by (HESSE, 1974: Ch.4); and her position is examined in greater detail below (cf.footnote (18), this chapter).

(18) For example, Hempel claims that " there are .... no generally applicable 'rules of induction' by which hypotheses can be mechanically derived or inferred from empirical data" (HEMPEL, 1966: p.15). Nevertheless, what has been taken to be typically deductivist literature recognises the need for some statement of a theory of inductive confirmation of theories, to <u>supplement</u> the hypothetico-deductive account (HEMPEL, 1965: pp.28; 245; 338;), (SALMON, 1966: p.360). Despite the fact that he is not a supporter of the hypothetico-deductive account, Hanson criticises inductive reasoning. He points out that enumerating and summarising observables in itself does not lead to the finding of scientific laws by purely logical operations as argued in the inductive account (HANSON, 1958/1961). The lack of success which has characterised repeated attempts to solve the problems associated with inductive reasoning has lead some workers to suggest that these problems are in principle insoluble, or that they are pseudo-problems (STRAWSON, 1952: Ch.9). Hesse opposes the fundamental deductivist positions with respect to the inductive approach. She asserts that "... many inferences in science are inductive and analogical in charcter, and move from observation to theory, particular to general, and particular to particular" (HESSE, 1974: p.89). Moreover, after examining Popper's and Strawson's contentions, she concludes than neither of the two writers has propounded

a strong case for abandoning the problem of induction; and that both direct their arguments in favour of dismissing induction at the wrong targets. The failure to solve the problem of induction, she claims, may be due to the undeniable lack of adequately formulated rules of induction, and to the lack of agreement about how these rules should be formulated. This situation results in controversy within inductive logic. Suggesting that inductive assumptions permeate human discourse, both through general statements describing evidence and through scientific inferences from evidence to theories, Hesse considers the problem of induction (in its 'modest version') to be the problem of "explicating intuitive inductive rules". She distinguishes two parts to this version of the problem:
" (i) to formulate a set of rules which capture as far as possible the implicit rules that govern our inductive behaviour; and (ii) to formulate these in an economical postulate system" (HESSE, 1974: p.97). She contends that justification will rely on the <u>interaction</u> of postulates and rules; and consequently will differ from earlier formulations of 'stronger cases' of the problem of induction, which purport that the postulates arrived at could be justified independently of the inductive processes themselves. Further, the logical postulate system in which inductive rules can be formalised is probability theory. Finally, Hesse attempts to set the conditions for a probabilistic confirmation theory for science (HESSE, 1974:p.101).

(19) In the nineteenth century, William Whewell's "Philosophy of the inductive sciences" emphasised the role of hypotheses in the sciences. His characterisation of the function, in discovery,

of conjectures that are"clearly conceived and brought into rigid contact with the facts" and which "perpetually show their vigour by overshooting the mark", has proved very influential in the writings of later philosophers (WHEWELL, 1837). The discussion of hypothesis and experiment around the turn of the century and thereafter includes the important contributions of (MACH, 1959: Ch.14), (POINCARE, 1952), (DUHEM, 1914/1954: Ch.6), (PEIRCE, 1932/1935), (PEIRCE, 1957), (DEWEY, 1938: Chs.6; 23). These were implicit treatises of the hypothetico-deductive approach in science. The subject is dealt with more explicitly in (BERNARD, 1865), (CAMPBELL, 1920), (NICOLLE, 1932), and (REICHENBACH, 1951). Clear enunciation of the scheme is made by (BRAITHWAITE, 1953), (HESSE, 1953), (HEATHCOTE, 1954), (HUTTEN, 1954); and excellent summary is given by (MEDAWAR, 1969). Popper is the principal modern advocate and analyst of the scheme (POPPER, 1959/1972);(POPPER, 1963: Ch.1); and Hempel is an eminent suporter (HEMPEL, 1966). Most works concerning the philosophy of science and scientific methodology tend to discuss, implicitly or explicitly the hypothetico-deductive account: e.g. (WARTOFSKY, 1968), (ACHINSTEIN, 1971), (HARRE, 1970). Relevant methodological issues are considered, in a historical context, in (MADDEN, 1959); and (HANSON, 1958/1961) examines the role of hypothesis in scientific discovery. Most of the works cited contain extensive bibliographies.

(20) Schematisation of the deductive mode of inference can be performed as follows (ACHINSTEIN, 1971: p.133):

<u>Premises:</u> Hypotheses H_1, H_2, ...H_n have been determined to be

plausible (establishing their plausibility may have required inferences of a variety of types, such as analogical and inductive).

Conclusion : Hypothesis (H) is plausible. The conclusion holds on condition that H_1, H_2, ...H_n deductively imply (H).

(21) Commenting on deductive inference, Bambrough remarks that it does not prove anything more than what is already known in the premises and that offering a second proposition (deductively inferred) in order to justify a first proposition (hypothesis) implies offering a proposition of the same kind as the first and, necessarily, not an ultimate justification for it (BAMBROUGH, 1964: pp.100-101). Further, it has been suggested that the degree of confidence to be placed on an initial statement (hypothesis) can only be established inductively through the logical relation between a scientific hypothesis and some confirming evidence for it (CARNAP, 1950: p.2).

(22) Verifiability or falsifiability is a necessary characteristic of a scientific hypothesis. Not every assertion, even a meaningful one, is verifiable or falsifiable. For example, nominal definitions of the kind "Greece lies in South-East Europe" cannot be shown either true or false. The direction normally assumed by a magnetic needle is called by convention 'north-south' but it is unverifiable (or unfalsifiable): it is only a name and no operation could confirm or infirm it. Another type of unverifiable or unfalsifiable statement is an assertion about supernatural phenomena. This is untestable and unverifiable not because it does not refer to facts

(since such statements often do) but because no method is available whereby it could be decided what its truth value is. Several categories of verifiable or falsifiable statements can be distinguished: (i) singular propositions (e.g. "this swan is white"); (ii) existential propositions (e.g."some swams are white"); (iii) universal propositions (e.g. "all swans are white", which is verifiably false because of "Cygnus Melancoryphus" living in South America); (iv) law statements (e.g. "all swans that have as their habitat such and such a geographic area are white", which specifies a set of conditions under which the law obtains) (BUNGE, 1959: Ch.3).

(23) The definition pertains to a factual hypothesis as it is employed in empirical science. In the formal sciences the concept of a hypothesis has retained its original meaning of an assumption, a premiss: the starting-point of an argument (e.g. proof of a theorem). Thus, the formal sciences take a hypotheisis as a previously accepted formula (axiom, theorem, or convention) or a tentatively introduced formula making some deduction possible. This is to be retained or rejected on the strength of its consequences. In either case, a hypothesis is a premiss used in a reasoning (BUNGE, 1967: p.222).

(24) For example, Brodbeck claims that hypotheses represent empirical laws which are inductive generalisations: whether quantified or not they assume a certain form, as expressed either in the verbal "if ... then ..." or by a mathematical formulation (e.g. an equation) (BRODBECK, 1959: p.378). Hypotheses may be formulated by way of inductive generalisation performed

on the basis of the observation of a range of particular cases. They may also be arrived at by means of analogy, either material or mathematical; and it has been observed that both philosophical conviction and theological phantasy (i.e. deduction from extra-scientific thought) have in the past contributed to the formation of plausible scientific hypotheses (BUNGE, 1959: Ch.3). As will be seen below (in Part Two), a realist view of science takes models to perform the essential role of hypotheses that are advanced and tested against factual evidence (cf.Appendix to Part II, entry: "Realism"). However, there are important differences in the conceptions of model and hypothesis between realists and hypothetico-deductivists.

(25) This subjectivity is often masked by impeccably objective verbal descriptions and the use of statistical methods. Objective interpretation is the principal, though elusive, goal of hypothesis testing: but there is also, to a greater or lesser extent, some contribution of the knower to the known.

(26) There are no 'final' answers at the end of the testing of a hypothesis, simply because there are no 'final' questions (i.e. final formulations of scientific problems to be solved through the process of scientific inquiry). The critical procedures may ultimately indicate that the original questions require reformulation, e.g. when the critical tests of a hypothesis tend to invalidate it. Nevertheless, even if the expectations led by a hypothesis are confirmed by factual evidence, it does not follow that the hypothesis that gave rise to them is true: false hypotheses can also lead to true conclusions

(MEDAWAR, 1969: p.49).

(27) The first aspect, which one might call "verification testing", concerns primarily the syntactic and, to a certain extent, the semantic rectitude and acceptability of the hypothetical statement. This involves questioning the internal consistency of the hypothesis with respect to its grammatical and semantical ineptness, conformity with expert opinion (or prevailing religious or political climate, as (FRANK, 1954: pp.3-18) and (MOORE, 1954) point out), and its logical consistency both within itself and towards other, previously established scientific laws. In case of failure of the hypothesis to meet these verification tests the natural process for attaining its rectitude is to return to the stage of formulation of the hypothesis and to reconsider the statements involved. Whenever the scientist is sufficiently convinced of the grammatical and logical rectitude of his hypothesis, the second aspect of confirmation may be approached; and this can be called validation testing. The aim of validation tests is to establish the external consistency of the hypothesis by means of observational data gathered in relation to the phenomenon under study. The preceding comments refer to the "logic of confirmation" rather than to Popper's falsificationist doctrine. For these distinct positions cf. main text above and footnote (29); further, cf. Appendix to Part II, entry: "Positivism and Logical Positivism".

(28) The concept of 'law' is not a precise one as far as scientific terminology is concerned. This does not necessarily mean that the concept is confused. In general, a proposition may be

called a hypothesis when it is first proposed and not tested. Because the concept of law is characterised by a certain degree of looseness, it is not possible to produce a set of necessary and sufficient conditions for laws. However, relevant and central conditions, though not logically necessary, can be established for laws. A statement might be classifiable as a law even if it failed to satisfy one of these conditions (ACHINSTEIN, 1971: p.1). A scientific law may be viewed as a sufficiently verified and validated explication of a scientific hypothesis which remains consistent with other established laws. Cf. Appendix to Part II, entry: "scientific laws".

(29) The problem has received lengthy treatments by such writers as (CARNAP, 1950), (NAGEL, 1939), and (HEMPEL, 1965). The latter author sets out to delimit the task of a 'theory of confirmation' of a scientific hypothesis (H) given evidence (E). Thus, he distinguishes two main problems (HEMPEL, 1965: p.6):
(1) the problem of advancing precise definitions of the two non-quantitative relational concepts of 'confirmation' and 'disconfirmation'; (2) the problem of advancing criteria for:
(a) <u>either</u> a metrical concept of "degree of confirmation" of (H) given(E), which assumes values in terms of real numbers;
(b) or (failing the above) the definition of the two relational concepts: (i) "more highly confirmed than", and (ii) "equally well confirmed as".
It seems that the second problem can only be approached after solving the first problem. However, it is pointed out that the second problem has received more attention in methodological research (HEMPEL, 1965: p.6).

(30) "Logical" theories construe probability as a logical relation between propositions, and are restricted to postulating uninterpreted qualitative concepts. Thus, Carnap develops a theory of inductive logic defining a quantitative concept of "degree of confirmation" for specific formalised languages (CARNAP, 1950), (CARNAP, 1951). The underlying principle is that a tautological statement is considered logically "certain" as having a logical probability equal to one. The various approaches which involve the notion of "probability of hypotheses" have received adverse criticism. Thus, Hempel has criticised Carnap's account for failing to produce a quantitative concept of wider applicability (HEMPEL, 1965: p.7). Popper's critique comprises (i) suggestion of certain adequacy conditions on any acceptable definition of "evidential support"; then (ii) it shows that no probability function can satisfy these conditions; and then (iii) it shows that the conditions that are put forward by him are nevertheless satisfiable -- viz. consistent -- by formulating a "corroboration function" which (a) is not a probability, and (b) satisfies the adequacy conditions (POPPER, 1959/1972: p.387 f.).

(31) The statistical approaches are concerned with defining the degree of confirmation of a scientific hypothesis (H) given evidence (E) in terms of the number of confirming and disconfirming instances within the body of evidence (E). According to Popper's comments on this type of approach, a hypothesis that has been falsified by every second test would be assigned a probability of confirmation equal to 50% (POPPER, 1959/1972:p.257).

(32) In attempting to elucidate the notions of verifiability, inductive support or degree of confirmation, and cognitive meaningfulness, the logical positivists went as far as to equate meaningfulness of a statement with its testability, and to reduce the latter to confirmability. Thus, their "verifiability principle of meaning" implied that all statements that were not testable and confirmable in experience were not legitimate in scientific discourse but belonged in the realm of extra-scientific knowledge (e.g. metaphysics). Cf. Appendix to Part II, entry: "Positivism and Logical Positivism".

(33) The emergence of the falsifiability criterion of acceptance of scientific hypotheses has given rise to the tendency among scientists to protect their theoretical hypotheses from total refutation by employing other 'ad hoc' hypotheses which are assumed to account for the factors that have rendered unsuccessful the results of the testing of some hypothesis. Such an attitude towards hypothesis testing has been called "conventionalist stratagem". It is pointed out by critics of this approach that no theory could ever be falsified when this "stratagem" is employed (POPPER, 1959/1972: Sec.19; 20); (LAKATOS, 1970: p.184). The establishment of methodological rules which help identify 'ad hoc' hypotheses that render the "research programmes" fertile and content-increasing rather than "degenerative" and sterile has been proposed as a step in the direction of removing the problems of the "conventionalist stratagem" (LAKATOS, 1970). Further, the act of "protecting" a hypothesis with other 'ad hoc' hypotheses is not wrong in principle, provided the latter hypotheses are independently

testable (BUNGE,1967: Ch.5). In fact, Bunge is clearly in favour of procedures protecting theoretical hypotheses from refutation, and opposes strict application of the refutability criterion which, if applied, would tend to arrest the further development of the hypothesis concerned (BUNGE, 1973: Ch.2).

(34) Pointing to the variable "degree of testability" which characterises scientific hypotheses, Bunge contends that confirmability and compatibility with the bulk of already existing scientific knowledge are jointly necessary and sufficient for a hypothesis to qualify as scientific; while refutability is neither necessary nor sufficient for a hypothesis to be scientific, though it is necessary for "optimal empirical" testability (BUNGE, 1973: p.31). However, it may be argued that compatibility with the bulk of existing scientific knowledge cannot be a necessary condition for "scientificity". For if it were then, say, Einstein's theories would have been declared unscientific.

(35) Cf. Chapters four and eight for a discussion of "scientific revolutions" and "paradigms", "research programmes", "poly-theoretic models of science", and other such notions associated with the "newer philosophy of science".

(36) In his assessment of approaches that employ statistical decision theory, Suppes remarks that although many examples purporting to illustrate the case have been propounded in recent years, their treatment of the evaluation of scientific theories has not yet succeeded in offering genuine alternatives to the

semantical notions of truth and validity. An obvious weakness of these approaches is manifested in the fact that they tend to employ standard semantical notions both in describing evidence and in stating their own theoretical structure (rather than treat observation statements in terms of utility as would be normally expected). Suppes concludes that statistical decision theory does not offer at present "a genuinely coherent or deeply original new view of scientific theories" (SUPPES, 1967: p.66), though it may be possible to develop in that direction in the future.

(37) As has already been noted above, in the course of discussing the formulation of scientific hypotheses.

(38) Cf. Appendix to Part II, entry: "Theory"; also main text, Part II, chapter eleven: "the role and structure of theories".

(39) Adapted from (HARVEY, 1969: p.34). It should be pointed out that the function of diagrams and step-by-step accounts of "scientific method" is important in terms of allowing a sufficiently abstract level of analysis to be reached in any general discussion of the components of the "scientific method" and their interrelationships. The ensuing gains with respect to clarity and systematisation of the exposition greatly outweigh the disadvantages in terms of lack of realism in the description of what scientists "actually do". Schematic descriptions of scientific method tend to be unrealistic in two related aspects. Firstly, they seem to provide inaccurate accounts of the sequence of stages of an inquiry.

Scientists discuss problems of description and classification; they make conscious use of hypotheses, laws, theories, and models. However, they do so in ways that appear totally different from the established textbook accounts of "scientific method". The processes of thought of a scientist cannot be represented by the abstract linear structure depicted in such step-by-step accounts. As a rule, scientists proceed through the various stages that may be said to constitute the "scientific method" in irregular rather than consecutive manner. It is not unusual for a scientist to start his inquiry, say, with a theory or model in lieu of the standard first step of the hypothetico-deductive account, that is, with a hypothesis and the basic observation of facts relevant to it. The second kind of ambiguity introduced by standarised descriptions of the "scientific method" is that they cannot be representative of all the individual applications of the methods of science. Obviously, consideration of a particular science, or of science as a whole, is not the same as observation of the method of work of an individual scientist. Thus, although all the elements of the "scientific method" may be used, at one time or another by scientists, the same elements are not easily separable or identifiable in accounts of the thought processes of individual scientists. A stated above, such ambiguities in general descriptions of "scientific method" do not invalidate the approach of adopting abstract schemata for the purposes of explication, providing it is made clear that this is the only function of such descriptions. These points are stressed in (HELMSTADTER, 1970: pp.20-24), (SIDMAN, 1960), and (SKINNER, 1956: pp.221-223).

(40) Some of those who do not accept the scheme as the principal explanation of "scientific method" are (HESSE, 1953), (HESSE, 1961: Chs.1,2,11), and (REICHENBACH, 1951); and (BRAITHWAITE, 1953) who, nevertheless, defends deductive reasoning (in isolation from epistemological and metaphysical issues). The principle of deductive thinking is strongly attacked by(CAMPBELL, 1920: Part I), (SMART, 1953: Ch.12), and (HARRE, 1970: Ch.1). Hanson, who is the proponent of some of the most adverse criticisms against the hypothetico-deductive account, insists that deducing from hypotheses is not a complete description of scientific activity because it omits to account for the way in which these hypotheses are conceived and formulated. His alternative approach, which differs from the two main schemes of reasoning referred to so far, is based on the observation that the actual situation in scientific inquiry encompasses elements of both schemes and can best be described as a continuing conceptual struggle to fit each new observation of phenomena into a pattern of explanation (HANSON, 1958/1961: p.158). Another conceptual scheme which purports to explain how scientific theories are developed has been expounded by Van Duijn. His approach employs Hanson's designation of scientific reasoning as "thinking patterns" (VAN DUIJN, 1961: pp.61-67). The process of scientific inquiry is seen as a conceptual struggle between patterns and sub-patterns in the mind of the investigator, which is analogous to the process of solving crossword puzzles. The scientist may be pictured as constructing patterns by drawing lines connecting selected points within the territory of a specific landscape. These points represent empirical facts and cannot be identified

by purely inductive reasoning because, it is postulated, experimental facts are not of equal importance in the process of concept formation. Only a limited number of them are so-called "cardinal" facts. The latter, when recognised, play special roles in the theories to which they pertain. Recognition of "cardinal" facts, combined with the ability to construct patterns from these, can explain the character of scientific progress in a better way than other views that neglect these elements. Discrimination between "cardinal" and other facts is achieved through the scientist's insight. Pattern-finding is the essence of creative activity in science. It is a psychological event and cannot be completely described in logical terms. Once a certain pattern is mentally perceived in the arrangement of some "cardinal" facts it becomes possible to try and extrapolate this pattern to unknown territory. As a result of such extrapolation, "cardinal" facts may be predicted to exist at specific points in the unknown territory; and if this is indeed the case, the pattern can be extended further. In every case, the pattern will have to be constantly confronted with the facts. The scheme implies that a theory is correct or true if its constituent patterns correspond with the "cardinal" facts uniquely. Van Duijn contends that his conceptual scheme indicates the differences between the two principal accounts of scientific reasoning, that is, inductive and hypothetico-deductive. The creative activity of pattern-finding and pattern-extrapolation is based on known facts. This stresses the inductive approach which, nevertheless, tends to be faced with difficulties due to its well-known lack of discrimination between masses of facts, on the one side, and certain "cardinal"

facts, on the other side. If this unequivalency of empirical facts is accepted, scientific activity emerges through hypotheses, that is, through extrapolations of patterns already understood. Deduction from these extrapolations enables derivation of new cases where a theory may be held to apply. In this manner, the hypothetico-deductive approach is manifested in Van Duijn's scheme in terms of "cardinal" facts and acceptable patterns, rather than in terms of all possible logical constructions (hypotheses) as in the standard hypothetico-deductive account.

(41) In a number of cases the ideal form of deductive argument cannot be followed; for instance, lack of information, incomplete understanding of the phenomena, the need to employ probabilistic statements in an explanation (what Hempel refers to as "inductive systematisation") may preclude deductive reasoning (HEMPEL, 1965). Recently, Achinstein attempted to investigate whether various modes of inference -- such as inductive, deductive, explanatory, analogical -- are in fact distinct, and whether it is possible to sustain the claim that one of these modes is more fundamental than the others. He sets out to answer these questions by drawing on specific examples from the history of science (ACHINSTEIN, 1971: Chs.6; 7).

(42) A realist view of science and "scientific method" is reviewed in Part II in the context of the discussion of epistemological and methodological issues regarding the use of models in scientific inquiries. The philosophical positions referred to as neo-realism and positivism are discussed in some detail in the Appendix to Part II, entries: "Realism"; "Positivism and

Logical Positivism"; and these views are developed in so far as they concern the use of models in science.

(43) When drawing a conclusion after having interpreted the results of the testing, the scientist is faced with both the possibility of accepting a false hypothesis and the possibility of rejecting a verisimile hypothesis. These two possibilities of error present the investigator with a dilemma: as he reduces the chances of commiting one of these errors he increases the chances of making the other. Consequently, the scientist's conclusions may involve some value judgment with respect to the significance of the implications of making one error as contrasted with those deriving from making the other error (HELMSTADTER, 1970: Ch.1). This view stresses the pragmatic element involved in scientific inquiry.

(44) Cf. Appendix to Part II, entry: "Empiricism".

(45) Cf. Appendix to Part I for a review of some of the arguments in favour of "rationalism" that have been advanced by Noam Chomsky and his associates in connection with pioneering work in the field of linguistics.

(46) Cf. Appendix to Part II, entry: "The phenomenological method".

(47) Cf. Appendix to Part II, entry: "Description versus explanation".

(48) Cf. Part II: "The role and structure of theories" (chapter eleven).

(49) A brief account of the main views on the "Description versus explanation" distinction is included in the Appendix to Part II, q.v.

(50) Cf. Appendix to Part II, entries: "Instrumentalism"; "Realism"; "Description versus explanation".

(51) Popper attempts to formulate a radical alternative to Empiricism. Although his writings may be said to lie on the periphery of the Vienna Circle, both chronologically and conceptually, it is essential to stress -- as he himself does (POPPER, 1974/1976: pp.87-90) -- how much his views diverge from Empiricism. Indeed, his first major publication (POPPER 1959/1972) was introduced, in 1934, as a critique of Logical Positivism. Among the features of his philosophy three are worth mentioning in the context of the present discussion. Very roughly, these concern: (i) the problem of demarcation; (ii) the relation between logic and methodology; and (iii) the empirical basis of science. First, as regards the attempt to establish criteria of demarcation which enable distinctionsto be made between what can be regarded as scientific and what can be said to belong to non-scientific realms, Popper rejects the verification theory of meaning of the Logical Positivists for its attempted reduction of meaning to testability and consequent exclusion of all metaphysical statements as meaningless. He argues that metaphysical assertions are meaningful <u>at some level;</u> they have played some role in the development of scientific knowledge over time. Thus, some ideas are originally metaphysical until new research findings turn them into substantiated theory. Secondly,

in investigating the relations between logic and methodology in science Popper expounds a theory of knowledge which is founded on a point of logic, that is, on the asymmetry between verification and falsification. He claims that it is not possible to draw a picture of science based on logic alone; it is essential to complete such a picture by adding rules of method (methodology). This need arises because of Duhem's argument concerning falsification. Briefly, the argument regards the not uncommon practice of evading falsification of some hypothesis that is being tested against empirical data by, say, modifying relevant observations -- e.g. by suggesting that certain crucial observations had been wrongly made. In this way, the choice is always open to the scientist either to falsify and discard his hypothesis or maintain it by, say, claiming invalidity of tests because some minor auxiliary assumption to the hypothesis is wrong; or because empirical data have not been correctly observed or recorded; or by changing the definitions of some terms; or by introducing new auxiliary hypotheses; these being some of the ways of "evading" falsification, the so-called "conventionalist stratagem". To avoid such dilemmas it is necessary to formulate methodological rules which must be consistently followed by the scientists. Finally, as regards the empirical foundation of science, Popper argues that it consists of a set of basic propositions and not of a pile of indisputable facts. Theories are bodies of propositions; the facts that are employed in their attempted refutation are also linguistic things, statements. Popper does not believe that empirical facts have the highly certain characteristics that are ascribed

to them in the old Empiricism and in Logical Positivism. In his view facts are not indubitable; and statements referring to "sensory observation" cannot be expressed in a theory-neutral observation language (POPPER, 1959/1972).

(52) Relativism (cognitive or epistemological rather than moral, cultural, or otherwise) is related to scepticism in intricate and subtle ways -- though the two doctrines, in their various versions, must be distinguished. Not all versions of relativism need be rooted in scepticism. For instance it might be claimed that systems of knowledge or beliefs are relative to the disciplined techniques or methods of knowing in terms of which knowledge is acquired and validated -- the view of theory/method interdependence that was referred to earlier. Scientific knowledge may thus be taken as relative to those methods of inquiry which pertain to and constitute particular disciplines of natural science, or of social science for that matter (e.g. the discipline of physics). To take, say, physical knowledge and the ways in which it is acquired seriously need not imply a sceptical outlook with respect to the possibility of such knowledge relative to methods of inquiry. In this sense, a relativist position can be maintained independently of a sceptical one. For scepticism seems to refer to being dubious about the possibility of there being established knowledge of some sort. Scepticist views regarding knowledge in general as demonstrably impossible may be encountered -- though not very successfully defended. But there are other forms of scepticism pertaining to specific kinds of claims to knowledge; and these are usually grounded in some epistemological commitment. For instance,

scepticism with respect to the knowledge claims of mystics may be due to one's inability to assimilate such claims within some conception of knowledge (epistemology) to which one subscribes. For commitment to some theory of knowledge imposes limitations upon what can be accepted as legitimate knowledge by those who accept that account of knowing. Assume, for example, that the aim of an inquiry in the field of social-spatial organisation that is dealt with by urban planning is to describe some aspect of the historical development of an urban settlement (such as the formation of the commercial centre of the city, as it would have appeard to those inhabitants who were present) in order to identify possible processes and trends that were in operation at the time. Thus, with regard to such a kind of historical study, if it is held that matters of fact are only to be known by direct acquaintance, and that the only theory of empirical truth is the correspondence theory of truth which, unlike the idealist coherence theory of truth, distinguishes the knower and the known; in short, if one espouses an empiricist epistemology it would not take much to realise that there is little option but to be a sceptic with regard to knowledge of that sort which is claimed to be founded on a solid and indisputable basis of experimental evidence obtained through value- and theory-neutral observation unaffected by particular ways of looking at the world. Now, relativism may presume scepticism but may also be characterised independently of it. For example, a relativist outlook may be maintained with regard to the outcome of the scientist's work as largely affected by himself: in terms, say, of his interests, values, aims, etc. ; and these, in turn, may be affected

by the situation in which the inquirer finds himself: the kind of social world in which he lives, the sorts of problems his community faces, some dominant and generally accepted way of looking at the world (a paradigm), etc.

(53) Many points concerning this view and its rivals are referred to in the Appendix to Part II, entry: "Description versus Explanation".

(54) It is not intended to pursue here the recent controversial debates in the philosophy and history of science, often referred to as the Kuhn/Popper antithesis, involving writers such as Popper, Kuhn, Lakatos, Toulmin and Feyerabend. The main purpose of the ensuing, rather oblique reference to this debate is to provide a very brief overview of two apsects that are relevant in the context of this thesis, viz. (i) the view of science as a social activity; and (ii) the relativist/absolutist dilemma. For the principal positions and main arguments of these debates, see (POPPER, 1966/1973: Vol.II); (POPPER, 1970: pp.51-58); (LAKATOS, 1970); (KUHN, 1962/1970); (KUHN, 1963); (KUHN, 1970[b]). For related views see: (FEYERABEND, 1970[b]); (POLANYI, 1950/64); (TOULMIN, 1972). Further, there is a vast amount of periodical literature written by commentators of the main views; as well as excellent works in the social sciences which discuss the implications of these issues for knowledge of the world of man and society -- for instance (DIXON, 1973); (GIDDENS, 1976); (STUDDERT-KENNEDY, 1975); (SMART, 1976). That these discussions have filtered through to the field of urban planning (GALLOWAY and MAHAYNI, 1977)

is hardly surprising since there are no realms of theoretical knowledge and its practical applications that would view these issues as irrelevant to their cognitive and practical activities.

(55) The notion of a "paradigm" has already been introduced in the very first pages of this thesis for it is seen as a very important concept in current discussions of the growth of knowledge in most fields of cognitive as well as practical endeavour. Apart from the context of the Kuhn/Popper controversy regarding the advancement of scientifc research, the concept of "paradigm" may be seen to share common characteristics with other notions developed in a variety of philosophical and cognitive contexts. For instance, Wittgenstein speaks of "language games" with their own linguistic and other rules on the basis of which utterances but also actions acquire meaning (WITTGENSTEIN, 1969: Sect.105): "All testing, all confirmation and disconfirmation of a hypothesis takes place already within a system" which is "the element in which arguments have their life". The influence of this view is evident in Winch's writings in the philosophy of the social sciences, where it is argued that (WINCH, 1958/ 1963: p.15): "Our idea of what belongs to the realm of reality is given for us in the language that we use ... there is no way of getting outside the concepts in terms of which we think of the world"; and (ibid.: p.126): "...logical relations between propositions themselves depend on social relations between men". The American pragmatists, notably William James and Charles Peirce, spoke of"multiple realities" and of"sign systems". Thus, James viewed cognitive activity as

being occupied with a rich mixture of topics and subjective interests that have nothing to do directly with "cognizing the actual". Rather, it is usually the case that the scientist is engaging in selection from "alternative possible actuals" some one of these and cognizing that as the ideal (JAMES, 1920: p. 46) being guided by his "luxuriant foliage of ideal interests -- aesthetic, philosophic, theologic, and the rest -- which co-exist along with that of survival ..." (ibid.: p.29). Moreover, Peirce argued that claims to knowledge are legitimated not by their origins, but by the norms and rules of inquiry itself. These norms and rules form a sign system that is itself subject to the feedback of experience -- not experience in the narrow sense, but experience in life, in the confrontation of situations that have become problematic or paradoxical. Thus, every claim to knowledge has meaning only in terms of a system of signs that is open to further interpretation and has consequences that are to be publicly tested and confirmed (PEIRCE, 1931-1958: Vol.V). For Peirce "signs are socially standardised ways in which one thing (a thought, world, gesture, or object as sign) refers us (a community) to something else (the intepretant, the significant effect or translation of the sign, being itself another sign). Thus, signs presuppose minds in communication with other minds, which in turn presupposes a community (of interpreters) and a system of communication" (THAYER, 1968: p.83); also (PEIRCE, 1931-1958: Vol.V, pp.311 f.; 484). Thus, in Peirce's view "all language, signification, and consequently all inquiry and its end product, knowledge, are essentially social in character. The very meaning of our concepts depends on the role that they play in a social context of rules and norms" (BERNSTEIN, 1971:

p. 176). For the contemporary philosopher W.v.O.Quine, who has been influenced by the pragmatists (QUINE, 1960:p.24): "Where it makes sense to apply 'true' is to a sentence couched in the terms of a given theory and seen from within this theory, complete with its posited reality". His view, indicating inspiration from the work of B.L. Whorf (1897-1941) in linguistics, that there are or can be different languages which are not translatable into each other and which supply those who speak them with quite different pictures of the world, is akin to other so-called perspectivist theses maintaining that there are alternative systems of beliefs, assumptions, rules, and concepts in terms of which the world may be interpreted. These systems are seen as not equivalent to one another; and making a selection between them is not possible on the basis of universal criteria external to those systems. The well known Sapir-Whorf hypothesis (see chs.four and five) has given rise to theories of "linguistic relativity"; it maintains that the individual's total experience, including perception, ways of thinking, view of the world, is moulded by his language. Thus (SAPIR, 1966: p.9) : "every experience is saturated with verbalism". Languages exist within social communities of speakers; hence the worlds in which different societies live are distinct worlds. For Whorf, "language structures" are related to the way individuals look at the world (WHORF, 1967: p.214): "We are thus introduced to a new principle of relativity, which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar or can in some way be calibrated". Thus, investigators are themselves culture- or context-bound

and prevented by their own linguistic framework from entering that of another culture, society, or even cognitive field.

The notion of "multiple realities" also appears in the writings of those who pursue the phenomenological approach or method in their endeavour to establish an essential basis for knowledge of experience that would be free from all unjustified presuppositions (cf. Appendix to Part II, entry: "The phenomenological method"). Especially in connection with the writings of Alfred Schutz (1899-1959) in the philosophy of the social sciences, "multiple realities" refer to different provinces of meaning which cohere and co-exist in the overall meaning-structure of an individual's world of consciousness, but also in society (SCHUTZ, 1972). The various realities or provinces of meaning differ according to the nature of the "bracketing" (the phenomenological "epoché" or temporary suspension of belief in existence) performed. Among the many spheres of reality, the paramount reality is that of everyday life (SCHUTZ, 1967[b]); (BERGER, and LUCKMANN, 1966: p.35). The reality of everyday life is apprehended in a normal self-evident way -- so-called the "natural attitude" -- which suspends doubts about the world: it is taken for granted as reality. In contrast, the province of scientific thought, being another reality, examines such doubts about the world, but suspends subjectivity, pragmatic interests of the thinker, and his own bodily existence. The transition from one reality to another is experienced as a "leap" or "schock". This is a "radical modification in the tension of our consciousness, founded in a different 'attention à la vie' " (SCHUTZ, 1967[a]). Moving from the reality of everyday life to, say, the world of play

(e.g. the theatre) "is marked by the rising and falling of the curtain" (BERGER, and LUCKMANN, 1966: p.39). In contemporary Continental Neo-Marxist and Structuralist views, the emergence of the notion of a "problematic"("la problématique") is significant in the context of relativist accounts of knowing associated with the Kuhnian "paradigm model" of science. Thus, in Louis Althusser's reading of Marx (ALTHUSSER, 1969) the "problematic" is a central idea, and refers to the system of fundamental related concepts which fit together to form the conceptual framework of a particular science. The kinds of questions that are investigated within a discipline seem to determine such a "problematic" as much as the sorts of questions that are omitted. Individual terms, or problems, acquire meaning only when they are located within some "problematic". The same term is said to have a different meaning if embedded in a different "problematic". The similarities between the concept of a "problematic" and that of a "paradigm" as expounded by Kuhn should be obvious -- though there are also important differences to be found (KEAT and URRY, 1975: pp.132-133). The notion of a "problematic" (in its Althusserian sense) has been employed in the field of planning by Hasan Ozbekhan to refer to the situation in that field "which has begun to display characteristics that are found in large, integrated, inter- and intra-active, complex, dynamic systems. These are systems with which we have great difficulty in dealing because we do not yet understand their overall behaviour. Nor have we yet developed adequate tools or conceptual approaches with which to deal with them, to penetrate them. Furthermore we are at a loss to ascribe a meaning to the nature of their totality. This is because accustomed

as we are to cope with distinct categories and relatively small and isolated systems, we have never developed an "ethic" that would render large systems meaningful" (OZBEKHAN, 1970: pp.235-236). Thus, it appears that the "problematic" of urban planning within which questions can be meaningfully asked is constituted by a systems view of cities. There is no room in Ozbekhan's account for a different "problematic" or outlook.

(56) Apart from those notions that were seen to be akin to the Kuhnian conception of a "paradigm" (cf.footnote (55), this chapter) though developed within different philosophical traditions, it might be interesting to note certain similarities that may be said to exist between Kuhn's account and some findings in the field of cognitive psychology. Research carried out by psychologists of differing orientations -- from supporters of Gestalt-psychology to structuralists such as Piaget -- seems to indicate that the individual begins to perceive the world by means of some organising conceptual schemata. Such schemata possess a very rough reflex-like character in the newly born child. Apparently, the analogy between these schemata and the scientists' philosophical presuppositions, as they are guided by some paradigm, seems rather improbable. However, their function is similar to that of the scientists' presuppositions and consists in categorisation of the large amounts of information received by individuals over time, viz. in selection and organisation of information (MADSEN, 1970: p.15). The Kuhnian "paradigm model" of science is also said to lie in the so-called "structuralist" tradition -- not necessarily in the sense that this term applies to Continental philosophers and social thinkers

like Althusser, Lévi-Strauss, Lacan, etc. -- which opposes positivism (KROHN, 1977: p.70): "Structuralist writers do not see science as proceeding only from a series of observable items, or from isolated bits of experience, to a specific series of concepts and hypotheses, but in perspective-giving wholes, sets of beliefs, "Gestalten", or paradigms, or even world views".

(57) A relativist approach (cf. this chapter, footnote (52), above) implies that the particular conceptual and theoretical systems associated with a scientific paradigm are treated as locally sovereign. It contrasts with the so-called absolutist view which maintains that certain abstract, ideal, universal standards exist and are or ought to be imposed on all scientific milieux alike. Those who espouse a relativist view of knowing would obviously face difficulties in defending their own approach as the most rational or the one to be preferred for they would be accused of absolutism. Popper and Lakatos (see references in footnote (54), this chapter, and the main text, below) argue that there exist universal criteria by which scientific theories can be compared and assessed -- though they understand such criteria differently. Referring to themselves as "demarcationists", they lay down statute laws for rational critical appraisal of the results of scientific inquiries. In opposition to such views, Kuhn, Toulmin and Polanyi (see references in footnote (54), this chapter) argue that science can only be judged by"case-law": only the members of a specific scientific community are competent to answer particular questions encountered in scientific practice within that community. Their positions, though not exactly

similar, are referred to as "sociologism" (LAKATOS, 1970). The question whether there may be some medium position between these two extremes has been investigated in some length in (TOULMIN, 1972). Feyerabend carries relativist arguments to an extreme point by claiming that all methodological doctrines and principles are false, and substituting for them an attitude of anarchism in scientific research (FEYERABEND, 1975); (see main text, below).

(58) The close relation of Lakatos' notion of "scientific research programmes" with the Kuhnian "paradigm model" of science is explicitly recognised by Kuhn in (BUCK and COHEN, 1972: p.138).

(59) The notion of a "scientific research programme" is not a very precise one -- though it is not certain that it was originally intended to be a precise one.

(60) In some views, questions of belief should be completely separate from questions of knowledge. Though it does not seem possible to provide unshakeable arguments against this view, it is not difficult to see that such a view makes theories of knowledge appear dogmatic and arbitrary. It is accepted here that theories of belief suggest theories of knowledge though they do not logically imply them.

(61) Cf. footnote (55), this chapter.

(62) Cf. chapter four, above.

(63) Many differences in belief and way of looking at the world that are said to obtain between paradigms (or cultures) -- the so-called incommensurability of paradigms -- may be reconciled if it is accepted that differences in knowledge and circumstances can be taken to account for both actual and expected consequences of making some particular ontological and/or epistemological assumptions or engaging in some particular action .

FOOTNOTES TO CHAPTER NINE

(1) These diferentiations within naturalist and antinaturalist views are discussed in Appendix to Part II, entry: "Naturalism (in the social sciences)". Naturalists are frequently referred to as "positivists" in relevant social science literature, but this is a serious mistake for positivism is a set of philosophical doctrines encompassing specific epistemological and ontological theses reflecting only one possible view of science and its "method". Antinaturalists are sometimes referred to as "humanists"; and this usage is not unambiguous. For there are naturalists (say, pragmatists) who would be labelled humanists too. Moreover, the variety of positions within the anti-naturalist "camp" is great: Wittgensteinians, phenomenologists, existentialists, critical theorists, all attempt to formulate their own ways of grasping meaningful action. Some anti-naturalist positions are also called "historicist" because of their conception of the world of man and society as unique in its manifestations, hence subject to historical study, and not repetitive and invariant as the world of nature where phenomena can be compared and empirical laws can be discovered. Historicist arguments are examined and strongly attacked in Popper's classic and influential study (POPPER, 1957/1961). A useful account of such arguments can be found in(PARSONS, 1949: Chs. 13; 16-19) in the context of attempting to comparate different societies. Historicists generally discount the possibility of inter-cultural or inter-societal comparisons for they take cultures and societies to be fundamentally different from one another and to be very much the product of their age: of historical and cultural conditions obtaining at the time. Others might

agree that societies are unique but still attempt to find some way of comparing them -- as do Parsons and his disciples. Interesting "historicist" accounts are (CASSIRER, 1950); (CASSIRER, 1953); (COLLINGWOOD, 1956).

(2) The term refers to the Continental, especially German philosophy of the "Geisteswissenschaften" (or "human studies") which are to be distinguished from the "Naturwissenschaften" (or"natural sciences", or simply "sciences") in terms of either subject matter and hence methods used in its study (Wilhelm Dilthey) or just methods of study (Heinrich Rickert). Introduced by Dilthey (1833-1911) in the middle of the nineteenth century, the term "Geisteswissenschaften" attempts to render into German John Stuart Mill's phrase "the moral sciences". It may apply to disciplines such as history, economics, social anthropology, sociology, etc.; and, more recently, to criminology, semantics, and communication theory (RICKMAN, 1967: p.275). Hermeneutics and the philosophical tradition of the "Geisteswissenschaften" were developed within the broad framework of philosophical <u>idealism</u>. Now idealism is a term employed to refer to a very wide spectrum of views about the nature of reality; and to the extent that there are different conceptions of the nature of reality within the idealist tradition, the term is rather ambiguous. However, among the widely divergent types of idealist philosophical doctrines there is a common thesis which may be said to be the fundamental tenet of idealism as against its opposite doctrine, commonly called <u>materialism</u> (that is,the view that everything in the world is to be accounted for in terms

of material causes or events). Stated very roughly, the principal idealist thesis is that both ideas and ideals are, in last analysis, fundamental for philosophical construction and not, as materialism holds, derivative and only of secondary significance. Associated with idealist doctrines are claims to the effect that material things or external realities cannot exist independently of mind (a claim, incidentally, which is rejected by realist philosophers); that the world is basically mental rather than physical; that the most important element in the nature of reality is mind or spirit (LACEY, 1976: pp. 86-87). The main idealist philosophers of the first half of the nineteenth century, Fichte, Schelling, and Hegel, known as "absolute idealists", were all influenced by Kant. However from among a number of the latter's ideas which they criticised, they rejected his theory of knowledge, especially his conception of "unknowable things-in-themselves". For Kant ("Critique of pure reason"), the origin and nature of man's mental image of the physical world is both empirical and rational; it is founded on both <u>experience</u> and <u>reason;</u> this may be seen as an attempt to reconcile into one theory of knowledge elements of the empiricist and rationalist epistemologies (BENTON, 1977: p.101). On this account, sensual perceptions are received from the "phenomenal" world (or the "world of appearances") and are then organised and structured into a coherenrt whole by means of <u>reason</u>; and the latter contains <u>a priori</u>, before any encounter with concrete factual impressions, principles of order which make sense of the vast amounts of information received through the sensory channels. Thus, it is argued that knowledge <u>begins</u> with

experience -- though it does not follow from this that knowledge arises from experience, as purported in the empiricist epistemology -- but is also a product of man's thinking faculties. However, the world of experience, the "phenomenal world", is a world of "appearances": there is no way of determining whether man's mental apparatus -- the "forms" of perception, i.e. space and time, and the categories of the understanding, such as cause, substance, attribute, etc. -- is applicable to anything beyond the world of experience. The real objects that may exist beyond the "world of appearances", viz. the "things-in-themselves" or "noumena", are unknowable although their existence is thinkable (STARK, 1958/1967: p. 105); (BENTON, 1977: pp.101-104). The idealists' rejection of the concept of the "thing-in-itself" thus leaves room only for minds and objects of experience. It is contended that "reality can be known to be ultimately spiritual although spirit can only realise itself in relation to an objective material element and this is the reason for the existence for the latter" (URMSON, 1960: p.191). Thus, for the idealist object implies subject, but subject also implies object; though subject is seen as ultimately prior.

(3) In this aspect of the "methodological debate" in the social sciences, the main issue is the contrast between the so-called "objective" (scientific, "naturalist") and "subjective" (cultural, "anti-naturalist") viewpoints in the study of human conduct and social life. The debate is claimed to originate in the irreconcilable theses of certain positivist and Neo-Kantian philosophers, on the one side, and the romantic,

intuition-oriented Heidelberg school (also known as the Baden school or the South German school of Neo-Kantian philosophy), on the other side (LICHTHEIM, 1970: pp.1-10). The group of philosophical movements which emerged in various German academic centres (e.g. Marburg, Göttingen, Heidelberg) from around 1870 to 1920 has come to be known as the Neo-Kantian philosophers. This name tends to impute an unjustified sense of unity to a number of movements which never became a well-coordinated school. These movements developed as a reaction to the absolute idealist philosophies of Fichte, Schelling, and Hegel, and shared little else apart from "a strong reaction against irrationalism and speculative naturalism and a conviction that philosophy could be a 'science' only if it returned to the method and spirit of Kant" (BECK, 1967[a]: p.468). They also were hostile to the developing positivist philosophy, although some Neo-Kantian philosophers reconciled their initial hostility towards positivism by making substantial concessions to that philosophy (BENTON, 1977: p.112). Neo-Kantianism brought a revival of the critical concern with epistemological problems of the sciences at the expense of metaphysical explorations characteristic of earlier philosophical work. Thus, the emphasis and limits of the sciences laid the ground for an understanding of the problems of scientific inquiries and provided the foundations for a real philosophy of science instead of speculative philosophies of nature (BECK, 1967[b]: p.304). Contributions to the epistemology of the "exact" or physical sciences were also made by philosophers in the positivist tradition which was becoming increasingly influential. This concern

of both Neo-Kantians and positivists with the methods of the natural sciences revived interest in the already existing problem of the proper and peculiar methods of the human and cultural studies (or "Geisteswissenschaften"). The resulting extensive discussions and literature on the nature of historical knowledge and appropriate methods for cultural, historical, and human studies emerged as a reaction to attempts by certain Neo-Kantians and positivists to introduce generalisations and systematic social analyses into historical and socio-cultural studies following the methods of the natural sciences. The fundamental distinction in terms of contrasting categories and methods between the natural sciences ("Naturwissenshcaften") and the human studies ("Geisteswissenschaften") was most strongly advocated by the Heidelberg Neo-Kantians, Windelband (1848-1915) and Rickert (1863-1936), as well as by Georg Simmel (1858-1918) and Wilhelm Dilthey (1833-1911). The latter is seen in the Anglosaxon world as the most influential thinker on these issues -- though there is no general agreement on this (POSTAN, 1971: p.11). He is also regarded as the originator of the term "Geisteswissenschaften", but is not usually characterised as a Neo-Kantian. These scholars gave consideration to the particularising logic and forms of understanding of historical and cultural studies as contrasted with the generalising , law-giving logic of the physical sciences. They contended that cultural and social events are unique groupings of value and a space-time setting and their study necessitates particularising methods which are capable of picturing the unique individual, based not on perception

but on interpretative understanding ("verstehen") (Dilthey, Rickert). The very influential work of Max Weber (1864-1921) on methodology in the social sciences may be taken as an intermediate position between (a) the Heidelberg Neo-Kantians who stressed methodological rather than subject-matter differences between natural and social sciences; and (b) the Dilthey/Simmel theses, claiming that methodological differences were essentially imposed by the nature of their subject-matter (BECK, 1967[a]: p.473); (RICKMAN, 1967: p.277). The tradition which views social-cultural studies as fundamentally different from the natural sciences is occasionally labelled as "humanist" because it attributes peculiar characteristics to human beings and their social relationships (BENTON, 1977: p.12).

(4) Cf. Appendix to Part II, entry: "Positivism and Logical Positivism". For a realist critique of positivist views, see ibid., entry: "Realism"; and for accounts of explanation, cf. ibid., entry: "Description versus explanation".

(5) Cf. Appendix to Part II, entry: "Operationalism".

(6) For a brief account of behaviourism as a philosophical doctrine, and as a doctrine (social behaviourism) which entails a particular approach to the study of human conduct and social phenomena, see Appendix to Part II, entry: "The mind/Body Problem".

(7) Chomsky's views and some of the criticisms that have been made

against them are referred to in the Appendix to Part I. See , also, Appendix to Part II, entry: "Empiricism".

(8) It might be said that these neo-realist formulations, apart from their agreement on a range of basic epistemological issues, have in common some version of the following argument. That if it is accepted that an adequate philosophical account of the natural sciences must also include some conception of "understanding" in terms of grasping what unobservable processes, structures, and mechanisms underlie observed phenomena, then it might be possible to relate the peculiarly humanistic concept of "verstehen" with a non-positivist account of "scientific method".

(9) Cf. Appendix to Part II, entries: "Analytic and synthetic statements"; "Empiricism"; "Positivism and Logical Positivism". See also footnote (6), above.

(10) In Chapters four and five. It may be useful to classify such issues into those concerning the nature of the subject-matter of the social sciences and how similar it is to that of the natural sciences, and into those which arise out of purely methodological questions. However, the view of theory-method interdependence that was defended above prevents such an approach (cf. chapters four and five).

(11) Max Weber and Alfred Schütz attempt to formulate a "verstehen" approach to social enquiry, and subject its results to empirical testing for acceptance or rejection. In this sense, they may be

said that they are concerned with reconciling a scientific method of assessing statements with a humanistic, interpretative approach. Aspects of their work have already been reviewed in Chapter five.

(12) Cf. footnote (1), above.

(13) The epistemological and methodological issues arising from the use of models in scientific inquiry are investigated in Part II.

(14) This claim originates from both the theoretical tradition of structural-functionalism in social sciences such as sociology or social anthropology,and the so-called General System Theory. The former applies the organismic analogy to the social system which is taken to be composed of parts that survive within an environment. It is an equilibrium theory purporting that the maintenance of order (equilibrium) in the social system (organism) depends upon action stemming from the system as an entity in itself, like evolution; and is beyond the control of the individual. General System Theory concentrates on the processes of organisation of all types of phenomena. It postulates the existence of systems as wholes composed of the dynamic relationships of parts and with holistic properties over and above those of their constituent parts. It claims that all phenomena may be so characterised. A systems view of the city need not entail acceptance of structural-functional theories for systems may be conceived which are not functional in that sense (MARCHAL,1975: pp.448-468). However, a functionalist perspective is naturally extensible to aspects of social/spatial organisation.

(15) Cf. Appendix to Part II, entry: "Description versus explanation" for an account of the view that accurate description of observable phenomena amounts to their explanation.

(16) The alleged symmetry in logical form between explanation and prediction advanced by positivist philosophers has been briefly discussed, in the context of the main theses of that school, in the Appendix to Part II, entry: "Positivism and Logical Positivism". Differences between prediction and explanation, with special reference to the social sciences (which are termed "inexact" together with some physical sciences such as the branches of physics dealing with aerodynamics or extreme temperatures), are discussed by (RESCHER, 1970: Appx. II). Thus, it is argued that (ibid.: p.177): "a satisfactory explanation, though it need not logically rule out alternatives altogether, should as a minimum establish its hypothesis as more credible than its negation. Of a prediction, on the other hand, we need to require only that it establish its hypothesis as more credible than any comparable alternative" (italics in original). Although predictions may be structured in the same strict logical manner as explanations, i.e. supported by clearly articulated, plausible arguments, they need not be so constructed.

(17) Statistical laws in the social sciences are not the same as so-called "historical laws" or "quasi-laws" in terms of the uncertainty of their conclusions (HELMER and RESCHER 1959). The latter kind of "laws" are taken as restricted generalisations

that are genuinely lawful statements which admit exceptions: they are spatio-temporally restricted. Restrictions of application may be imposed in terms of particular cultures, technology systems, time periods, particular locations, specific groups of individuals, etc. Moreover, "quasi-laws" are said to be "loose" in the sense that, being conditional statements, the nature of such conditions is such that they often cannot be specified (RESCHER, 1970: pp.169-171). The difference between a statistical and a quasi-law is said to be that the former (ibid.: p.176): "asserts the presence of a characteristic in a certain .... percentage of cases; a quasi-law asserts it in all cases for which an exceptional status (in an ill-defined but clearly understood sense) cannot be claimed" -- though either kind of law gives rise to the same schema of explanation. As regards statistical laws, these are taken to be analogous to deductive laws. For (HEMPEL, 1965: pp.417-418): "(they) assign to the explanandum event described by the explanandum statement the logical probability called for by the logical relation between the explanans and the explanandum statements". Thus, statistical laws can be applied to specific circumstances in order to infer, with a high degree of probability, the occurrence of some phenomenon; and explanations employing such laws are characterised by a high degree of deductive applicability. Hence prediction is possible not only with strictly deductive but also with statistical explanations (ibid.: pp.407-410). Connections between statistical and deductive explanations are also asserted by (NAGEL, 1961: p.520). In general, naturalists like Hempel and Nagel take statistical laws to be valid when deductive laws are not

available due to the lack of sufficient evidence. Such laws tend to become increasingly dependable with increases in knowledge and so acquire ideally the status of strictly deductive laws. One implication of this view is that the notion of "absolute chance", viz. the idea that there may be phenomena in the world of nature or of man and society (even in quantum theory) which are not subject to any determining conditions whatsoever, is rejected (NAGEL, 1961: pp.325-335); (HEMPEL, 1965: pp.259-265). This indicates that the use of statistical laws in the social sciences is accepted not because of the nature of the subject matter of those sciences -- e.g. social phenomena may be inherently unpredictable, or inherently incapable of being studied scientifically -- but simply because the knowledge which has so far accumulated is not sufficient. If scientific research into social life is carried out over a sufficiently long time period it will be possible to recognise the deterministic systems related to those laws.

(18) A distinction which assumes importance in the context of the social sciences is the one between laws and trends. The difficulties involved in identifying and establishing social laws and the relative ease of the noting of trends renders the latter strong candidates as foundations of predictions of social phenomena. The non-repetitive character of many such phenomena is said to preclude their explanation through subsumption under some general laws, according to the deductive account of explanation (cf. Appendix to Part II, entry: "Description versus explanation"). Popper provides an admirable discussion of laws and trends in the social

sciences (POPPER, 1957/1961: Sect.27). He sees "trends" as "useful statistical devices" but "radically different" from laws (ibid. : pp.115-116). Scientific predictions can be based on laws but cannot be founded "merely on the existence of trends" for the latter may change more or less abruptly, even though they may have persisted for long periods of time (ibid.).

(19) A critical account of many important issues raised by anti-naturalist arguments contesting the possibility of predicting social phenomena is to be found in (GIBSON, 1968: pp.259-373). Long-term predictions in the social sciences are further criticised by Popper in his classic work (POPPER, 1957/1961: Sect.11).

(20) On this issue of instrumentalism versus realism, see Part II, chapter fourteen, and Appendix to Part II, entry: "Description versus explanation".

(21) For a brief account of conventionalism, see chapter five, footnote (70); also Appendix to Part II, entry: "Description versus explanation".

(22) See chapter four, section 6.

(23) Issues relating to prediction were discussed in some length and were allocated a separate section in this chapter even though they fall within section 3 dealing with epistemological questions of the "methodological debate". This was dictated by the importance of prediction in spatial analysis and planning and the need to explore more fully certain problems within the context of social science.

(24) Cf. Appendix to Part II, entry: "Description versus explanation", for a brief account of various kinds of scientific explanation and the conceptions of science associated with them. There exists a long tradition among social theorists to view societies as organisms and to consider that their characteristic elements, such as institutions, habits, attitudes, perform functions analogous to those performed by the organs of an organism in the process of maintaining its health and securing its survival. This tradition of functionalism (RYAN, 1973: p.11) has been related to an issue which appears ubiquitous in most discussions of the scientific status of social science, and relates to the problems of explaining and predicting social phenomena in terms of motives and purposes of the actors involved in these phenomena. This is known as the "teleological argument"; it has been with the philosophers for many centuries. Functionalists have tended to disclaim purposive and causal connections and have sugested that explanation by final causes merely involves the belief that there are connections between social phenomena (RYAN, 1973: p.11). As far as the "teleological argument" is concerned, recent developments of cybernetics and systems engineering have indicated ways of taking account of the purposeful behaviour of certain categories of systems in attempts to explain such behaviour (ACKOFF and EMERY, 1972). There exists no way in which to answer the question of how similar to a self-regulating system a society is, although there are instances of such kinds of regulation in social phenomena (RYAN, 1973: p.12).

(25) Hempel strongly criticises functionalist approaches to the study of social phenomena which focus on the articulation of elements

in systems and on the relations among those elements and between those and the system in which they are structured. Taking functional analysis as aiming at determining that component elements of a system (biological, social, psychological) are necessary for its survival, he points out that such analysis fails to explain why any particular element in the system, rather than one of its alternative functional equivalents, should be necessary to its maintenance. In his view, functional analysis has little scientific use beyond the study of the conditions under which a self-regulating system, when disturbed, will return to its former state (HEMPEL, 1966: pp.297-330).

(26) Individualism in the sense of a methodological doctrine in the social sciences stipulates that large-scale social events and conditions should be treated as mere aggregates or configurations of the actions, attitudes, relations, and circumstances of the individual actors participating in them. As a prescription for explanation, methodological individualism rejects those explanations that are not couched wholly in terms of data about individuals (LUKES, 1977: p.180). Thus, explanations of social phenomena employing collective or holistic concepts, such as "social system", or macro-laws essentially pertaining to some whole or "system" rather than to individual "parts" or elements "making up" that whole are rejected by those who view methodological individualism as the most appropriate methodological rule in explanations of social phenomena. Individualism correlates with mechanism (WATKINS, 1953: pp.723-743); and as a methodological corollary of philosophical nominalism (cf. Appendix to Part II, entry: "Realism", discussion of "Universals") (POPPER, 1957/1962: p.132)

it is often but not always associated with issues which go beyond questions about methods of inquiry of social phenomena into the areas of metaphysics, ethics, epistemology; and into subjects such as religion, politics, and economics (LUKES, 1973: Part 2); (DRAY, 1967: p.53). In political economy, methodological individualism is associated with the liberal individualist tradition of Western democratic societies (BRODBECK, 1958: pp. 1-22), where connections with the "laissez-faire" principle of the market and with utilitarianism may be identified. Jeremy Bentham's (1748-1832) view that "no one is able to judge what you need better than yourself" has been criticised by contemporary writers on issues of social policy who argue that an individual is not always the best judge of his needs and interests (RESCHER, 1972). The ideals of individual autonomy and total freedom of choice which are seen as "core values" of individualism are said to be attainable by way of adhering to some of the individualist doctrines. Some writers even take such ideals as social consequences of the principle of methodolocical individualism (HAYEK, 1952); (POPPER, 1957/1962). In the area of planning of societal affairs, individualism is taken to entail a view of planning and regulation of social arrangements which favours gradual, piecemeal, incremental adjustments and readjustments of the existing situation in response to practical social problems. The proponents of this view are suspicious towards grand "utopian" or holistic visions of some "best" society towards the realisation of which planned courses of action should be conceived and implemented.

(27) See chapter four, section 2; chapter five, sections 2,3,4, and 6.

(28) The expression "social action" refers to human action seen in its social context. It requires that one or more of the following conditions be satisfied: (i) the individual actor's situation includes other actors whose presence is accounted for in the performance of the action; (ii) the other actors that are present in the situation of an individual's action are taken as capable of influencing that individual's conduct; and (iii) there are certain value assumptions, beliefs, expectations that are shared between the individual actor and those other agents who are present in his situation and potentially influence the actor's conduct (COHEN, 1968/1975: p.95).

(29) This should be obvious for the fact that the servant, employee, subject, etc. adheres to certain norms of conduct towards the master, employer, ruler need not imply that he values these norms and that he will not seek to alter them should the opportunity arise (COHEN, 1968/1975: pp.77-78).

(30) Cf. footnote (17), chapter ten, for a fuller account of this view. See also chapter three for some views on the pragmatists' theory of value.

(31) In Max Weber's terminology, "Wertbeziehung" (WEBER, 1949: pp. 149-152). The question whether there can be a value-free and ethically neutral (and objective) science of society, developed on the model of the natural sciences, which deals with the value-charged behaviour of human individuals as social agents

has been of central concern to Weber (ARON, 1967: p.193). See above, chapter five, footnote (30).

(32) These issues are discussed at length in chapters one, three, four and five.

(33) This involves the same kind of distinction as between knowledge (or meaning) and truth; cf. chapter ten, footnote (39).

(34) See chapter four, sections 2 and 6. Questions of objectivity in scientific theorising are discussed in chapter eight.

(35) Cf. chapter four, section 6; chapter eight, section 3.

(36) See chapter ten, footnote (39).

(37) See chapter four, sections2 and 6; chapter five, sections 1,2, 3, 4, and 6.

(38) The various antipositivist/naturalist and antipositivist/ antinaturalist critiques of positivistic naturalism are examples of this state of affairs; cf. Appendix to Part II, entry: "Naturalism (in the social sciences)".

(39) See chapter five, section 6: especially pp.390-395.

(40) See chapter one,section 3.

FOOTNOTES TO CHAPTER TEN

(1) Instances of this abound in European universities where urban planning is traditionally associated with architecture and the arts; and in the United States where some "Ivy League" universities still organise their planning departments within the established schools of Fine Arts (e.g. the University of Pennsylvania).

(2) See chapter six, above.

(3) The wide diversity of application of the term "planning" in many, often unrelated contexts tends to complicate the task of identifying either the level of theoretical discourse or the level of practical activity of planning in any serious attempt to delimit its context (PROST, 1976).

(4) There are, of course, statutory requirements which lay down rules concerning what is expected of planners as end results of their deliberations. However, these are aspects of planning as an institutionalised process and instrument of government rather than exploratory analysis of epistemological and methodological issues of relating knowledge to action. These latter cannot be settled by statute, but rather by agreement within the planning community.

(5) These distinctions are based on (SMELSER, 1968: pp.4-7).

(6) This second perspective would be compatible with Continental structuralist approaches, Marxian social theory, and the view of science advanced by neo-realist philosophers such as R.Harré (cf. Appendix to Part II, entry: "Realism"; see also main text, chapter eleven, section 5.4).

(7) See chapter one, section 3; chapter 4, section 6; chapter eight, section 3.

(8) See chapter one, section 3; chapter eight, section 3.

(9) The knowledge/action continuum which characterises planning has been discussed above; cf. chapter four, section 4.

(10) These issues are raised by Marxist thinkers in urban sociology and planning; cf. (CASTELLS, 1977); (PICKVANCE, 1976: ch.1).

(11) Detaching views from some particular theoretical framework within which they gained their expression -- in this case, Marxian social theory -- may be subject to the risks of conceptual distortion due to reasons of incommensurability of perspectives mentioned earlier (cf. footnote (7), this chapter). However, in this particular case, the approach may be justified in consideration of arguments (to be presented below) about the social nature of the subject matter of planning and of its "methods of inquiry". Lest the author be accused of doctrinaire rejection of the Marxian perspective on social theorising (including the level of the city), it should be made clear that the hitherto oblique references to such approaches are not to be interpreted as composing a critique of Marxian views since such views are not examined at all in this thesis. This could be a shortcoming for a dissertation of this nature, but restrictions of time presented insurmountable obstacles. It is, however, the intention of the author to pursue this direction of research

and explore its potential contributions to planning theory, as well as the many points at which it is likely to break down. There is much that is of value in the perspective of social theory advanced by the historical materialism of the early Marx. But there is also much philosophical and epistemological naiveté in these and later writings, and ambiguities and inconsistencies that only a systematic reading and critique could bring to the fore. The vulgar Marxism that has been based on Engels' dialectical materialism -- the latter being a formulation which Marx himself would probably denounce -- is especially vulnerable to philosophically informed critical appraisals.

(12) As was argued above (chapter five, section 6), all knowledge is socially produced and is guided by cognitive interests, say, in prediction and control. However, in the case of planning such interests are much more pronounced and explicit for planning is by definition reasoned action or choice. The intimate linkages between knowledge and action render any attempt at separating these components a schematic reconstruction rather than a valid account of what is the case.

(13) This "institutional" category need not be identified with Searle's "institutional facts" referred to in chapter five, section 6, above -- though there are affinities between these conceptions.

(14) These ideas are introduced and discussed at lenght in chapter five, sections 5 and 6.

(15) See especially chapter five; also chapters four and nine.

(16) Some of these theoretical approaches have already been discussed in chapter two.

(17) Obviously, this formulation by (BOLAN, 1974) does not allow for any interpretative activity and categories of meaning such as those that were mentioned in chapters five and nine. In one view, "value" may be seen as the particular meaning that consciousness has ascribed to some appearance of reality. Thus, reality and consciousness are connected by means of value. The contrast between "objectivist" and "subjectivist" interpretations of the meaning of "value" has acquired importance in traditional axiology or "theory of values". However, it may be possible to sidestep the objective/subjective dichotomy by taking "value", in general, as the reification of the intentionality of consciousness. In this way, value is adapted to the structure of the real from which it derives its validity. The terms "reification" and "intentionality" are employed in the technical sense in which they are explicated in chapters four (sect.2; footnote (9)) and five (sect.3, footnote (29)), respectively.

(18) This process and some of its implications for planned society have been discussed in chapters two and three.

(19) This view that is advanced by (BOLAN, 1974) on the requisite knowledge of behavioural categories of the people affected by plans is characteristic of a stimulus/response approach to the study of human behaviour which is formulated in behaviourism.

It seeks empirical knowledge of behavioural responses to planned changes, the latter acting as stimuli. Behaviourism is strongly criticised as the natural embodiment of a positivist epistemology in the systematic and scientific study of human and social life. The ways in which this doctrine reduces all meaning categories of social action to publicly and intersubjectively observable physical movements and speech, and the impoverished nature of the results from inquiries following this principle, are discussed in chapters four and, especially, nine; also in Appendix to Part II, entry: "The Mind/Body Problem".

(20) Cf. chapters four and nine; see also Appendix to Part II, entry: "Naturalism (in the social sciences)".

(21) Cf. Appendix to Part II, entry: "The Mind/Body Problem", for an account of physicalist views and some of their implications for social theorising and planning.

(22) Issues relating to the goals, objectives, and scope of scientific inquiry have been examined in chapter six.

(23) The distinction between nomothetic and idiographic disciplines was introduced in the neo-Kantian climate of the "methodological debate" in the social sciences in the late nineteenth century. The conditions that gave rise to that debate -- incidentally, an ongoing one to date -- and the various positions that are put forward in its context are discussed in some detail in chapter nine.

(24) This was discussed in chapter five, sections 5 and 6.

(25) The dialectical mode or "dialogue model" of inquiry is discussed extensively in chapter five, sections 5 and especially 6. Its many affinities with the model of scientific inquiry put forward by many contemporary philosophers of science is also noted (sect.6).

(26) The scheme presented below is based on (HARRIS, 1967: p.325) and on the author's notes taken during a series of lectures delivered by Prof. Britton Harris at the Department of City and Regional Planning of The University of Pennsylvania. These lectures were part of course C.P. 621, May-June 1972, entitled "Planning Analysis Models". The discussion of the scheme is based on these notes and on the author's paper "Urban structure models in spatial analysis" delivered on 3rd and 10th March 1975 in the context of a course on "Applied Planning Techniques" offered by the Department of Urban Design and Regional Planning of the University of Edinburgh (Mimeo).

(27) A brief account of pragmatists' views on aspects of social policy has been given in chapter one, section 2, where it was noted that there are strong influences of pragmatist social thought on the school of so-called "new humanists" in urban planning. Pragmatism as "instrumentalism" is also discussed in Appendix to Part II, entry: "Instrumentalism".

(28) The inconsistency that may be noticed between the resolution of a problem as the end result of inquiry and the requirement that inquiry be a continuous, never-ending process is characteristic of this conception of planning as a "process of inquiry". Cf. (SCHEFFLER, 1974: chapter 7).

(29) There are two main reasons which seem to justify the amount of space devoted to discussing aspects of the social thought of pragmatist philosophers -- in this and other parts of the thesis (chapter one, setcion 2; chapter three, section 5; chapter four, section 1). The first is that there is a recent revival of pragmatist ideas, hitherto regarded as defunct, in the realm of social policy with which urban planning exhibits close affinities. The second reason is that many of the pragmatist ideas, which are rooted in Hegelian historicism, have found their way in contemporary formulations of the "newer" philosophy of science with its emphasis on history, perspectivism, the social nature of knowledge, the importance of the "community of scientists", the relativity of knowledge, the importance of ideological and cultural elements in science, etc.

(30) This is of course, the division between <u>realism</u> and <u>instrumentalism</u> which is discussed in several chapters of the thesis. In its most philosophically informed presentation the debate appears in the last chapter of Part II, in relation to models; and in the Appendix to Part II, entry: "Description versus explanation". See also, ibid.: "Realism", "Instrumentalism". These distinctions are hinted at in chapters one, two, and six.

(31) This is a realist view of science in the general sense in which it contrasts with idealism. Very roughly, it postulates that things in the world can exist independently of men's conceptions of them, and that theories about these can be made to correspond to them thus providing an objective, and uniquely true account of them.

(32) This view roughly corresponds to the version of realism advanced by Rom Harré -- so-called neo-realism. This philosophical position is discussed at length in Part II, chapter eleven, and in Appendix to Part II, entries: "Realism"; "Description versus explanation".

(33) The hypothetico-deductive account of scientific theories is discussed in chapter eleven, section 2. It is referred to as the "standard sketch" or the "received view" of theories.

(34) This conception of "formal model" is explicated in chapter twelve, section 6. It is closely associated with the Logical Empiricist account of science.

(35) Scientific explanation is discussed in the Appendix to Part II, entry: "Description versus explanation".

(36) See chapter four, section 6; chapter five, section 7; and chapter eight.

(37) Although prediction is the main role ascribed to models of social/spatial phenomena in the context of the planning process, it is not the only function that they are capable of performing. However, the other potential applications of models are more or less connected with their function as instruments of forecasting and prediction. Apart from any understanding of the behaviour or of the mechanisms that causally generate such behaviour of some object or system of interest, models can provide forecasts of future levels of spatial activities. They can also provide

the vehicle for normative/optimising analysis by positing some goal-state and identifying the steps necessary to attain it. They can be employed as devices for development control and monitoring. Necessary policy adjustments are revealed by comparing actual developments in the"object" of planning with predicted ones. By monitoring the mismatches, planning proposals may be appropriately modified to fit the new state of affairs. Thus, the models operate as "learning mechanisms" (though this is a different conception of "learning" to that of the "new humanists" as was argued above, for the latter conceive of "learning" as a mutually educative activity involving both the planners and the planned). Models might also be employed in their capacity of educating devices since they offer integrative frameworks of social/spatial relationships which are shown explicitly and often expressed quantitatively. They can also be employed in an exploratory way and so assist planners and decision makers in the process of their familiarisation with future possibilities given a range of hypotheses regarding values, norms and preferences, or states of affairs in the city. There are also cases in which models are used as simply representational devices and this requirement dictates the mode of their construction as physical analogues of some real objects or systems. Thus a scale model of, say, a housing estate or redevelopment scheme showing the distribution of buildings, open spaces, roads, etc., as well as existing or rearranged physiographic features of the terrain is usually employed as a visual illustration of some state of affairs rather than as a predictive or theory-extending device. Such pictorial representations are essentially different from the sentential models that are of use in planning in

accomplishing forecasting and systematising tasks. The latter consist of sets of propositions which are logically connected with one another. These propositions may or may not be taken to reflect the empirical data within some domain of inquiry -- though they would have to be consistent with a number of other propositions and data in some very basic way. The propositions in the models refer to facts which are regarded similar to those in some particular domain of interest. The above distinctions in certain uses of models and the corresponding types of models are more fully discussed in chapters twelve and thirteen (Part II).

(38) See also chapter three, sect.3, and ibid., footnote (19).

(39) These distinctions are drawn in greater detail in chapter three. It is important to make clear that the conception of scientific knowledge as ideologically charged need not entail the view that science is a wholly subjective enterprise or that there can be no such thing as "objectivity" or intersubjectively validated claims to knowledge in science (this is briefly stated on p.257, above, and in chapter eight). The point is well made in (BLOOR, 1976: p.37): "The general idea of truth should never be confused with the standards that are used in any particular context to judge whether a particular claim is to be accepted as true. This would be merely to assume that the mere notion of truth can act as a substantial criterion of truth". The meaning and the truth of a proposition are two different things. Men decide by convention what it means for a proposition to be true; its truth depends on the state of affairs known as reality.

The fact that the canons and procedures for assessing claims to knowledge are conventionally agreed upon by some community of scientists and are therefore subject to the influence of systems of beliefs and ideologies does not imply that it is up to the individual scientist -- i.e. a matter of subjective preference -- to decide whether some proposition is true. The statement: "There is a new redevelopment scheme in the High Street" may depend for its meaning on human conventions and other theories but, given its meaning, the truth of the statement is not decided or agreed upon. Rather, it involves going to the High Street and taking a look.

(40) Cf. chapter two, section 2.

(41) The philosophical presuppositions of this view are sketched in the Appendix to Part II, entry: "The Mind/Body Problem".

(42) See chapter two, sub-section (D); see also Appendix to Part II, entry: "Positivism and Logical Positivism".

(43) The objectives of this thesis could be said to point towards this direction, though they are not as ambitious as may be inferred from the main text.

(44) Characterisation of "policy science" and distinction between "strong" and "weak" programmes is undertaken in chapter five, footnote (57).

(45) Goal formulation seen in the context of a technological approach to urban problem solving is discussed in chapter five, footnote (53).

These issues are also dealt with briefly in chapter three.

(46) Brief accounts and discussion of applications of multivariate statistical techniques in spatial analysis, with ample bibliography, are given in the author's lecture notes to students of the Dept. of Urban Design and Regional Planning, Edinburgh University. These are based on lectures given in the framework of a course on "Planning Techniques" organised by the Planning Research Unit of that Department, in 1974-1975.

(47) For instance it is argued that contrary to some views, particular statistical techniques promote or are especially compatible with specific general assumptions regarding the nature of evidence and the ways in which the researcher relates to it. In one view, factor analysis fosters an approach which is analogous to Baconian inductivism and early formulationsof "scientific method" in which nature (i.e. the facts) dictates the explanation (HOPE, 1967: p.78).

(48) The origins of the distinction between theory and "practice", traced to Kantian philosophy, and the views of the pragmatists and Critical Theorists on this important issue are discussed in chapter five, footnote (49). Reference to that note will help identify the important distinction between the pragmatists' integration of means and ends in the "process of inquiry" and the Critical Theorists' view of the dialectical relationship between the planners and the planned. Wherever the term "practice" (enclosed in double quotation marks) appears in the text it is used in the sense of referring to activity involving

"practical reason", as in Aristotle's usage, to denote the realm of politics, and ethics and moral philosophy. However, quotation marks may have been omitted in cases in which the denotation becomes obvious from the context (e.g. in chapter five, sections 5, 6). In all other cases, practice denotes application or actual performance (as in Webster's "New Collegiate Dictionary", 1975 edn.).

(49) There is an additional consideration for the planner flowing from this distinction. The planner who is inquiring and inquisitive into moral and political implications of his work and adopts the role of a social critic of some existing state of affairs may well find that his employment prospects are prejudiced if interests vested in the 'status quo' are threatened. The planner who eschews such questions and implicitly accepts the empirical givens is protected in this respect. It would be tempting to suggest also that formally excluding value and ethical questions from planning studies -- even though such questions cannot be <u>actually</u> separated from "purely" technical considerations of means -- helps to shield the planner from exposure to moral questioning by others, and to moral self-criticism.

FOOTNOTES TO CHAPTER ELEVEN

(1) Cf. Appendix to Part II, entries:"The Mind/Body Problem"; "Naturalism"; "Description versus explanation".

(2) Cf.Appendix to Part II, entry: "Naturalism".

(3) Cf. Appendix to Part II, entries: "Linguistic Philosophy"; "The phenomenological method".

(4) Cf. Part I.

(5) Cf. Appendix to Part II, entry: "Description versus explanation".

(6) This scheme was introduced in (HARRIS, 1967); cf. chapter ten.

(7) Cf. Appendix to Part II, entries: "Positivism"; "Instrumentalism".

(8) Cf. Part I.

(9) However, most hypothetico-deductive theorists would accept this.

(10) The earliest precise formulation of this account is given in (CARNAP, 1939). Later versions are found in (NAGEL, 1961), (BRAITHWAITE, 1953), (PAP, 1962), and (CAWS, 1965).

(11) A basic assumption of this scheme is that a general distinction can be drawn between two types of terms which occur in scientific theories: observational terms and theoretical terms. The former refer to observable objects, properties, relations, and events, and can be understood independently of theories (e.g. terms like "pressure", "sulfuric acid", "red"). The latter refer to

theoretical terms which are not observables and can only be understood in the context of the theories in which they occur (e.g. terms like "neutron", "magnetic field"). The debate concerning theoretical and observational terms has been referred to in Part I, chapters two, six, seven and eight.

(12) Cf. Appendix to Part II, entry: "Pure axiomatic systems or calculi", for a more detailed exposition of the structure of a logical calculus.

(13) Cf. Appendix to Part II, entry: "Interpretation of a calculus".

(14) Cf. Appendix to Part II, entry: "Scientific laws".

(15) Cf. Appendix to Part II, entry: "Interpretation of a calculus", for an example of "model".

(16) Popper's account has been referred to in Part I, in the context of the Kuhn/Popper debate on the process of advancement of scientific knowledge (cf. chapter eight).

(17) A discussion of the analytic/synthetic dichotomy, in the context of Logical Positivism, is provided in Appendix to Part II, entry: "Analytic and synthetic statements".

(18) This is discussed in Appendix to Part II, entries: "Positivism and Logical Positivism"; "Realism".

(19) Cf. Appendix to Part II, entry: "Realism".

(20) The doctrine of Operationalism is briefly discussed in Appendix to Part II, q.v.

(21) Further, Nagel notes that there seems to be no simple schema which adequately represents all the ways in which theoretical notions are related to observational procedures (ibid., p.94); and that the form of correspondence rules shows great diversity (ibid., p.101).

(22) Instrumentalism is briefly discussed in the Appendix to Part II.

(23) For a more detailed discussion of these issues, cf. Appendix to Part II, entries: "Positivism","Instrumentalism", and "Realism".

(24) It is argued that adoption of the view that correspondence rules are synthetic statements implies the discarding of the distinction between theoretical and observational terms (RYAN, 1970: pp.88-89); (FEYERABEND, 1964: pp.280-308).

(25) See Part I; further, cf. Appendix to Part II, entry: "Operationalism".

(26) As a matter of fact, Bhaskar's statement is made in a different, but not unrelated, context. Very roughly, opposing classical Empiricism (and Logical Positivism), Bhaskar offers an alternative philosophical position which he refers to as "Transcendental Realism" (BHASKAR, 1975). One of the fundamental tenets of Empiricism is that whatever is known by experience could have been otherwise. The history of the world, in the eyes of an empiricist, is the story of a series of states in which there happen to be patterns (regularities; constant conjunctions of events). Nothing must be as it is,

the analysis of law-like statements; that is, that element over and above the(presumed) constant conjunction that explains our ascriptions of necessity; .... The usual response to this challenge consists in the attempt to locate the surplus-element in the statement's 'explanation', and more particularly in the 'theory' which explains it" (ibid., p.149). "But can'theory' do what experience and deducibility fail to do, i.e. provide a rational ground for our ascriptions of natural necessity? The answer clearly depends upon the extent to which the former contains components irreducible to the latter ..... In short, unless theory contains elements irreducible to experience and truth-functional operations on it there is no basis for a non-Humean theory of natural necessity" (ibid., p.152). He then goes on to make the statement referred to in the main text, above.

(27) This term is used here to make possible the distinction between concepts, on which the refining operations of various scientific disciplines are carried out to develop their technical terminology, and constructs, which result from that process and are deliberately formulated for specific objectives, unaffected by ambiguity and vagueness, and appropriate for precisely expressing the behaviour of precisely specified perceptual objects and events and their interrelations. This is not a widely accepted use, hence the above qualification is thought necessary. In particular, use of the term "construct" should not be interpreted as endorsement of the view that the objects referred to by theories are logical constructions out of sense-data (CAWS, 1965: p.51).

no event must have any particular cause, no state must be followed by any other state. Logic or reasoning alone cannot reveal which of infinitely many possible worlds we live in, nor which of infinitely many possible continuations from the present state will, in fact, occur. There is, therefore, no room for the idea that causal laws are in any sense necessities in nature; they only express constant conjunctions of events. Bhaskar endeavours to refute this crucial empiricist fundamental which is based on Hume's theory of causal laws. He argues that phenomena in nature are produced by mechanisms; and these phenomena combine to generate the actual flux of phenomena of the world. These mechanisms endure and act quite independently of men. The statements that describe their operations, which may be termed "laws", are not statements about events. Rather they are statements about the forms of activity of the things in the world, and about the ways things would act in a world without men, where there would be no experiences and few, if any, constant conjunctions of events (ibid., p.17). Laws are interpreted as designating the activity of generative mechanisms and structures independently of any particular sequence or pattern of events. But once this is done, there is an ontological basis for a concept of natural necessity, that is necessity in nature quite independent of men or human activity (ibid., p.14). The following passages are quoted in order to provide an accurate perspective of his arguments with respect to the issue of theories containing elements irreducible to experience. "The radical empiricist challenge to philosophers then is to provide an alternative account of the "surplus-element" in

(28) The subject of scientific explanation has not received any explicit consideration, and it is intended to discuss it only implicitly in the context of examining certain concepts that are instrumental in it. Scientific explanation encompasses a complex of complex issues, the critical examination of which lies beyond the scope of this dissertation and would require a thesis by itself to do the subject justice. Excellent essays on the nature and logic of scientific explanation have been produced by: (HEMPEL and OPPENHEIM, 1948/1953), which is the classic account of the deductive or covering law schema of scientific explanation; (BRAITHWAITE, 1953); (HEMPEL, 1965); (RESCHER, 1970). Problems of explanation in a socio-spatial context are investigated in (HARVEY, 1969). The statement made in the main text above, to the effect that explanation is the act of rendering the unfamiliar in familiar terms, is a gross approximation to the complexities of the concept of scientific explanation; but it appears to have received the assent of some writers: (HANSON, 1958/1961: p.54); (THEOBALD, 1964: p.261); (BRIDGMAN, 1936: p.63); (HARVEY, 1969: p.11). Further, it has been implied by the followers of Hesse's quest for "metaphorical redescription" of what is to be explained (HESSE, 1963). This statement has been used in this chapter only after giving full recognition to Hempel's criticisms of it (HEMPEL, 1965: pp.257-258); and it is expressly qualified as relating more to the psychology of cognition rather than to scientific explanation proper. In this manner, it serves well the purposes of the intended argument, that is, that the process of acquiring knowledge frequently involves analogical thinking. The deductivists' position on the nature of scientific explanation is well-known;

and requires that a sound scientific explanation subsumes what is to explained under general laws (thus suggesting the characterisation of "nomological explanation")(POPPER, 1959/1972: sect.12); (HEMPEL, 1965: p.329). These authors reject the conception of explanation as reduction of the unfamiliar to the familiar.

(29) For example:(RUSSELL, 1948); (NAGEL, 1961: p.107); (BLACK, 1962: Chs. 3, 13); (ACHINSTEIN, 1972: p.239); etc. Moreover, the epistemological platform of the so-called General System Theory contains a set of general principles one of which is the "postulation of the critical role to be played by analogic models in complex phenomenal domains"(SUTHERLAND, 1973: p.19). Further, Kuhn's view on the important function of analogical relationships between paradigms has already been mentioned in this chapter.

(30) This formulation corresponds to the distinction between formal and empirical knowledge.

(31) The concept of a metaphor has been discussed earlier (chapter one).

(32) Some of the examples cited by Nagel are: (a) Huygen's development of the wave theory of light by means of analogies with the concept of sound as a wave phenomenon; (b) Fourier's theory of heat conduction constructed as an analogy of the known laws of the flow of liquids, etc. (NAGEL, 1961: p.108). A typical analogy which has been successfully employed in science is the one between an atom and a solar system, where

the atom's nucleus is held to be analogous to a sun and the electrons to planets revolving around it in eliptical orbits (ACHINSTEIN, 1968: p.203).

(33) The concept of analogy has been briefly discussed in Appendix to Part II, q.v.

(34) Argument by analogy follows the form: if X and Y have characteristics a,b, and c in common, then they share attribute d, too. This process of reasoning has been criticised by logicians because it may lead to error. Its employment in scientific inquiry may be relevant to the initial admittance of a proposition as a hypothesis to be tested, but not to the justification and acce tance of that hypothesis (HANSON, 1958).

(35) A brief account of "Rationalism" especially in the context of the debate between "Rationalism" and "Empiricism", is given in Appendix to Part II, entry: "Empiricism"; also in Appendix to Part I.

(36) Hempel contends that the conception of explanation as a reduction to the familiar establishes neither a necessary nor a sufficient condition for an <u>acceptable</u> scientific explanation. Reliance on "untestable metaphorical or metaphysical ideas rather than on general empirical hypotheses ..... would not afford even a potential scientific explanation"(HEMPEL, 1965: p.432). Further, he criticises explanations in terms of "similes or metaphors" because they cannot be refuted by empirical tests: ".... since they do not specify what to expect under any empirical conditions,

no empirical test can possibly discredit them. But absolute immunity to disconfirmation is not an asset but a fatal defect when we are concerned, as is scientific research, to arrive at an objectively testable and empirically well-supported body of empirical knowledge" (ibid., p.433).

(37) Works by (CASSIRER, 1953[a]) and (LEVI-STRAUSS, 1966) deal with the role of metaphor in primitive cultures; while metaphor is seen in the general context of the process of thought by (SHIBLES, 1971). Further, works by (BLACK, 1962), (SCHON, 1963/1969), (HESSE, 1963), (HESSE, 1964), (HESSE, 1970), (BROWN, 1976) examine aspects of the function of metaphor in scientific thinking and attempt to advance accounts of the logic of discovery based on metaphors. Moreover, (SWANSON, 1966) discusses the metaphorical content of models as these are used in the development of scientific theories.

(38) The establishment of such a symbolic relation provides a focus for change and a programme for the exploration of change, where change was not thought possible in any concrete sense before. On Schon's account, in the displacement of concepts the old theory is symbolic of the new situation. The nature of the symbolic relation between old and new concepts is explicated as the "intimation of a similarity of relations", that is, a first awareness or "dim perception of a set of shared relations which will become explicit later on" (SCHON, 1963/1969: p.59).

(39) "Analogy" is further discussed in the Appendix to Part II , q.v.

(40) Those writers are supporters of the so-called "majority" position of the nature of models in science, and most of them would be commonly known as "logical positivists". Among them are philosophers like Braithwaite, Brodbeck, Hempel, Nagel,Suppes, etc. These workers tend to agree that between a model and its corresponding theory there exists a <u>formal</u> similarity in that the theory and its model(s) share the same formal calculus; or that the theory and its model(s) are different interpretations of the same calculus. Thus, a theory and its model are said to be isomorphic (share the same structure); and this relationship is taken to be both a necessary and a sufficient condition for something to be considered a model for a theory (RUSE, 1973: pp.63-80). This explication of the concept of "formal model" should be seen in relation to the hypothetico-deductive account of scientific theories introduced earlier. Formal models are discussed more fully below.

(41) For example, in (NAGEL, 1961: p.111), and (HESSE, 1961:p.22).

(42) Refer to footnote (40) above.

(43) The origin of the debate dates back to the old controversy between the positivist and realist interpretations of scientific theories (q.v. in Appendix to Part II; also ibid., entry: "Description versus Explanation"). Philosophical controversy over the use of models in science has some roots in an ancient philosophical problem: the problem of <u>Universals</u>. Models in science are always <u>models of something</u>, and the relationship between the model and that which is modelled always involves

similarity. The problem of Universals, in this sense, is the problem of accounting for assertions of similarity. The question concerning the ontological status of descriptive properties of things (i.e. Universals) has received various answers; they are discussed briefly in the Appendix to Part II, entry: "Realism".

(44) Supporters of this view would be characterised by a strong logical empiricist orientation, and would include writers such as (CARNAP, 1942: Sect.33); (CARNAP, 1956: pp.38-76); (HEMPEL, 1965: pp.433-447); (BRAITHWAITE, 1953: chs.3, 4); (ACKERMANN, 1965: pp.312-326).

(45) Cited in (NAGEL, 1961: pp.114-115).

(46) The main issues were introduced in (CAMPBELL, 1920) and have been subsequently discussed in (HUTTEN, 1954: pp.284-301), (HESSE, 1963: pp.8-62), (BLACK, 1962: ch.13), (ACHINSTEIN, 1968: chs. 7, 8); (HARRE, 1961: ch.3), (HARRE, 1970: chs. 1, 2, 3), (BHASKAR, 1975: ch3, sect.2), and others. Early reference to these issues can be found in (WHEWELL, 1837/1967: Bk.I), where the term "idea" is employed in the role which contemporary thinkers assign to models.

(47) The issue here is whether a theory <u>explains</u> by analogy, or is <u>understood</u> by analogy, or both.

(48) Campbell's arguments about the essential function of models in scientific theorising have been extended and developed by writers such as (HUTTEN, 1954), (HESSE, 1963),

(FEYERABEND, 1965: pp.173 ff), and (HARRE, 1970),who contend that models are necessary not only as heuristic devices, but also for the growth and development of a theory; and particularly, for the generation of facts empirically relevant for the theory but which would not have been forthcoming without the models. However, several criticisms have been levelled against that view; and alternative accounts have been offered, most notably by Braithwaite (BRAITHWAITE, 1953: chs. 1-4), (BRAITHWAITE, 1962: pp.224-231). Hesse identifies three distinct problems in these discussions (HESSE, 1967^{b}: 357). Very roughly, these are: (i) The issue of the predictivity of theories. Predictions derived by using models offer no guarantee of truth because they are based on analogical reasoning. However, it is purported that argument by analogy has some force (at least inductive) and may be preferable to other approaches employed in the derivation of predictions from theory. (ii) The issue of the meaning of theoretical concepts (already referred to in the discussion of the theoretical/observational dichotomy of Logical Positivists). The "black box" view of theories reflects the extreme approach in this context (no interpretation of theoretical terms is required), with Braithwaite's contextualism appearing as a less extreme alternative (theoretical terms acquire meaning derived from the empirical context to which they relate); with the resulting demise of models as indispensable in theories. (iii) The issue of the realist view of models (to be discussed below).

(49) A brief account of the philosophical thesis of Realism in the specific terms in which it has been formulated by Rom Harré, an Oxford philosopher, is given in the Appendix to Part II, entry: "Realism". This version of Realism is also referred to as "neo-realism" by its proponent (HARRE, 1976: p.17).

(50) Cf. Appendix to Part II, entry: "Empiricism".

(51) This is not to dispute the fact that some, but not all, models may be used in situations where deliberate simplification and/or distortion is intended; and thus it may not be possible to identify them with the theory which they imperfectly represent.

(52) The empiricist reply to this argument is that models may be said to have real referents to the extent that the predictions which issue from them, and their ascriptions of meaning to theoretical entities, conform with empirical evidence(thus, adhering to the equation real=empirical).

(53) A distinction is drawn between "imagined" and "imaginary". The former refers to entities which may come to be known as real; the latter denotes entities that are by definition constructions of the imagination and cannot be real.

(54) Existential statements (e.g. "there are electrons"; "there are social processes") prompt their appropriate questions (e.g. "are there electrons?"; "are there social processes?"). In relation to the use of models in theory building, existential statements "assert, deny, or temporise about the existence

of a real mechanism, identical whith or like the .... model which is used to devise a hypothetical mechanism" (HARRE, 1970: pp. 55-56).

(55) It is stressed that the term "mechanism" is not employed with the intention to denote anything specifically mechanical. Some mechanisms happen to be mechanical (e.g. a clockwork) but others are not (e.g. the mechanism of a chemical reaction; the mechanism of star creation) (HARRE, 1970: p.36).

(56) These ideas are developed by Harré within a broader philosophical framework in which he endeavours to refute certain fundamental claims of positivist thinking. He covers a very broad spectrum of issues in his essay (HARRE, 1970), of which only two are mentioned, very roughly, below. His thesis that enduring, semi-permanent structures are an important feature of the world, together with"the flux of events", is developed as a counter-argument to the empiricist and positivist tenet that events are the prime objects of knowledge. Further, he opposes the principle that the only "vehicles of rational thought" are sentences and propositions. He contends that there are several kinds of vehicles for thought, and most important among these are: <u>linguistic</u> (sentences used to make statements are external and public manifestations of thought); and <u>pictorial</u> (pictures, models, diagrams). Mental life is seen to be founded on a complex of vehicles for thought, one typical public manifestation of which is the so-called "<u>statement-picture"complex.</u> This consists of a working drawing (or some verbal description of it) depicting some structure, and a statement (or some flow chart),

of how that structure will react to certain stimuli. Although both pictures can be described and the content of propositions can be expressed diagrammatically, these are notational accidents. The essential difference in meaning and role between pictures and statements remains unaltered. Moreover, the way sentences function in the making of sentences cannot be fully understood in isolation from the statement-picture complex to which they belong. Scientific knowledge consists of knowledge of the structures of which the world consists, and knowledge of how these structures can change. Structure is presented diagrammatically (by pictures and models), and the possibilities of change are presented sententially, as conditional statements. It is emphasised that consideration of conditional statements alone, without the structural "picture" from which they have been abstracted, leads to the characteristic "event" view of the world of the empiricists. For it is just the successive states of things, rather than the things themselves, that conditions describe (HARRE, 1970: pp.12-13). The preceding remarks bear upon the relation between model and theory, as this was referred to in the main text above; and on the essential role of models in scientific activity, as it is argued from a realist viewpoint.

(57) Two different kinds of modelling relation are said to be present in science. In one, the sentences in a model are linked by some relation of correspondence to another set of sentences (a sentential model). In the other, a relation obtains between the subject matters of each set of sentences; this concerns matters such as real likeness and difference (an iconic model) (HARRE, 1976: pp.18-19).

(58) The following discussion is a brief outline of the neo-realist conception of the dynamics of science. The issues are highly complex and technical and there are many criticisms of this position. However, this should be seen as a review rather than a critical assessment of the realist account; hence it should be adjudged as to how well it performs its reportorial task and not as to whether the substantive content of the views it attempts to describe is plausible, inadequate, or plainly false.

(59) Cf. Appendix to Part II, entry: "Description versus explanation".

(60) Harré gives two limiting cases of this process. In one, the scientist investigating the behaviour of a material in chemistry tries to explain it by referring to the chemical composition and stereostructure of the material. In this case both behaviour and nature of the material are subject to empirical investigation. In another case, e.g. Freudian psychology, a system of concepts is invoked to describe the nature of a person. However, it is implied that it is not possible to subject to independent empirical scrutiny the ascribed nature.

(61) An example from actual scientific practice is invoked by Harré to illustrate his schema of the dynamic structure, the <u>intellectual process</u> of scientific discovery. The case is drawn from biology and refers to the "Mendelian pattern of characters" inherited from generation to generation. Mendel proposed the genetic factor or "gene" as the basis of a mechanism which produced the pattern of characters. The mechanism of inheritance was unknown at the time;

Mendel's proposal was an analogue for the unknown mechanism. But it was adequate as an explanation: analogues of the observed patterns could be deduced from it. It was also plausible as a mechanism for it did not contradict established ideas in biology. His hypothesis took a hundred years to establish as a fact about organisms but in the end genes were established as existent entities and as causally productive of the observed patterns. His model of the genetic factor or "gene" suggested that investigation should be carried out in the nuclei of cells by employing techniques of molecular biology (HARRE, 1976: pp.21; 23).

(62) The Appendix to Part II contains brief outlines of positivist and realist views regarding certain issues concerning the subject of the function and cognitive status of models in scientific inquiries.

FOOTNOTES TO CHAPTERS TWELVE, THIRTEEN, AND FOURTEEN

(1) No less than twelve usages of the noun "model" are distinguished in "Webster's New Collegiate Dictionary" (WOOLF, 1975: p.379), most widespread among which are: (i) a miniature representation of something (a scale model of a building); also, a pattern of something to be made; (ii) an example to be imitated ("he is a 'model' of a man"); (iii) a person or thing that poses or serves as a pattern for an artist ("some say that god Hermes himself was the model for Praxitelis ' homonymous sculpture"); (iv) an archetype or prototype: the original pattern of which all things of the same type are representations or copies ("the Napoleonic Code has served as model to a number of legal systems in Europe"); (v) a person engaged in displaying merchandise (e.g. clothes); a manequin; (vi) a type or design of clothing or other product ("several new models were introduced during this year's Paris Motor Show"); (vii) a description or analogy used to help visualise something that cannot be directly observed or that is inaccessible for experimentation (e.g. an atom, the solar system); (viii) a system of postulates, data, and inferences presented as a mathematical description of an entity or state of affairs (e.g. mathematical models depicting the transportation system of a city). The synonyms that are given for "model", that is, example, pattern, exemplar, ideal, archetype, all possess the shared meaning element of idealisation and representation.

(2) Quoted in (SUPPES, 1960: p.287). The broad concept of a "possible realisation" of a class of sentences suggests, roughly speaking, an entity of the appropriate set-theoretical structure (SUPPES, 1962: p.252).

(3) Model theory is the theory of semantical models, or the semantics of pure mathematics. It deals with the properties of mathematical structures, or systems of mathematical structures, which are given by sets of axioms formulated frequently (but not necessarily) in the lower predicate calculus. It has become, especially after the 1950's, the most advanced branch of semantics, and remains practically limited to logic and mathematics (BELL and SLOMSON, 1969); (ROBINSON, 1962: pp.60-79); (STACHOWIAK, 1972: pp.145-166); (BUNGE, 1972: p.239).

(4) The first users of models in the formal sciences, at least in terms of the concept if not of the word, are said to be E. Beltrami and F. Klein (mathematics) who were carrying out research in connection with the non-Euclidean geometries of the 1870's; they were followed by Frege and Russell who employed models in mathematical logic (CHAO, 1962: p.558).

(5) Hesse in fact regards this characterisation "entirely inadequate for the logician's purposes", but sufficient to indicate the significant respects in which the sense of logical model of formal science differs from other senses of "model" encountered in empirical science.

(6) This is especially so in connection with the notion of "formal model" which has been introduced earlier and is discussed below.

(7) The point about essential differences between the notion of logical model in formal science and the concept of model as it is employed in empirical science is strongly disputed by Suppes

who claims that the concept of logical model "is the fundamental one for the empirical sciences as well as mathematics" (SUPPES, 1962: p.252). He argues that"the difference to be found in these disciplines is to be found in their use of the concept. In drawing this comparison between constancy of meaning and difference of use, the sometimes difficult semantical question of how one is to explain the meaning of a concept without referring to its uses does not actually arise". Given various technical meanings of the concept of model, associated with well-defined contexts, "mathematicians ask a certain kind of question about models and empirical scientists tend to ask another kind of question" (SUPPES, 1960: pp.289-290). However, Bunge contends that there is no coincidence between the concept of semantic or logical model and the concept of model as it is used in empirical science (BUNGE, 1973: p.111). "The semantic concept of model differs from the various other senses of the same word except in the trivial sense that every theoretical model or specific theory of some sector of reality is in turn a model, in the semantic sense, of some abstract theory" BUNGE, 1972: p.239).

(8) The notion of "mapping" is a general one and, broadly, describes the process of movement from one set of entities to another (ABELL, 1971: p.38). It originates in mathematics (BEER, 1967: p.64), where a mapping affords "a geometrical way of viewing a function". An element X in the domain A of function f is <u>mapped</u>, or transformed, by f into the corresponding element y=f (x) in the range B of f. In this way of looking at functions, y is sometimes called the <u>image</u> of x relative to the function f (BISHIR and DREWES, 1970: p.79). A mapping is one of the

mathematical notions that are reduced to more simple ones by way of set theory. For example, Mostowski gives the following characterisation to "the intuitive notion of a mapping, or function, from a set A into a set B, which may or may not be different from A" (MOSTOWSKI, 1972: p.7): a mapping, or function, is "a fixed rule which associates with each element x of A one, and one only, element y of B .... The image of an element x of A under a mapping f from A into B is the element y of B which is associated with x by the mapping f" (ibid.). A precise definition of a mapping can be given in terms of the concept of an ordered pair in set theory; and such a definition eliminates vague notions of the preceding characterisation, namely "fixed rule" and "associate". "A mapping f of A into B is defined as a set of ordered pairs (x,y), with x in A and y in B, such that y is the image of x under f" (ibid.). For example, the process of assigning names to objects is a mapping of a set of objects into a set of names (ABELL, 1971: p.38). In this sense, a language (such as ordinary spoken and written English) is a mapping (WARTOFSKY, 1968: pp.124; 130). Further, the modelling process, that is the representation of some object or system by another system (whether sumbolic or physical), is often viewed as the mapping of the model, element by element, onto the system which it is a model of (BEER, 1967: p.64); much like a geographical map is a model of the terrain it represents (GOODALL, 1972: p.174). If the mapping involves one-to-one transformations, then the model is said to be <u>isomorphic</u> to its"original"; and if it involves many-to-one transformations, it is called <u>homomorphic</u> with respect to the "original" (BEER, 1967: p.64). For relations of isomorphy and

homomorphy in the context of the drawing of analogies, cf. Appendix to Part II, entry: "Analogy".

(9) According to those theories, the world of perception was an embodiment of the "ideal forms" (the forms of things which were the "real" subsisting realm): the world was modelled after these "forms", was a copy of these "forms"; and these "forms" (abstract entities) were the originals (PLATO). Moreover, the world was viewed as essentially number : mathematical structures were thought to underlie the perceptual appearance of things; and the latter was a mapping or model of the former (Pythagoreans). In this view, the "concrete" world of perception and experience becomes itself a representation of "forms" or formal structures rather than being considered as the original of which these forms are abstract models (WARTOFSKY, 1968: p.143).

(10) Scale models and other models which "look like" the system or object they represent are often called "iconic" models in engineering (GORDON, 1969: p.8).

(11) "Structural" here denotes the structural properties of a system: those which would be shared by any other system isomorphic to the one under investigation. These are occasionally, but misleadingly, called the "logical" properties of the system to distinguish them from"descriptive" properties (in accordance with the formal/empirical dichotomy in science). However, the structural properties characterising a system would be matters of fact, empirical questions (KAPLAN, 1964: p.264).

(12) Models of this latter kind are common in, say, psychology. For example, probabilistic models in psychological learning theory refer to a mathematical theory (in this case: probability theory) which contains the axioms of that theory together with some interpretation of all or some of the factual(descriptive or non-logical) constants and variables of the theory into empirical observables. In this sense, such models come close to the notion of logical models. Recognition that the analogy involved in these models is only formal, rather than both formal and material, has led writers such as Black to dispute the presence of causal or explanatory properties in these models. The mathematical theories involved are simply seen as convenient expressions of the empirical data (BLACK, 1962: chs. 3; 13).

(13) The characteristics of theoretical models are based on (ACHINSTEIN, 1968: ch.7). Achinstein's category of "theoretical models" encompasses the sense of "model" which is called semiformal or mathematical model by Hesse which she distinguishes from "theorerical model". Thus, Achinstein considers models of, say, learning behaviour in psychology, and models of economic growth in economics to belong to the class of "theoretical models" (ACHINSTEIN, 1968: p.212).

(14) Achinstein points out that the distinction between the set of properties exhibited by an object or system and its inner structure does not coincide with the distinction between macro- and micro-phenomena, respectively.

(15) It now becomes clear that Achinstein's variety of theoretical models is more extended than Hesse's who considers only the

latter type of model, viz. models formulated on the basis of some analogy with a known system, as a theoretical model.

(16) Any standard introductory textbook on finite mathematics can be referred to for an explication and definition of Markov processes (or chains) and associated concepts. A good elementary account is given in (KEMENY, et al., 1956/1966: ch.IV).

(17) Cf. Appendix to Part II, entry: "Description versus explanation".

(18) Wold's characterisation of"theoretical model" should be read as: "joint formal (or logical)-empirical construct"; for his distinction between "theoretical" and "empirical" knowledge actually corresponds to that of formal (or logical) and empirical knowledge (or science) (WOLD, 1969: p.429).

(19) Early experiments with probabilistic models of residential development, using a Monte-Carlo simulation approach, are documented in (CHAPIN, et al., 1964); (CHAPIN, et al., 1965). Stochastic models of urban development,using Markov processes, have been formulated in (HARRIS, 1965) and (DREWETT,1969). The literature in probabilistic models of migration is quite extensive. The pioneering work of Torsten Hägerstrand in investigating the diffusion of technological innovations, in the context of human geography, has opened up new directions of research into the spatial consequences of social interaction (HAGERSTRAND, 1965), (HAGERSTRAND, 1967); with attempts at a stochastic approach to his conceptualisation of the "mean information field" by (GALE, 1972). Excellent reviews of these and other models are available in (OLSSON, 1965) and

(HARVEY, 1967). The application of Markov processes to migration and mobility has been explored in (GINSBERG, 1971) and critically assessed in (GINSBERG, 1972).

(20) According to (ACHINSTEIN, 1968: ch.8), the supporters of this view generally defend the contemporary positivist view of science, with contributions from writers such as (BRAITHWAITE, 1953); (BRODBECK, 1959); (HEMPEL, 1965); (HUTTEN, 1956); (NAGEL, 1961). Some of the main principles of Positivism are discussed in Appendix to Part II, entry: "Positivism and Logical Positivism".

(21) The notion of "formal model" has been referred to earlier in this Part. It is examined here not as one of the senses of model in empirical science but as a conception of model from a particular point of view of the scientific enterprise, which is claimed to be applicable to all senses of model.

(22) This statement appears to overlook another such systematising effort undertaken by Harré in his "Principles of scientific thinking" (1970), where he expounds his theory of models and analogies in science from a realist point of view. However, Harré's work was not available at the time Achinstein made the above statement.

(23) As stated above, the senses of model that are distinguished by Achinstein have also been followed, in general, in the present discussion. Therefore it is not necessary to refer to these again in the context of this argument.

(24) Achinstein remarks may be too sweping given that Brodbeck explicitly admits that this account of "formal model" is not consistently adhered to by scientists.

(25) Achinstein's critique is based on the discussion provided in (NAGEL, 1961) which is taken to be representative of the claim in (3), above.

(26) By interpretation is meant the assignment of meanings to words or symbols. Cf. Appendix to Part II; entry: "Interpretation of a calculus".

(27) Interpretation (iii) includes (ii), but excludes (i). These are based on: (NAGEL, 1961: pp.90-96) and (BRAITHWAITE, 1962 : p.231) for (i); (NAGEL, 1961) for(ii); and (NAGEL,1961: p.110) for (iii).

(28) For one type of representational model, the so-called analogue model, claim (5) may be plausible. But even in this case, such a strong claim is unwarranted. See above, "Analogical relationships between ideas"; Chapter eleven, sect.5.2, pp.694-703.

(29) The expression "semantical models" is used by Achinstein to refer to "formal models", and <u>not</u> to models in logic and mathematics (i.e. not the model-theoretic sense of model) as is employed throughout this dissertation.

(30) Probabilistic approaches to modelling socio-spatial phenomena are not infrequent in urban planning, geography, or economics. Some relevant works in this direction have been referred to earlier.

(31) Cf. Appendix to Part II, entry: "Variable", for a brief account of kinds of variables in a social/spatial context.

(32) There is a view of science known as "Operationalism" (q.v. in Appendix to Part II) which makes stringent demands on what is to count as a "scientific concept" and requires that each such concept be related to the experimental procedures or operations necessary to establish whether the concept can be applied to scientific research. If the concept is so related with empirical (= observable) referents then it can be said to be meaningful. Those terms which cannot be defined operationally are to be removed from the scientific vocabulary. Adoption of this programme results in a much impoverished science. This was recognised by its originator who proceeded to relax the programme's strict initial demands in order to allow highly theoretical but useful terms to remain in scientific theorising. However, the programme seems to have had a disastrous impact in the social sciences where it is still being adhered to more or less consistently perhaps not as a philosophical doctrine but rather as part of the general methodological apparatus of logical empiricism. Philosophers of science, such as Hilary Putnam, regard this practice of operationalisation and faithful pursuance of "scientific method" in the social sciences as being at least at odds with what is happening in contemporary scientific research, if not wholly misdirected.

(33) For alternative views of theories, cf. Appendix to Part II, entry: "Description versus explanation".

(34) This view which might be referred to as an instrumentalist view of models, opposes the realist account of models according to which at least some models may come to be known as true.

(35) The distinction between "model-structures" and "model-objects" is introduced by Byerly neither as a classification nor as a statement indicating what the models consist of. Rather, it aims to draw attention to the role played by the empirical content of models in scientific theories over and above the mathematical structures of the models (BYERLY, 1969: p.135). On this account, a "model-object" is any sort of object from which a logical-mathematical structure might be abstracted; it will always have non-logical or descriptive or empirical content. In contrast, a "model-structure" is a definitely specifiable schema of mathematical-logical relationships and has no descriptive content. The logical-mathematical structure of the "model-structure" is, in some sense, "carried" in the "model-object" which is a model as an analogue (ibid.).

(36) Considering the uses of models in the applied scientific context of Operational Research, Churchman, et al. note that: " The primary function of a scientific model is explanatory rather than descriptive" (CHURCHMAN, et al., 1957: p.157); and in the context of physics, Hutten states that "Over and above the mere representation, the model explains how something happens" (HUTTEN, 1953: p.285). Further, it is argued that " the acceptance of the model is justified in the first place by the way in which it helps us to explain, represent and predict" (TOULMIN, 1953: p.285).

(37) The argument concerning the "theory-ladenness" of all observation terms is convincingly put forward in (HANSON, 1958: p.61), (FEYERABEND, 1962), (FEYERABEND, 1965).

(38) The "black box" concept has been referred to above (chapter eleven) in the context of the discussion about the operationalist and instrumentalist views of scientific theories (see also q.v. in Appendix to Part II). The concept attempts to convey the image of a system (mechanical, animal, theoretical) which is subjected to investigation. Interest is focused not on the inner workings of the "box" (if such obtain in that system), that is the composition and processes endogenous to the system, but on the global functioning of the system: its empirically manifest behaviour or properties; let it be called output O. The latter can be said to be the outcome of some external (environmental) factor or stimulus; let it be called input I. For each input I_i there corresponds some output O_j ; and a general formula relating the set of input values to the set of output values will represent the <u>behaviour</u> of the system. Now a model which is developed on the basis of these principles would be called a "black box" model of the system of interest. If the model sets out to relate the sets of variables I and O with a set of variables, S, specifying the internal state of the system, then this model may be called a <u>behaviour model</u> of the system. Since the "box" has been assigned internal states relating to endogenous variables it ceases to be "black" and becomes a "grey box"; but it is still not a "translucid box" because it depicts no details of the inner structure of the system (BUNGE, 1973: pp.101-102).

(39) This view of explanation is akin to a realist account of science and may not be accepted by those who reject that philosophy. These issues are discussed at length in the Appendix to Part II, entry: "Description versus explanation".

(40) This would relate to the realist account of explanation; see Appendix to Part II, entry: "Description versus explanation".

(41) T.S. Kuhn's conception of "paradigm" has been discussed in Part I. It is argued (MARTINS, 1974: pp.280-281) that the proliferation of theories and concepts which stress discontinuity in change is one of the marked characteristics of the current intellectual situation. In many domains of discourse, such as in epistemology, the history of science, social and political theory, and in fields of the humanities, expressions like "paradigm shift", "Gestalt switch", "scientific revolution", "displacement of concepts", "system-breaks", etc., have become important elements in the description of change and evolution.

(42) It was thought appropriate to examine some of the main current philosophical connections of scientific activity in the Appendix rather than in the main text so as to avoid rendering this Part of the thesis exceedingly technical in philosophical terms. However, these conclusions should ideally be read in conjunction with the discussion of the positions referred to as "Positivism" "Instrumentalism", and "Realism" in the Appendix to Part II. It should be stressed, as has already been noted in that Appendix, that the positions here labelled as "positivist", "instrumentalist", and "realist" may not exist stated in "pure form". Moreover, they are not necessarily identified with any particular writer, although strong influences of any one writer on a specific conception of science are acknowledged (for example, in the case of realism, the writings of R.Harré have provided the foundation upon which the description of this position is

based). It is not uncommon to find some writers who may follow one position in their methodological endeavours but who expound substantive views influenced by a different conception of science. This state of affairs is rendered more complicated by the fact that some positions tend to merge into each other at the margins. For instance, operationalism and positivism do so in terms already stated in the Appendix to Part II; similarly, positivism and instrumentalism: both reject the realist view of theoretical terms which interprets these as referring to actually existent, even if unobservable, entities. Further the positivist view of scientific theories as providing true explanations of observed phenomena may become difficult to distinguish clearly from the instrumentalist conception of theories as devices for the generation of predictions, because of the positivist thesis on the symmetry between explanation and prediction. Although each position holds a different conception of laws in a deductive-nomological explanation, it is possible either to conflate these positions or slide from the one to the other. As it is unusual to find a writer, in natural or social science, who explicitly pursues a single distinctive conception of science, "scientific method" can only be identified rather indirectly.

(43) Cf. Appendix to Part II, entry: "Positivism and Logical Positivism".

(44) See also Part I.

(45) Other aspects of this contrast may be found in the distinction between the context of discovery and the context of justification

in discussions of the "method of science" -- referred to in Part I, above -- and in the debate arising from the Kuhnian interpretation of the history of science (KUHN, 1962/1970) in terms of successive paradigms and revolutions between which there are few or no rational links or accumulations of truth. The Kuhnian claim that such paradigms and scientific revolutions are irreducibly dependent on their own social culture or on the sub-culture of their own scientific elites (BARNES, 1974), (BLOOR, 1976) is strongly contested by "objectivist" philosophers who express concern for such an influx of "subjectivist" conceptions of scientific inquiry and theories of science. Thus, logical empiricists and realists, as well as other philosophers of "objectivist" persuasion, such as Karl Popper, are united against the interpretative or <u>hermeneutic account of science</u> -- though their views on substantive issues in both philosophy and science differ widely.

(46) Cf. Appendix to Part II, entry: "Realism", for a more detailed discussion of these views expressed by Harré.

(47) Refer to the hypothetico-deductive account of scientific theories at the beginning of Part II, and the entries "Positivism", "Realism", "Description versus explanation", in Appendix to Part II, for the corresponding accounts of scientific theories.

(48) It is recognised that not all theories conform to this conception of causally explanatory theories. For example Harré notes the need to distinguish between two radically different kinds of theory, each playing an indispensable role in science. There are

the so-called "reticular" (or abstractive) theories which do not explain, except in a minimal sense, but connect up sets of facts all of the same kind by formulating laws of the behaviour of a range of observable phenomena (e.g.Newtonian dynamics, or ideal gas laws); rather than referring to underlying mechanisms or structures. Further, there are explanatory theories (which are accounted for by the realist view of scientific theories) which explain in a maximal sense (HARRE, 1964: pp.8-18). This distinction is often raised as a criticism of the realist view of theories which is said to be too restrictive because of its failure to represent "reticular" theories (KEAT and URRY, 1975: pp.40-41).

(49) See Appendix to Part II, entry: "Ideal types".

(50) The notion of "essense" which is employed in the realist account most probably derives from John Locke's thesis that objects have real "essences" which are their underlying structures (e.g. in modern physics,an atomic structure would be such an "essence"). Locke ("An essay concerning human understanding", 1690, bk.3, chs.3-6) regarded such "essences" as distinct from their observable properties. He took the aim of science to be the discovery of these "essences" -- underlying structures and mechanisms -- which could lead to explanations (LACEY, 1976: pp.59-60) For Popper's account of "essentialism", being a variant of the modern neo-realist formulation of Harre's , see Appendix to Part II, entry: "Description versus explanation".

(51) Cf. Appendix to Part II, entry: "Instrumentalism". Very briefly, the instrumentalist account of scientific theories takes these

to be computational devices which generate testable predictions. They are instruments, hence only their utility can be assessed and not their truth or falsity. The knowledge of the real world produced by theories so conceived is restricted to the predictions that can be provided by them. In contrast both positivists and realists regard theories as genuine statements about the world and not mere conventions. They have to be assessed for their truth or falsity, not just for their instrumental power. Pragmatist and conventionalist accounts of theories also tend to fall within this broad instrumentalist attitude. See also entry: "Description versus explanation" in the Appendix to Part II.

(52) An instrumentalist interpretation of models and analogies (and theories) is lucidly expounded in (KAPLAN, 1964: chs. 7,8), where some of the arguments used to support instrumentalism against realism are also discussed. Moreover, Kaplan's analyses are usefully expressed in a broad "behavioural sciences" framework.

(53) This argument is advanced by Popper in his fierce critique of an instrumentalist view science which he regards as obscurantist and as having a retarding effect on the development of scientific knowledge. See entry "Instrumentalism" in the Appendix to Part II.

(54) At this stage Smart makes reference to (SPECTOR, 1965: pp.121-142). The same viewpoint is also expressed in (RYAN, 1970: pp. 88-89).

(55) The author is indebted to Larry Briskman,Dept. of Philosophy, Edinburgh University for raising this point.

(56) These notionshave been referred to above in footnote (38), chapter thirteen.

APPENDIX TO PART I

APPENDIX to Part I.

Empiricist theories of knowledge, though not necessarily in the form of orthodox or classical empiricism of past centuries, are still dominant in contemporary natural and social science. While the role of the human contribution to what was once thought of as the "rock-bottom", unassailable foundations of knowledge -- i.e. facts -- is becoming increasingly recognised (strangely enough, more so in science than in the social sciences), it is generally accepted that scientific theories have to mirror or correspond to the world in some very basic sense. Hence ideas that make claims to knowledge of the world and which are intuited independently of experience are viewed with great suspicion -- if not outrightly rejected. The debate between proponents of the two rival theories of knowledge, empiricism and rationalism, was thought settled in favour of the former -- at least in the Anglo-Saxon world, and excluding the directions followed by German idealists, philosophers of the "Geisteswissenschaften", phenomenologists, and modern existentialists like Heidegger.

However, there has been a recent revival of the debate following fresh "evidence" from the field of linguistics to the effect that "innate" language faculties may be recognised in all human beings. The existence of certain universals in all languages is taken by Noam Chomsky

and his associates to have serious implications for the classical empiricist theory of knowledge and to point towards a rationalist philosophy of language. What follows is a brief, and indeed inadequate, account of some of Chomsky's main points and the criticisms that these have evoked among professional philosophers -- and linguists. It was thought appropriate to refer to this debate for Chomsky draws on his findings in linguistics to make methodological recommendations for the disciplines studying social life and man. His methodological and conceptual critique of behaviourism -- and its extention to sociological investigations as behaviouralism [1] -- is especially sharp and convincing. However, objections to his views mainly concern the nature of his inferences from linguistics and their applicability to human knowledge as a whole.

Starting from the seventeenth century, many philosophical essays have focused on the relationship between the "mind" and the perception of the external world by human beings. Two contrasting theses were put forward by philosophers and were extensively debated in the context of what has been known as the rationalist/empiricist dispute. At its most extreme, the difference between the two doctrines lies in the interpretation of what constitutes the source of human knowledge. Rationalists claim that the "mind" (or "reason", hence the characterisation of the doctrine as "rationalism")[2] is the sole source of human knowledge. Thus, philosophers like Descartes and Leibniz contend that human perception and understanding of the external world rests upon a number of "ideas", that is, upon the knowledge of certain propositions and certain principles of interpretation. These "ideas" are taken as "innate" and are logically independent of experience.

If experience yields only the tentative and corrigible, and if human beings find themselves in the possession of apodictic truths, there must be some other non-experiential and infallible source of knowledge. The rationalists' conviction of irrefutable knowledge of the necessary truth of such principles as universal causation, the three-dimensionality of space, etc., is their main reason for denying the sovereignty of experience (BLACK, 1970: p.457). Empiricist philosophers like Locke, Berkeley, and Hume claim that the relationship between the human "mind" (if there be such a thing, as many empiricists would deny) and the perception of the external world is a matter of passive registration of sense-impressions and their subsequent combination in terms of laws of "association" . The empiricist theory has been very influential in the development of modern philosophical ideas, especially in the movement known as logical positivism (BERGMANN, 1950/1965).

The recent revival of the debate concerning the philosophical positions of rationalism and empiricism has been mainly due to important work carried out by the language theorist Noam Chomsky and his associates. Focusing on the field of linguistics (i.e. the scientific study of language), Chomsky has studied the universal and essential properties of human language. Since it is questionable whether thought is conceivable except as "embedded" in speech or writing, the relationship between language and thought appears to be an important research subject the systematic investigation of which is bound to produce results with profound implications for both the sciences of nature and of man and society. Chomsky contends that the structure of language is determined by the structure of the human mind. He formulates an empirical hypothesis purporting that certain "universals" are present in all human languages (CHOMSKY, 1972: p.40). Thus, he identifies

certain phonological, syntactic, and semantic units that are universal in the sense that they can be defined independently of their occurrence in any particular language; and these elements are called substantive universals of linguistic theory. Further, Chomsky has distinguished formal universals, that is, the general principles which determine the form of grammatical rules and the manner of their operation in the grammars (3) of particular languages (LYONS, 1970: pp.99-100).

The principles(formal operations) underlying the structure of language are so specific and so highly articulated that they must be regarded as being biologically determined, that is, as constituting part of "human nature" and as being genetically transmitted from parents to their children (LYONS, 1970: p.11). The existence of this highly specific language faculty (which is associated with the human "mind" rather than with experience) is claimed to be the only conceivable explanation for the (provisionally accepted) fact that different languages make use of the same formal operations in the construction of grammatical sentences (LYONS, 1970: pp.103-105). In this sense, Chomsky's "rationalist" philosophy of language entails the hypothesis that human beings are genetically endowed with a number of specific faculties (to which one might attribute the name "mind") which play a crucial role in acquiring knowledge and enable man to act as a free agent undetermined -- but not necessarily unaffected -- by external stimuli in the environment (CHOMSKY, 1966); (CHOMSKY, 1968/1972).

Apart from the evidence concerning the presence of certain universals in all languages, Chomsky and his associates offer further evidence to support their assertions about the existence of "innate" language faculties in all human beings. Thus, it is claimed that the ability

of children to derive the structural regularities of their native language (its grammatical rules) from the utterances of their parents and others around them, and then to employ the same regularities in the construction of utterances they have never heard before can only be explained by making the following assumption. Children are assumed to be born with a knowledge of the principles of universal grammar and the predisposition to use these in analysing the utterances that are heard around them (LYONS, 1970: p.11; p.106). Moreover, the difficulty of accounting for this fact upon any "inductive" conception of the learning process (empiricist theories of language learning) is offered as further evidence supporting Chomsky's rationalist position. It is pointed out that the deficiency in the empiricist account of language learning can be overcome by assuming that children have an inborn knowledge of the universal principles governing the structure of human language (BLACK, 1970: p.459); (LYONS,1970: p.106).

Chomsky's rationalism has attracted considerable hostile criticism. While sections of his work which relate directly to linguistics are very highly regarded both by linguists and philosophers of language, his hypothesis concerning the universality of certain formal principles of sentence construction in natural languages and the implications of such a hypothesis for a rationalist philosophy of language are not readily accepted. Thus, Chomsky's critics observe that it is not possible to subject to direct empirical testing his hypothesis about universal formal principles in human languages. It cannot be established, as yet, that languages which violate these universal formal principles cannot be learned or used by human beings; and consequently it cannot be accepted that these formal universals are "innate" to human individuals (LYONS, 1970: pp.111-112). With regard

to Chomsky's philosophical point of view, it is remarked that his position is significantly different in content and intention from such paradigmatic rationalists as Descartes, Leibniz, or Kant (BLACK, 1970: p.457).

In contrast to the classical rationalist position regarding "innate" ideas which originate in the intellect (are intuited with certainty, thus independently of experience) and are necessary for the organisation and mastery of the external world, Chomsky's principles of universal grammar are not known with similar certainty. Because they are assumed to operate at levels that lie below awareness, their formulation is rendered extremely difficult and their recognition as authoritative principles becomes an arduous process. Moreover, the principles of universal grammar are not regarded as necessary in the logical sense, since Chomsky insists upon the existence of many conceivable, but unused, alternatives. Though Chomsky calls himself a "mentalist" he declines any commitment to the classical sharp distinction drawn between "body" and "mind" by, say, Descartes. The traditional rationalist argument that the philosophical functions and operations of the body (unlike the workings of the mind) are subject to the same "mechanical" or"physical" laws as the rest of the material world is absent from Chomsky's rationalism. His position appears to oppose "mechanistic determinism" and seems to be consistent with the view that the "knowledge" and "predispositions" for language, though "innate", require rather definite environmental conditions during the period of "maturation" (LYONS, 1970: p.108; p.113).

Consideration of the important differences between classical rationalism and Chomsky's thesis has led Max Black to argue that Chomsky attempts to contrast "an old-fashioned and unresourceful empiricism" (in general,

Hume's sensationalism) against "an up to date and sophisticated rationalism that Leibniz would disown" (BLACK, 1970: p.458). "Nativism" or rationalism become positions naturally tenable if one's conception of empiricism is extremely poor. However, a more complex construal of aspects of experience will inevitably require substantial evidence to support the claim that such empirical aspects can be located in the organism. The difficulties involved in providing such evidence are recognised by Chomsky himself (BLACK, 1970: p.458). Suggesting an alternative to Chomsky's hypothesis about the existence of "innate" knowledge of the formal principles of language, Lyons contends that it may be a general "faculty" which given the right environmental conditions will interact with these to produce linguistic competence (LYONS, 1970: p.113). He argues that some mental faculties are specific to human beings (although most philosophers and psychologists would refrain from calling these "mental faculties"); and that they are both biologically and environmentally determined (LYONS, 1970: p.114).

The general implications that can be derived from Chomsky's philosophical thesis relate to his conviction that human beings are different from animals or machines and that this difference should be taken into account especially in the sciences of man and society. Considering, in particular, the modern "behavioural sciences" Chomsky believes that it is misleading to claim that they have "achieved a transition from 'speculation' to 'science' " and that it is not difficult to perceive by scanning the relevant literature that these sciences "have commonly insisted upon certain <u>arbitrary methodological restrictions</u> that make it virtually impossible for scientific knowledge of a nontrivial character to be attained" (emphasis added).

He accepts that"rigorous analysis" and "careful experiment" are useful, but sees them currently employed in a way which merely imitates the surface features of the natural sciences and which results in restrictions of subject matter and in concentration on peripheral issues (CHOMSKY, 1968/1972: pp.ix-xi). He claims that there exist few nontrivial empirical hypotheses concerning human behaviour and why human individuals act as they do. He contends that pursuance of investigations into direct relations between experience and action, stimulus and response, is unlikely to yield useful results. The study of human behaviour, he submits, is more fruitfully undertaken if it is based on " at least a tentative formulation of relevant systems of knowledge and belief", and if it subsequently inquires into the means by which these systems are acquired, on the basis of empirical evidence (ibid.: p.ix).

Although Chomsky streses the fact that the study of language may be a rather special case in the general investigation of human behaviour he nonetheless believes that exploration of the structure of language reveals properties of mind that underlie the exercise of human mental capacities in normal activities and can contribute to an understanding of human intelligence (CHOMSKY, 1968/1972: pp.viii-x). Finally, he purports that the investigations of human behaviour exhibit a very primitive character and that the study of man and society can only be called speculative (on the basis of existing results) and should be clearly labelled as such and be distinguished from the achievements of scientific inquiry (ibid.: p.x).

REFERENCES : (BERGMANN,1950/1965); (BLACK, 1970); (CHOMSKY, 1966); (CHOMSKY, 1968/1972); (CHOMSKY, 1972); (LYONS, 1970).

FOOTNOTES (Appendix to Part I)

(1) Cf. Appendix to Part II, entry: "The mind/body problem".

(2) The term "rationalism" is not very precise in philosophical and other discussions; "apriorism" seems to be more appropriate.

(3) According to Chomsky, a grammar is in principle a finite system of rules for generating the strings which constitute a language and also the structural descriptions of these strings.
A complete structural description of a string should specify its phonetic and semantic representation (each in some universal system) as well as the array of syntactic structures that serve to interrelate them (CHOMSKY, 1970: p.462). A grammar can be regarded as a mathematical theory of a class of well-defined empirical phenomena. Grammar is to speech behaviour as, say, Kepler's laws are to planetary motions. Both are theories about the actual world. If both deal with idealisation and abstractions they are equally subject to strict, though indirect, control by empirical facts (BLACK, 1970: p.453).
Thus, a grammar provides a codification of certain facts .
This codification can play a role in the explanation of phenomena (CHOMSKY, 1970: p.464). The grammar (or description) of a language consists of three interrelated parts: (1) syntax accounts for regularities concerning combinations of words (syntactic rules); (2) semantics describes the meaning of words and sentences; and (3) phonology deals with sounds and their permissible combinations (LYONS, 1970: pp.23-24).

APPENDIX TO PART II

APPENDIX to Part II.

Glossary of certain special terms employed in the main text.

This glossary represents an attempt to explicate various technical, usually philosophical, terms that appear in the main text. However, apart from such terms it endeavours to provide summarised accounts of some of the philosophical outlooks referred to in the main thesis. In this undertaking, it lays no claim to generality, thoroughness of presentation, and in-depth analysis. It avoids critical assessment and seeks to present the positions in terms of their charcteristics on which there is common agreement. Evidently, the discussion is biased in favour of the main objectives of this dissertation as stated at the outset. Many of the entries are extensively informed by the corresponding articles in "The Encyclopedia of Philosophy" (ed.Paul Edwards, 1967; the Macmillan Company &the Free Press, N.York) with appropriate referencing and credits.

CONTENTS

(1) Scientific laws.

(2) Deductive and axiomatic systems.

(3) Pure axiomatic systems or calculi.

(4) Theories (received view).

(5) Theoretical and observational terms.

(6) Interpretation of a calculus

(7) Correspondence rules.

(8) Analytic and synthetic statements.

(9) Instrumentalism.
(Including reference to some basic doctrines of pragmatism; it is also discussed in entry (17), this Appendix, "Description versus explanation").

(10) Operationalism (or operationism).
(Doctrine demanding specific operationalisation of all theoretical terms in models and theories; its close links with Logical Positivism and the "verification theory of meaning").

(11) Analogy.
(Conditions that obtain when an analogy is drawn betwen 'X' and 'Y').

(12) Variable (in social scientific research).

(13) Positivism and Logical Positivism

(Main theses of classical positivism and additional demands of Logical Positivism; principal theses of positivist epistemology).

(14 Empiricism ("Apriorism" versus empiricism; main tenets of classical empiricism; causation).

(15) Realism.

(Ancient Greek and medieval antecedents; discussion of universals: nominalism, realism, conceptualism, and corresponding views of scientific laws; similarities and differences between positivism and realism regarding: objectivity, methodology, theory versus observation, scientific theories, models and their role in inquiry, causation and necessity. Questions of describing, explaining, and understanding, and the corresponding views of positivism, realism, and instrumentalism, are investigated in entry (17), this Appendix, "Description versus explanation").

(16) Ideal types.

(17) Description versus explanation.

(What is description; what is explanation; types of explanation: deductive-nomological, inductive-statistical, causal, motivational, teleological, functional; models and analogies in explanation (realist view); pattern explanation; reduction of familiar to unfamiliar; descriptivist account of explanation; descriptivism as phenomenalism and positivism; instrumentalist view of explanation; conventionalism; fictionalism of metaphorical redescription; realist account of explanation; Popper's view of "essentialism").

(18) Naturalism (in the social sciences).

(Naturalistic methodological monism and different methodological programmes; naturalism as not independent of some way of looking at natural science: positivist, conventionalist, realist naturalism; rejection of identification of naturalism with positivism).

(19) Linguistic philosophy.

(Origins; Wittgenstein's two philosophies; "forms of life"; social studies).

(20) The Mind/Body problem.

(Dualist and monist accounts; Descartes and dualist views : interactionism, psychological parallelism, occasionalism, epiphenomenalism; monist views: idealist,materialist; materialist views: physical monism, physicalism, behaviourism (in psychology, philosophy, social sciences, environmental control and planning), identity theory of mind, neutral monism, double aspect theory, dialectical materialism .

(21) The phenomenological method

(Antecendents of modern phenomenology; Husserl's project for a presuppositionless enquiry; opposition with naturalism and empiricism: the data of intuition; conception of man living in his mind: idealism; non-empirical status of phenomenological statements; accurate descriptions of phenomena; methodological circle of phenomenological inquiry; properties of phenomenological statements. Five conditions to be satisfied by any phenomenological statement: (a) they describe"essences"; (b) description is to be based on intuition of essences and not abstraction; (c) description is to be made while belief in

existence of objects is temporarily suspended or bracketed to remove presuppositions (conditions of truth of phenomenological statements: the epistemological circle and linkages with hermeneutics); (d) statements about phenomena are to be limited to intentional acts (intentionality); (e) statements about phenomena must be about the criteria of coherence governing intentional acts or their consequences (two kinds of intentional acts: purposive, about something). Certain differences between Empiricism and Phenomenology. The concept of "life-world". Extensions of phenomenological philosophy to social studies and conceptions of space).

(1) Scientific laws.

The concept of law has been referred to explicitly in the main text (PartI of the thesis); and can be briefly characterised as an empirical generalisation which is accepted as true. It is generally assumed that there are important logical distinctions between experimental laws and theories. The following three distinctions are made more or less explicit in the relevant literature (HESSE, 1967[a]: pp.404-405):

(a) Experimental laws contain only terms that refer to observables or are operationally definable; whereas theories may contain terms that do not refer to observables (theoretical terms). Although it is admitted that this distinction may have vague and shifting boundaries it cannot be dismissed altogether. The orthodox position on the radical difference between laws and theories is expounded in (NAGEL, 1961: Chs. 5 & 6); and is attacked in (FEYERABEND, 1962: pp.28-97), (PUTNAM, 1962[a] : pp.358-397), and (PUTNAM, 1962[b] : pp.240-251).

(b) Because they are based on experience and refer exclusively to observables,laws are considered to possess truth value and meaning which are totally independent of the changing theories that may be employed to account for these laws. Theories may be revised but the new ones that take their place have to be consistent with the experimental laws previously known to be true. Further, in the development of a theory criteria such as simplicity or internal coherence may be appealed to. These do not enter in the assessment of acceptability of laws. This view has been challenged by the claim that both laws and theories are subject to revision in the light of theoretical considerations.

(c) Laws occupy a lower position than theories in the deductive

hierarchy of a systematic science. As systems of statements entailing laws, theories are purported to be more general than laws which are ususally expressed as single statements. This appears to be a less controversial type of distinction between laws and theories.

(2) Deductive and axiomatic systems

(a) A deductive system is any system of interrelated statements such that some of them follow deductively from others.

(b) An axiomatised deductive system or axiomatic system is a deductive system in which every statement is either an axiom not following from any other statement, or a theorem following deductively from one or more axioms.

(3) Pure axiomatic systems or calculi.

A pure axiomatic system or calculus is a system having the logical form of an axiomatic system, but making no reference to particular contents. A calculus is an axiomatic system, and a fortiori a deductive system. It is a formalised language system: a consistent set of sentences containing only rigorously defined terms drawn from a limited vocabulary, such that every sentence in the system is either a member of a small set of sentences given as axioms or follows logically from members of that set. The calculus will consist of a vocabulary the terms of which cannot be chosen according to their empirical meaning: they cannot have external definitions, but also they cannot have internal definitions since the calculus is an entirely new construction. Thus, the elements of the minimum vocabulary of the calculus are just terms, so-called primitive terms

(or primitives). They are assembled into sentences which enable calculation; these are axioms or postulates. Axioms, being sentences that cannot be inferred from other sentences, must fulfill the conditions of independence and consistency.

In addition to primitives and axioms the construction of a logical calculus requires two sets of rules. Firstly, formation rules specify how primitive or other terms may be organised so as to form acceptable expressions of the calculus, so-called well-formed formulas. Secondly, transfomation rules or rules of inference indicate the procedure for moving from one sentence or set of sentence to another. The sentences which are formulated according to the rules, starting from the axioms, are theorems. It is often appropriate to introduce defined terms, that is, abbreviations for long expressions containing only primitives, in order to reduce the size of some theorems. The distinction between primitive and defined terms is not identical with that between observational and theoretical terms (SPECTOR, 1965: p.122).

Note: with respect to items (2)-(3) above a few additional remrks may be useful. An axiomatic system is a deductive system but is not necessarily a calculus (although it always possesses a calculus -- its logical form). A deductive system is not necessarily either an axiomatic system or a calculus (although it always points to the possibility of an axiomatic system, that is, a formalisation of itself).

(4) Theories

A theory may be a deductive system or an axiomatic system (according to one view of the nature and structure of scientific theories: cf. main text, Parts I and II). In the latter case it is said that the theory

has been axiomatised. A theory cannot be a calculus, since the calculus contains at best sentences devoid of empirical meaning -- because it is purely formal -- whereas the theory contains propositions with empirical content. If the theory has been axiomatised, the resulting axiomatic system has a calculus. Axiomatisation of a theory consists in finding a minimum set of assumptions and showing that the rest of the theory follows from it. This amounts to constructing the calculus of which the theory is the "customary interpretation" (BRAITHWAITE, 1953: p.47). Very few theories have been successfully axiomatised due to the difficulties involved in such an undertaking. However, most theories can be partially axiomatised and the parts may be seen to be components of a genuine axiomatic system.

As mentioned above, experimental laws provide generalisations of what is immediately observable. Throughout the history of science such laws have been held to be of little explanatory value: they account for what happens rather than how the phenomenon takes place. Consequently, the law itself requires explaining and this is achieved by means of a theory. Firstly, the introduction of a theory brings the phenomena of interest under the scope of wider generalisations, covering many qualitatively different phenomena, than merely experimental laws. Secondly, a theory might provide answers to the problem of how the phenomena being studied actually take place. It will attempt to supply a coherent account of the natural processes involved in the phenomena. Through the employment of some analogy (or similar kind of imagery) it might be possible to understand such natural processes. This will provide a more complete representation of the phenomena, supplemented with relevant details. From a formal or logical point of view, the deductive quality of the account of the phenomena given

by the experimental law cannot improve by the introduction of a theory. As the law is cast in the form of a valid deductive argument, there is logically no possibility of improvement. Any enhancement of its explanatory force initiated by the theory must be accounted for in terms other than improving the logical links between explanans (what is to be explained) and explanandum (what explains). Therefore it appears that theories improve the account of natural processes rather than ensure deductive rigour, although the importance of the latter is not to be negated. The mathematical and logical rigour introduced by many theories is contributory to the goal of coherent narrative, and not wholly independent of it (RYAN, 1970: pp.76-79).

(5) Theoretical and observational terms.

Theoretical and observational terms or statements are also discussed in the main text (Parts I and II). Whatever may be thought about the distinctions between theoretical and observational languages, theories which purport to refer to unobservables do employ a terminology which does not appear in experimental laws as the latter contain only terms that are observable or operationally definable. Thus, there appears to be a crucial discrepancy between the account of the phenomena provided by the theory and the account which the empirical evidence will license (RYAN, 1970: P.85). Correspondence rules are expressly employed as statements linking these accounts.

(6) Interpretation of a calculus.

Interpretation of a calculus is the process of transforming a formal,

uninterpreted calculus into an axiomatic system composed of statements about some determinate subject matter. These statements have the same logical form as the corresponding sentences of the calculus. Such transformation is achieved by coordinating the calculus exhibiting the theory's logical form with the theory. This necessitates the establishment of correlations between the terms of the sentences of the calculus and the names of conceptual or perceptual entities. The rules following which this is accomplished are called rules of correspondence. Interpreting a calculus in analogous to converting an algebraic statement, e.g. an equation, into an arithmetical one by substituting definite numbers for the variables. In this context, the sentence "let y=8" is like a rule of correspondence.

In an interpreted calculus, the primitive terms will correspond to elements of the perceptual situations from which the first empirical generalisations arise; and consequently they will have external definitions. In the cases where the primitive terms do not have external definitions (since very few theories have been successfully axiomatised),it appears that attempts to give any meaning to the primitive terms are futile. One way of overcoming this problem is to seek an empirical generalisation whose formal properties are the same as those of the axiom in question, and then to try and understand the primitive terms as analogues of the perceptual elements which constitute that empirical generalisation. The state of affairs referred to by the empirical generalisation is a MODEL for the state of affairs referred to by the axioms (a state which is not possible to observe).

The classical example of such a procedure is the kinetic theory of gases

in physics. This theory concerns elastic particles which are unobservable. However, the equations describing their behaviour have the same form as the equations which describe the idealised behaviour of billiard balls or similar objects. The way in which colliding billiard balls behave becomes a model for the way in which the parcticles of gases are purported to behave in the kinetic theory of gases. The postulates of this theory will contain expressions like "molecule", "mass of a molecule", and "position of a molecule", which might be considered as primitives. Other expressions such as "mean kinetic energy of a group of molecules" and "momentum of a molecule" are introduced on the basis of the primitives; these are defined terms. One of the axioms of the theory might be: "All gases are composed of molecules". A typical derivation from the postulates of the theory (i.e. a theorem) might be: "If the pressure of a gas is increased while its temperature remains constant,its volume will decrease". (These examples are illustrations of the basic ideas of the hypothetico-deductive schema of scientific theories).

(7) Correspondence rules.

Correspondence rules link some of the theoretical terms (not necessarily all) contained either in the formal calculus or in the intended interpretation of this calculus (the theory) with terms referring to observables. It is claimed by the proponents of the hypothetico-deductive scheme that theoretical terms cannot be understood in themselves but must be understood,given their meaning, in an indirect manner through the role they play in the theory in which they occur. Such terms obtain an empirical meaning if and only if they appear in sentences in the calculus which also contain observation terms.

Sentences such as these are known as correspondence rules.

In the example of the kinetic theory of gases mentioned in (6) above, the sentence: "the mean kinetic energy of the molecules is the absolute temperature of the gas" is a correspondence rule. The expression "mean kinetic energy of the molecules" is a theoretical term which is said to obtain a partial meaning indirectly by virtue of its occurrence in a sentence which contains the observational term "the absolute temperature of the gas" whose meaning is given directly and completely by way of semantical rules (that is, rules that are formulated in some suitable metalanguage, e.g. "ordinary" English or French: these are the formation rules and transformation rules referred to in (3) above). There appears to be no general agreement as to the logical status of correspondence rules. The view taken of the cognitive status of theories (positivist, instrumentalist, realist) will determine the status of the rules of correspondence (HESSE, 1967[a]:p.406).

(8) Analytic and synthetic statements.

According to the Logical Positivist thesis on meaning and truth, all claims to knowledge can be treated as claims to know that a statement is true. Thus, the advance of science becomes the progressive determination of the truth or falsity of statements. On this view, all cognitively meaningful statements can be distinguished into just two exclusive classes: analytic or synthetic. Very roughly, the former are statements of language; the latter are statements of fact. A true statement is analytic if it cannot be denied without contradiction or if its truth arises from the meanings of its terms. A true statement is synthetic if there are possible circumstances in

which it would be (or would have been) false.

The analytic/synthetic dichotomy is a fundamental assumption of Logical Positivism. Its production was necessary to account for the view that there exist some truths which are both necessarily true and informative about the world, and which do not require any empirical evidence. Such truths are proved 'a priori' . Admission of this interpretation would directly imply that experience is not always necessary to justify claims to knowledge of the world; and this would invalidate the basic tenet of Empiricism that all knowledge of the world rests in experience. Now this implication is unacceptable to the positivists who hasten to add that necessary or 'a priori' truths do not state empirical facts. By devising the analytic/synthetic distinction,'a priori' truths are considered to belong to the class of analytic statements and not to the class of synthetic statements. Further, analytic truths are claimed to be linguistic, man-made (and hence changeable, in principle), and unrelated to experience. All knowledge about the world can thus be expressed in synthetic statements whose truth cannot be guaranteed 'a priori' and must be established by observation and induction.

(9) Instrumentalism.

Instrumentalism is a term introduced by the American pragmatist philosopher John Dewey to refer to his "theory of the general forms of conception and reasoning" (DEWEY, 1931: Ch.2). This theory served as the framework within which Dewey reformulated two aspects of pragmatism, viz. a theory of logic and a guiding principle of ethical analysis and criticism. Dewey's Instrumentalism was developed as

a way of bridging one of the persistent dualisms in modern thought, that between science and values (THAYER, 1967: p.434). Many contemporary philosophers would acknowledge their debt to pragmatists such as Peirce, W.James, C.I.Lewis, and J.Dewey, although few would regard pragmatism as a living philosophical position today. In recent literature,under the influence of those pragmatist philosophers and of contributions by R.Carnap, E.Nagel, and others, pragmatism has come to refer to a broad philosophical attitude towards the conceptualisation of experience. Everything must be understood in the light of human purpose, including thought. Thoughts are instruments by which human beings try to achieve ends and, consequently, they must be assessed by their efficiency in subserving these ends. Although there may be many ways in which experience is apprehended, systematised, and anticipated, all theorising over experience is subject to the critical objective of maximum usefulness in serving human needs. Assessment of what is most useful or what is needed is relative to some given point of view and purpose. Thus, any position which lays emphasis on results as a test of satisfactoriness could fall within pragmatism.

Instrumentalism as characterised by Popper (POPPER, 1963: Ch.3) is an old-established view of science and of the status of scientific theories. Early formulations may be found in the writings of Osiander and Cardinal Bellarmino when they were endeavouring to accomodate the Copernican hypothesis in such a way that it no longer appeared to contradict the Bible. Further, Bishop Berkeley (1658-1753) was concerned with safeguarding religion, in general, from the dangers it would presumably face if science was said to possess the ability to discover the truth about the world without the mediation of divine

revelation. The instrumentalist view received more definitive formulations in the nineteenth and early twentieth century. These were advanced in reaction to realist (essentialisti) accounts which took the goal of science to be causal explanation through the discovery of underlying (hidden)causes,or essences of things. Thus, scientists and philosophers either expressed doubts about such underlying causes and essences existing behind the appearances or phenomena -- e.g. Ernst Mach's (1838-1916) contributions -- or expressed scepticism regarding the ability of science and of its methods to discover such causes and essences -- e.g. Henri Poincare (1854-1912) and Pierre Duhem (1861-1916) qua conventionalists (cf. this Appendix,entry: "Description versus explanation").

Reasserting Kant's thinking, Neo-Kantian philosophers such as F.A. Lange (1828-1875) claimed that all knowledge is conceptualised by man and that abstract concepts necessarily falsify and distort reality which -- in itself --is unknowable. Man needs to supplement reality by an ideal world of his own: the language he employs in his attempts to obtain knowledge of the world is full of fictions, metaphors, and anthropomorphisms. Further, Vaihinger (1852-1932) developed a philosophy based on the concept of fiction which he called the "philosophy of the 'as if' ", known as fictionalism (VAIHINGER, 1911/1924). On his account, fictions are known to be false or self-contradictory, but may be employed as heuristic constructs to achieve some definite end. After serving their purpose they are to be discarded much like scaffolding in building operations. For example, an extremely complicated situation can be grasped by adopting some fiction that deliberately substitutes for the "complete range of causes and facts" only a part of that range. These

ideas filtered through from Germany to America and influenced American pragmatists such as William James (1842-1910) and John Dewey (1859-1952) -- the latter's philosophy being known as Instrumentalism.

Instrumentalism draws extensively on the pragmatist position in terms of placing emphasis on obtaining practical results as the main purpose of scientific inquiry. Results such as an improved ability of prediction and control over the physical environment are taken to be the justification of scientific activity. This general attitude of the instrumentalist view of scientific activity is closely related to, or even provides a reason for adopting, the instrumentalist interpretation of scientific laws and theories, although either view may be accepted independently of the other(KEAT and URRY, 1975: p.63). The instrumentalist view of laws and theories takes these to be "leading principles", or instrumental procedures, or inference policies for inferring stated conditions from others. Thus construed, theories function as guides for logical inference indicating <u>how</u> certain formulations are to be derived from other formulations of events, rather than as descriptively true statements of reality serving as premises <u>from</u> which conclusions are deduced.

In this view,theories do not provide any knowledge of the world over and above the predictions derived from them; they are not assertions about the world but "inference tickets" (RYLE, 1949: pp. 120-125), or "techniques of explanation" (TOULMIN, 1953). Their status is that of computational devices, tools, or instruments in relation to observation statements. They enable the scientists to relate and systematise observation statements (e.g. readings of laboratory instruments) and to predict such sets of statements

from other sets (factual data) (SMART, 1968: pp.138-142). In this sense, theories are neither true nor false (except pragmatically) Nonetheless it is possible to critically assess their utility and clarity and the fruitfulness of the consequences that result from adopting them. Questions concerning the truth or reference of the theories themselves do not arise for a theory is asumed to be represented by its formal calculus and a set of correspondence rules, excluding intepretations of the calculus as such. The theory emerges as a mere uninterpreted formalism and the sentences of its calculus are neither true nor false (HESSE, 1967[a]: p.407).
A rather extreme version of Instrumentalism purports that theories consist only of their formal calculus which is considered as some kind of "black box": once data are fed into it predictions will be output. This view does not adequately account for the explanatory and predictive functions of models of the formal calculus: that is, futher interpretations of the formal calculus which may (or "must", according to some writers)be different from the intended interpretation of this calculus (i.e. the theory).

Instrumentalism is frequently contrasted with "realism" . However, the sense of "realism" entering such discussions is a broad one and refers to the claim that scientific theories are assertions about the world and not mere instruments for computation and prediction; thus they have to be assessed for their truth or falsity. There follows that in the instrumentalist/ realist dichotomy, the positions referred to as Realism and Positivism (cf. this Appendix) both fall under "realism", although important differences have been noted between these two views. Instrumentalism shares with Positivism the view which rejects the Realist intepretation of theoretical terms

as referring to actually existing, even if unobservable, entities (KEAT and URRY, 1975: pp.63-64). As a consequence of this, instrumentalists deny the realist claim about the function of models which typically regards them as making ontological commitments about the "real" existence of unobservable entities. In the instrumentalist view, many models have been and are being employed which make no claim that things are "really" the way they are depicted in these models. The use of such models has a purely pragmatic, instrumental justification: the models cannot account for the nature and constitution of the phenomena which are their subject, but can be used to make successful predictions about different and restricted ranges of those phenomena. However, the realist view may accept that in the absence of an adequate explanatory theory (which if developed would embody a model in the realist, non-pragmatic sense), a useful but not necessarily true model may serve the purpose of filling a gap in the knowledge of some phenomenon. Many such cases exist in science, but this is an unsatisfactory situation and not one which justifies the instrumentalist views. From the methodological point of view, instrumentalism has been criticised in (POPPER, 1963: Ch.3; pp.111-114), and (FEYERABEND, 1964: pp.280-308); and from a metaphysically neutral position in (HEMPEL, 1958: pp.37-98), (NAGEL, 1961, Ch.6), (SMART, 1963: Ch.2), and (SPECTOR, 1965). Cf. also (DEWEY, 1931); (THAYER, 1967); (THAYER, 1968); (SCHEFFLER, 1974).

(10) Operationalism (or operationism).

Operationalism is a movement within the philosophy of science, and is considered by some writers as the American version of the verification theory of meaning of the Logical Positivists.

It attempts to relate all scientific concepts to experimental procedures: to define them in terms of operations which must be performed in order to establish whether such concepts can be applied in scientific research. For example, the concept of lenght is claimed to be synonymous with the corresponding set of operations required to measure something. (Note the close association of this operationalist principle for establishing the meaning of a term, with the second principle of the verification theory of meaning: "the meaning of a factual statement or claim <u>is</u> its method of verification, i.e. the method of establishing its truth or falsity"). Applying the basic idea of operationalism to scientific concepts results in elimitation of those terms which cannot be defined operationally because, it is argued, such terms do not possess any empirical referents (meaning).

Operationalism is a fundamentally empiricist doctrine and has several common points with Logical Positivism. The initial formulation of the positivist principle of verifiability was subjected to a number of versions. An important modification was the restriction in the scope of application of the criterion of meaningfulness: from a general principle governing all human discourse to a criterion which rules what is meaningful discourse in empirical science alone. This modified positivist thesis appears to be closer to operationalism which seeks to explicate an approach already implied in the work of practising scientists. A further change the original positivist policy on verification had the effect that the empirical significance of a sentence was recognised to be dependent on the possession of meaningfulness by the terms it consists of (in contrast with the initial tenet stating that the meaningfulness of whole sentences should be directly inquired into). Thus positivism was brought nearer the operationalists who, as a principle, are concerned

with individual terms. An issue which seems to divide the logical positivists from the operationalists is the fundamental tenet of operationalism: that is,the meaningfulness of scientific terms is associated with the ability to relate them to experimental procedures. Whereas the positivist criterion of verification is satisfied if a term is founded on mere passive observation. If this operationalist idea is discarded -- and there are views that it is safe to do so (SCHLESINGER, 1967: p.545) -- the doctrine of Logical Positivism and Operationalism appear to merge.

The operationalist programme was originally stated explicitly by the physicist P.W.Bridgman (BRIDGMAN, 1927) and was founded on principles that were followed by practising scientists rather than on independent philosophical considerations (BRIDGMAN, 1956: p.79). Bridgman had to modify his initial "extreme" operationalist thesis in the light of a range of criticisms. The early demands of the programme were substantially weakened in order to accommodate highly theoretical but useful terms which would otherwise have been eliminated from the scientific vocabulary. This relaxation of the criteria employed in the original programme seems to equate the operationalist principle with mere insistence on the testability of theories, which is a well-known requirement. If operationalism is to be anything more than that, it has to be interpreted as a form of instrumentalism (SMART, 1968: p.141). However, the operationalist programme differs from instrumentalism in its view of scientific theories to the extent that it holds that theories consist of meaningful statements. Nevertheless, it does share with instrumentalism the point of view which denies the realistic interpretation of theoretical statements: that is, it denies

the view that such statements are about physical entities, processes, and properties (e.g. electrons, photons) which have an independent existence transcending the operations through which their presence or absence may be ascertained.

(11) Analogy.

The term "analogy" is used in a variety of meanings which range from a very broad one -- denoting almost any kind of similarity between two entities -- to a restricted one covering only certain types of similarities. Usage of the term with a restricted meaning is especially important in science, for example: (i) in the case of identity or similarity of physical principles between two entities (gas molecules -- perfectly elastic billiard balls, in the kinetic theory of gases) both operating according to identical principles of classical mechanics; (ii) in the case of similarity of geometrical configuration; (iii) in the case of similarity of function or role. Further, the term "analogy" is used to refer to some type of comparison. This, however, appears to be an inaccurate usage since in a comparison both similarities and differences are relevant, whereas in an analogy only similarities are sought.

This is not to deny that a relation of analogy implies differences as well as similarities; but only to make the point that an analogy emphasises the similarities, or "positive analogy", rather than the differences, or "negative" analogy". Occasionally, so-called "neutral analogy" is used to refer to those elements of an analogy (over and above the similarities and differences) which are not categorised either in the set of similarities or the set of differences between two entities which are said to be in some relation

of analogy. Four conditions may be distinguished to obtain in science when an analogy is drawn between two things 'X' and 'Y' (ACHINSTEIN, 1968: Ch.7).

(a) It is suggested that certain similarities exist between 'X' and 'Y' (whether 'X' and 'Y' be physical objects, stuffs, or phenomena). These similarities exist in parts, aspects, or properties of 'X' and 'Y' which refer to either their relationships or their structure. Related parts in 'X' and 'Y' are said to correspond.

(b) It is admitted that 'X' and 'Y' are basically unlike although they exhibit certain similarities in their relationship and/or structures.

(c) It is contended that, taking 'Y' as a basis, it is possible and useful to consider and describe 'X' from the point of view of 'Y' by using concepts and methods appropriate to 'Y', although the possibility of such use might not have been immediately apparent(e.g.when considering atoms as something like miniature solar systems).

(d) It is attempted to present 'X' in an illuminating manner by means of 'Y',in order to provide better understanding of 'X'; and this presentation of 'X' is undertaken on the belief that if 'Y' is employed instead of 'X', it will be more easily comprehended than 'X'.

Based on the four conditions stated above, Achinstein offers the following characterisation of "analogy" : "If an analogy is drawn between 'X' and 'Y' then these four conditions are generally satisfied; and if they are satisfied, then an analogy is drawn" (ACHINSTEIN, 1968: p.208). These considerations suggest that analogies are used by scientists to enhance understanding of concepts and phenomena. This is achieved by distinguishing similarities between such concepts

or phenomena and others that are more familiar, more accessible, or more readily grasped. Moreover, analogies might indicate ways of extending a theory by observing similarities between two phenomena one of which is governed by known principles; and then by contending that similar principles govern the other phenomenon as well.

(12) Variable.

In a social scientific context, the term "variable" is employed to designate any element in an empirical investigation where observation and measurement accrue. A derivative of this usage is to consider a "concept" (or "conceptual construct") also a variable when empirical instances of it are observed and studied; and, by extension, to ascribe the term "variable" to concepts in theoretical frames of reference as well. Therefore the term applies to both quantitative and qualitative observations; for example, sex or employment status would be called qualitative variables, whereas income or age would be thought of as quantitative variables. Quantitative variables are often called "attributes". Concepts are converted into variables by mapping them onto a set of values. In this manner measures of concepts are obtained. The process of assigning values to concepts is known as measurement; it seems to be faced with serious problems especially with respect to concepts which do not lend themselves to quantitative expression.

Variables can be classified according to: (1) level of complexity; (2) formal content; and (3) nature of relationship to each other. These aspects are examined below.

(1) Level of complexity: two-valued variables (attributes)represent

the simplest kind of variable (e.g.either 0 or 1; either member or non-member of the set of entities exhibiting some property). It is possible to distinguish : (a) natural dichotomies, such as sex (male or female), residence (resident or non-resident), employment status (employed or unemployed), and the like; and in such cases the investigator has no control over the assigment of his observations to either of the two classes as this is already decided upon(e.g. in census data, or other types of official statistics); (b) conceptual two-valued variables, where categories are created by the investigator, and the assignment of observations to the appropriate category depends on the purposes of the investigation (e.g. the housing stock of an urban area: distinction between buildings to be used and/or preserved -- suitable -- and buildings unfit for use; or mode of travel to work: users of public transport versus users of private cars);
(c) simplifying two-valued variables standing for variables with more than two values (e.g. type of economy: free-market versus centrally planned). Multi-valued variables (serials) may assume a number of values (known, finite) and are often called classifications; their values can be arranged in rank order only. They can be: (a) natural variables (e.g. urban population of a region by size of urban centre); (b) conceptual variables (e.g. classification of the residential building stock of a city by type : single-family houses, flats in multi-storey blocks, and the like) : (c) simplified "complex" variables (e.g. income can be subdiveded for the sake of simplicity into high, medium, and low income); or (d) combined "simple" variables (e.g. sex and employment status combined yield a variable with values: male/female employed, male/female unemployed).

(2) Formal content: continuous variables can acquire values such that between any pair of values, however close together, it is

possible to have another value (e.g. distance from the city centre); discrete variables can be assigned values which increase by steps or jumps (e.g. number of cars, population, number of houses).

(3) Nature of relationship between variables: an independent variable is one which determines the value of other variables; whereas a dependent variable has its value determined by other variables. In controlled experiments in social science, observations of the indepenent variable(which is manipulated experimentally) provide a basis for predicting changes or differences in the dependent variables. In such contexts, the independent variable is called the experimental, predictor, or causal variable. The dependent variable whose behaviour is presumed to be predictable from the independent variable has been called the criterion or effect variable. Such clear-cut relationships between social variables are seldom encountered in experimental situations in the social sciences; and this is attributable to a number of factors, among which the presence of other relevant variables in the context of the investigation is considered very important. These so-called intervening variables represent relevant influences in the experimental situation, which have not been neutralised by the experimental design and the effects of which must be taken into consideration.

Another distinction which is frequently encountered in experiments with models of various systems (economic, social, spatial) is that between endogenous and exogenous variables . An endogenous variable is one whose value is to be determined by relationships obtaining within the model being employed. An exogenous variable, although very important in the operation and logical structure of the model, is determined by relationships (or forces, or policies) outside

the model proper and is not accounted for by it. For example, the total area of land within some urban administrative boundary would be exogenously determined for use in a model of that urban area; as would be the population of that same area according to say, the 1961 census. However, the number of people who would chose to live in a specific part of that urban area could be predicted endogenously by some appropriate mode (ABELL, 1971: pp.4-6; Ch.4); (DICKSON, 1971: pp.252-268); (FILMER, et al., 1972: Ch.3); (STINCHCOMBE,1968: pp.28-30); (CHIANG, 1967: p.9).

(13) Positivism and Logical Positivism.

Positivism is recognised as one of the most influential schools in the philosophy of science with a long history in science and philosophy. Elements of positivism have been noted in the writings of medieval philosophers (such as William of Ockham); and the general philosophical view was developed significantly in the early eighteenth century, mainly through the work of empiricist philosophers such as Hume and Berkeley. Positivism is said to be the most fully elaborated variant of Empiricism. The nineteenth century Comtean positivism, with its pervasive influence in the development of the social sciences, is only one instance of the more general positivist intellectual and methodological tradition.

The adjective "positive" came to be applied to the methods of the natural sciences in respect of their reliance on observation and the use of experimental procedures; hence the term positivism which was coined in the nineteenth century. The positivist tradition continued through the nineteenth and twentieth centuries when its

dominance seemed complete with the development in the early part of the twentieth century of the general philosophical tradition known as Logical Positivism. More recently, the emergence of new movements in the philosophy of science has initiated a reconsideration of and strong criticism against the main theses of positivist philosophy.

Among the principal views of positivism (in terms that are not specific to the way that these views have been developed by twentieth century philosophers)the following are the ones most commonly attributed to this philosophy:

(a) All knowledge is ultimately founded in experience; this implies the rejection of any scientific concepts which go beyond the realm of the observable (this is the fundamental thesis of Empiricism).

(b) There is no causal necessity in nature; this entails a regularity view of causation and explanation. At its simplest, the Humean regularity theory of causation views the notion of cause as follows: to say that X causes Y is to say that X is always followed by Y in given conditions. Thus, a known causal law is a well enough confirmed empirical hypothesis. There are only regularities in nature: successions of events which can be systematically represented in the universal laws of scientific theories. The Humean account of causation, which has been generally followed by later positivists, emphasises that statements of causal connections cannot be logically necessary truths. The idea of a cause admittedly involves the idea of necessity, but this is also claimed to originate in experience. Causes precede their effects, are contiguous to them, and are such that there is a <u>constant conjunction</u> between causes and their effects. The mind acquires the habit, through observation, to pass from cause

to effect. Necessity is something that exists in the mind, not in objects, Hume argues.

(c) A direct consequence of (b) is that statements expressing the regularities that are discovered to obtain in the world, if true, are only contingently and not necessarily so; their truth is not a matter of logical necessity and cannot be known by 'a priori' means. Instead, they must be tested objectively by means of experiment and observation: these are the only source of sure and certain empirical knowledge.

(d) All genuine knowledge is based on sense experience; the purpose of science is not to go beyond or behind observables to try and obtain knowledge of unobservable natures, essences, constitutions, or mechanisms which have been claimed to necessitate the phenomena of nature. Metaphysical or speculative attempts to gain knowledge by reason unchecked by experience should be abandoned in favour of the methods of the sciences (the logic of science).

(e) The logic of science, based on the techniques and concepts of formal logic, appropriately describes the scientific enterprise and should be clearly distinguished from other ways of studying the same phenomena, e.g. historical, pshychological, or sociological ways. These latter are not relevant to the logic of science.

(f) The debate concerning the role of models and analogies in scientific inquiries may be seen to originate in this distinction between the logic of science, on the one side, and the psychological processes involved in the theoretical activity of the scientists, on the other side. The positivist attitude towards the use of analogies, and the models based upon them, in the development of theories is typically to regard these as devices having only psychological interest: heuristically useful in affording better

understanding either to scientists or to laymen. The logic of science is not concerned with such psychological processes which pertain to the context of discovery rather than the context of justification.

(g) A modern variant of positivism, called Logical Positivism, makes additional demands on what is to constitute scientific knowledge and reserves this characterisation for knowledge which is free from metaphysical considerations such as human values, normative statements, moral and theological issues, and the like; and rejects such considerations as meaningless or unintelligible. Further, all claims to knowledge are treated as claims to know that a statement is true: science is seen to advance by progressive determination of the truth or falsity of statements. Finally, the distinction is made between analytic and synthetic statements, viz. between statements of language and statements of facts about the world, respectively. All cognitively meaningful statements are said to be of just these two exclusive kinds. Analytic statements have no factual content; they are true by convention. Synthetic statements, being refutable, cannot be known 'a priori'.

(h) Positivism as a philosophy of science need not endorse these additional claims of Logical Positivism. The position can be maintained without rejecting forms of knowledge other than the scientific as meaningless; or without denying the relevance of value claims in toto.

As a theory of knowledge positivism expounds the following main views (though there are variants of each of the general principles stated below):

(1) <u>Theories and laws:</u> theories consist of highly general, universal statements (laws) whose truth or falsity can be assessed by systematic

observation and experiment. Universal statements in theories (laws), though they must hold for all times and places, do not express any form of necessity inherent in nature: either logical necessity or what may be termed empirical, natural, or causal necessity. Laws express non-necessary, contingent relationships, and their truth or falsity can be established only through empirical means: they cannot be known 'a priori'. Theories should have a deductive structure (deduction is considered the ideal form of reasoning in the formal sciences, e.g. mathematics).

(2) Theory and observation: assuming that consideration of the "logical problem of induction" rules out conclusive verification of scientific theories by means of observation and experimentation, there are two distinct responses to the question of how to evaluate theories: (a) the confirmationist approach places emphasis on the number of instances and variety of circumstances of confirmation of the theory; (b) the falsificationist approach focuses on falsification rather than confirmation: observation should be aimed at showing that rival potential theories are false. The falsity of the theory follows deductively from the falsity of predictions derived from it; and this is the only kind of deductive relationship to be established between theory and observation.

The falsificationist view is often associated with the account of "scientific method"referred to as the hypothetico-deductive account, especially in the works of K.R.Popper (though the philosophical position put forward by the latter cannot be called positivist). Observations used in the tesing of theories provide an objective foundation for science. The truth or falsity of statements about observations is not dependent upon the truth or falsity of theories (claim of theory-neutrality of observations).

(3) The two-language thesis: an important consequence of (2) is the recognition that many of the terms occurring in theories do not refer to observables. The most frequently encountered positivist strategy devised to deal with the "problem of theoretical terms" is the construction of an exclusive and exhaustive dichotomy between two "languages", or sets of terms:
(a) theoretical (or non-observational) terms; (b) observational (or non-theoretical) terms. Correspondence rules are often employed as a means for anchoring theoretical terms in experience and observation.

(4) What is observation or observable: the typical construal of the theoretical-observational dichotomy is to positively characterise what is observable and then define the theoretical as non-observable. Thus, the precise content of the dichotomy depends on the way in which "observation" or "observable" is defined. Among many different accounts, most important are:
(a) only the direct perceptual experiences of the observer count as observations (but this conception faces the problem of inter-subjective agreement between observers).
(b) operationalism: only the physical operations involved in measurement and experimentation count as constituting the observable.
(c) the pragmatic theory of observation defines as observational all those terms whose correct or incorrect application can be agreed upon by fiat (the scientists concerned).

(5) Epistemological and ontological privilege of "observation languages": positivist views (2), (3), and (4) imply that the language of observation is regarded as both epistemologically and ontologically privileged.

(a) Epistemological privilege of observation statements: their truth or falsity can be known either with total certainty or with a greater degree of certainty than statements containing theoretical terms; and can be confirmed or disconfirmed without reference to the truth or falsity of theoretical statements.

(b) ontological privilege of observation terms or statements: only terms of the language of observation can be regarded as making genuine reference to items in the physical world; and only such items can be said to exist.

(6) Scientific explanation: explanation of an event is achieved by deducting its consequences from a "covering law", together with ancillary premisses: that is, by showing that the event to be explained is an instance of a well-supported regularity. Two "models" of scientific explanation are accepted as specifying necessary and sufficient conditions for something to be regarded as scientific explanation: the deductive-nomological "model", and the inductive-statistical "model".

(a) In the deductive-nomological model, an event is explained by subsuming it under general laws.

(b) In the deductive-statistical model, the law statements of the deductive-nomological "model" are replaced by probabilistic or statistical generalisations. The relationship between premisses and conclusion is one of inductive probability (instead of deductive necessity). In this schema, a particular event is "explained" by showing that a statement describing it is supported with a high degree of inductive probability by a set of premisses at least one of which is a statement of the statistical probability that an event of one kind will be followed by, or associated with, an event of another kind.

(7) Symmetry between explanation and prediction: explanation and prediction have the same logical form. Prediction differs from explanation only in so far as what is predicted has yet to happen, while what is explained has already happened: every prediction counts as an explanation after the event, and every explanation counts as a prediction before the event.

The influence of positivism has been much greater on science and social science than on philosophy. Its empiricist foundation added to the increasing concern with observation, measurement, and data in the social sciences in contrast to earlier theoretical and even speculative tendencies in these disciplines. The positivist interest in the logic of measurement and in the nature of probability prompted the exploration of such ideas in the context of psychology and sociology. The most distinctive influence of positivism in empirical science is connected with the positivist view of the logic of science. One aspect of this influence is the application to empirical material of various logical and mathematical systems. In the social sciences, in particular, this can be recognised in the concern with models and model-building, and in the "methodological unity" debate concerning the unity of the methods of natural and social sciences.

This debate originates in the argument that if the social sciences are to be "really sciences" they must conform to the set of abstract, universal, and objective criteria which characterise the methods of the natural sciences; hence the term naturalism which refers to the study of social scientific phenomena by employing the methods of the natural sciences. The claim of naturalism in social science has been a characteristic feature of positivism, in general, and of

Logical Positivism, in particular. As a consequence the terms positivism and naturalism tend to be applied interchangeably (but inaccurately). Positivism is not the only philosophy of science; other philosophical positions include realism and conventionalism. Since positivism is not the only view of the methods of the natural sciences it cannot be rightly considered as a synonym of naturalism , although it is difficult to conceive of a naturalist position which is not also positivist.

Kaplan provides a perceptive summary of the influence of positivism in empirical science and suggests that it "has been on form rather than substance -- on methodology rather than content. It has given new vigor to the ideals of clarity and precision of thinking , in a perspective in which the emphasis on theory is conjoined with an equal emphasis on the ineluctability of empirical data. But too much self-consciousness as to methodology may have a repressive effect on the conduct of scientific inquiry. Unintentionally, and even contrary to its own purposes, modern positivism may have contributed to a "myth of methodology": that it does not much matter what we do if only we do it right" (KAPLAN, 1968: p.394).

REFERENCES : (AYER, 1936/1946); (HAMLYN, 1967); (HARRE, 1972); (HEMPEL, 1966); (HOLLIS and NELL 1975);(HUGHES, 1976); (KAPLAN, 1968); (KEAT and URRY,1975);(NACHMIAS and NACHMIAS, 1976);(URMSON, 1960); (WALSH,1972); (ACHINSTEIN and BARKER, 1969).

(14) Empiricism.

There are two distinct senses in which the term "empiricism" is used in cognitive discourse: (a) The ordinary use of the term serves to designate reliance upon the methods derived from practice and experience, without the aid of an accepted body of theory. For example, when it is argued that spatial planning, as it is practiced today, still follows a largely empiricist tradition, it is implied that the planning activity is not founded on an established body of theory concerning the spatial and procedural aspects of that activity. (b) The use of the term "empiricism" in philosophy is rather technical and refers to the well-known theory that all knowledge originates in experience . However, the term has no precise meaning because there are several variants of Empiricism.

This discussion is concerned with the use of the term in sense (b). In this context, the general principles of Empiricism were developed mainly by a succession of British philosophers known as "the British empiricists" (including Hume, Locke, Berkeley, and J.S.Mill); and originated in the reaction against Rationalism, a philosophical position expounded in the systems of Descartes, Spinoza, and Leibniz The dispute between Empiricists and Rationalists has already been referred to in the Appendix to Part I of the dissertation, especially with regard to the recent revival of rationalist arguments initiated by the work of Noam Chomsky and his disciples, in the field of linguistics. In its original formulation, the debate concerns: (i) the existence of 'a priori' knowledge about the world, which Rationalists condone whereas Empiricists reject (radically) or attempt to analyse into simpler concepts derived from experience;

and (ii) the cognitive status of 'a priori' propositions or statements.

With reference to the issue under (ii) above, it is generally agreed that all necessary truths are 'a priori': experience and observation can reveal only what has happened and is likely to happen, and not what must happen. Now, Empiricists deny the possibility of acquiring knowledge about the world except through experience and observation. Consequently, necessary truths are claimed to be true by definition, or analytic. However, Rationalists claim that some 'a priori' statements are synthetic: that is, they possess factual content and refer to the world of experience. In this view, an example of such a synthetic 'a priori' statement would be the assertion that "every event must have a cause". This states a necessary connection while, at the same time, it asserts a fact about the world and is not true by definition (as would be the case of the statement "every effect has a cause", which is analytic).

By denying the existence of synthetic 'a priori' statements, Empiricists reject the claim that reason can assure one of the truth of a genuinely synthetic (factual) statement. Disagreement over these matters of principle has resulted in the formulation of contrasting views by Rationalists, on the one side, and Empiricists, on the other side, with regard to metaphysics and the natural sciences. The Empiricist tradition antagonises metaphysics and emphasises the employment of the methods of the natural sciences as the legitimate means for acquiring knowledge of the world. In contrast Rationalists argue that understanding of the world is to be gained through metaphysical speculation which transcends experience (sense-perception) and depends upon the having of 'a priori' concepts.

The solutions offered by Empiricists to various philosophical problems derive from the aforementioned general principles. Hume's account of causation has already been discussed in the context of the Positivist views. Another formulation which has filtered through to the twentieth century Logical Empiricism (or Logical Positivism) of the "Vienna Circle" is due to Hume's statement that all ideas are direct or indirect copies of sense-impressions; thus, knowledge is either of internal relations between ideas (as in mathematics) or else has reference to the content of sense-impressions (factual knowledge). The fundamental tenet of Empiricism, that is, that experience rather than reason is the source of knowledge, has received different emphases and refinements. Consequently, Empiricists seem to differ in various ways although they are united in this general tendency. It is argued that a general empiricist thesis can be maintained on any of the following grounds: (i) all knowledge is either direct sense experience or derived from it; (ii) all knowledge depends on sense experience: all materials for knowledge are directly derived from it; (iii) all knowledge depends on sense perception: things can be known 'a priori' but relatively to experience since the latter is a precondition of having 'a priori' knowledge (HAMLYN, 1967: p.500). Thus, the main characteristics of the Empiricist theory of knowledge seem to be: (a) that knowledge is ultimately founded on experience and observation; (b) that there exists no necessity in nature: nothing <u>must</u> be as it is, no state <u>must</u> be followed by another state, nothing can be known about the world 'a priori'; (c) the Humean, regularity view of causation; and (d) the general mistrust toward metaphysical speculations which depend upon the having of certain 'a priori' conceptions of the world. Although Empiricism is primarily a theory of knowledge, it has

exerted important influence in the field of ethics (but this does not lie within the scope of the present discussion).

(Note: It is, of course, impossible and impractical to give a detailed account of Empiricism and of the differences between the Empiricist and Rationalist outlooks. The above is therefore a selective summary of some of the main points of these views).

REFERENCES: (AYER and WINCH,1952); (BENNETT, 1971); (HAMLYN, 1967); (HAMLYN, 1970);(HOLLIS and NELL, 1975);(HUME, 1902); (URMSON, 1960); (WILLIAMS,1967).

(15) Realism.

Realism has a long history in philosophy dating back to Plato and Aristotle, at least, and being associated with lengthy philosophical debates in medieval times. In modern philosophy, Realism has been developed and defended as a detailed view mainly after the beginning of the twentieth century in reaction to Idealism. Realism is compatible with a variety of doctrines. The modern formulation of the realist position referred to here is mainly due to the realist philosopher R.Harré. The term "Realism" was first used in discussions about the status of Universals. It was recognised that objects in the world share features with other objects; and it is in the nature of most such features that they can characterise indefinitely many objects. These properties of things have been called Universals and the objects they refer to are said to be their instances. Three kinds of answers have traditionally been given to the problem of the status of Universals.

(1) Realism: There are two versions of early Realism both claiming that "universalia sunt realia" (i.e. "universals are reals").

(a) Platonism is associated with Plato's conception of Universals as objects (ideal forms) which are separate from their instances. They are said to have a real being, independently of being thought, transcending particulars ("universalia ante res", i.e. "universals prior to the objects"). In contemporary philosophy, Platonism represents any view which treats things like Universals, propositions, numbers, etc.as independent objects.

(b) The realism associated with (often controversial) intepretations of Aristotle's view that Universals are not objects or separate from their instances, but are real things which somehow exist just by being instantiated: they exist in their instances, in their particulars ("universalia in rebus", i.e. "universals in the objects"). In this sense of Realism, laws of nature are taken to be "real Universals" which exist (or subsist) objectively and are discovered by means of rational inquiry. The particular events which the law refers to are instances of the "real Universal"; they exemplify this Universal, or are the means whereby it is revealed to the inquirer. In another sense of Realism (related to the preceding sense in complex ways), laws are said to be true or false objectively, independently of whether they are known to be true or false. There follows that laws "are not simply ways in which we shape the world of experience to our knowledge but that to which our knowledge has in some way to conform, if it is veridical" (WARTOFSKY, 1968: pp.253-254).

(2) Nominalism opposes the claim that universal laws of nature exist in reality, and challenges the view that Universals exist at all.

It rejects the existence of Universals in the sense of entities that are independently accessible and constitute the meaning of a word For nominalists,"universalia sunt nomina" (i.e."Universals are names"): the objects of thought are simply words and there is no more to the meaning of a general term than the set of things to which it applies (e.g. the word "The State" is not taken to denote a Universal: it means nothing more than the set of citizens that may be so named in common). Thus, it is argued that Universals can only have the status of names, and these names "exist" only in relation to the particular occasions to which they apply. Consequently, laws "exist" in nature only in the particular instances in which certain features are exhibited. The only universal connection among these features can be their grouping under a single expression which facilitates reference. In this view, a law of science is only a convenient "mark", an "economical" description: it is simply a more or less adequate means of dealing with nature, rather than true or false, as realists would claim. This view lends itself to the instrumentalist interpretation of laws. Since it is not accepted that there exists an underlying "reality" beyond the facts themselves, laws cannot be said to explain at all; at most they give a description which is <u>true</u> (in the sense of "adequate") of all the instances.

(3) <u>Conceptualism</u> attempts to overcome difficulties in the realist and nominalist views. The realist (Platonist) argument concerning the existence of Universals <u>apart</u> from the instances which embody them is said to lead to a dualism of Universals ("ideal forms"), on the one side, and the world of experience or thought,on the other side; and the latter exists as a shadow or reflection of the former.

Further, the nominalist claim that only particular facts really exist is considered to make incomprehensible the fact of their relation, since "a collection is no more than a collection unless there is some law-like relation which "really" holds among the particulars" (WARTOFSKY, 1968: p.255). Conceptualists argue, instead, that Universals are thoughts or ideas in the mind, and constructed by the mind. The statement of relations between the facts involves more than the arrangement of accumulated particulars under some conventional name. The discovered order or relation among particular facts is that which permits their common grouping: it is not <u>explicit</u> in the particular facts, thus it is not some "real Universal" which binds the facts together. The mind discovers the relation among particular facts, makes the connections and explicates what is implicit in the facts. Therefore, "the Universal is constructed in the mind, or is conceptualised as the order which is revealed by inquiry" (WARTOFSKY, 1968: p.256). In this sense, a law of science explains by bringing into conscious and explicit form an object of the understanding which was <u>implicit</u> in experience and particular facts. One version of this view takes explanation to be the reduction or interpretation of the unfamiliar in terms which are already familiar. The use of models and analogies to enhance the understanding of unfamiliar sets of relations relates to this view.

(The preceding exposition of alternative views on the status of Universals and on laws of nature may tend to create the misleading impression that the positions referred to are typically expressed in "pure" form and can be labelled, as above, in a straightforward manner. Therefore, it is necessary to add that the distinctions were drawn in a way which points to emphases within alternative accounts so as to facilitate the understanding of how these emphases are

reflected in the respective views).

The term "Realism" has been used to refer to a variety of positions in past and recent philosophy. The modern usage of the term is most commonly associated with the view that material objects exist independently of sense experience. Contemporary Realism shares with Positivism a common empiricist tradition; and it is often claimed that it is this common basis that is mainly to blame for the failure to distinguish these two positions in discussions about the issue of "naturalism" in the social sciences (i.e. the applicability of the methods of the natural sciences to the study of social phenomena). Both Positivism and Realism conceive of science as an empirically based, objective, and rational enterprise the aim of which is to furnish true explanatory and predictive knowledge of the world. In this context there are two different aspects of the concept of objectivity. On the one side, there is the requisite objectivity in the evaluation of scientific theories by testing these against empirical evidence. It is founded on inter-subjective agreement among the scientists concerned. On the other side, objectivity refers to the commitment that there are "objects" in the world which exist independently of beliefs or theories about them: science can describe but cannot construct the nature of that which exists.

The characterisation of the scientific enterprise as a <u>rational</u> enquiry entails the acceptance of universal standards of scientificity: the requirements for an adequate explanation, the purpose and function of scientific theories, the process of justification, and the like. Positivists and Realists believe in the existence, and possibility of proper application, of such general standards. Although they differ in their accounts of what these standards are or should be,

both take them to be universal, independent of specific theories or "world views", and independent of time context. In this sense, Hanson's view of "theory-loaded" observation data and rejection of the existence of a theory-neutral observation language (HANSON, 1958); the difficulties involved in conclusively confirming or falsifying scientific theories (cf.Part I); Kuhn's arguments supporting the relativism of scientific knowledge (KUHN, 1962/1970); Feyerabend's objections to the restrictive influence that adherence to strict methodological principles may have upon the advancement of science, and his advocacy of anarchism "as an excellent foundation for epistemology" (FEYERABEND, 1970: pp.17-130); all tend to challenge the above assumptions of objectivity and rationality adopted by Positivists and Realists alike.

Notwithstanding these common elements in the Positivist and Realist positions, the basic principle of the Realist philosophy of science, viz. that perception enables access to things and experimental activity provides access to structures and mechanisms that exist independently of ourselves, has important epistemological implications which are essentially different from the Positivist view. This principle, when fully expounded, entails a different account of necessity and causation in nature, and a different conception of explanation and prediction to those of Positivism. The realist view places emphasis on causal explanation by means of the discovery of the mechanisms which cause the observed phenomena. Rejecting the Humean theory of causation Harré introduces a "generative theory of causality"as a viable alternative to it. This "generative theory" postulates that: " (i) The cause produces the effect by the working of some mechanism. (ii) Given the cause it is naturally necessary

that the event will occur, i.e. the effect must occur unless something interferes. (iii) The connection between cause and effect is real, and is the causal mechanism" (HARRE, 1972: p.136); (emphasis added).

In this view, explanation is not the establishment of regularities but of necessary connections between phenomena. The discovery of a regular relationship (i.e. temporal precedence and regular succession) between two kinds of phenomena is only one kind of evidence that phenomena are causally connected. The constant conjuction of phenomena (or events) is a necessary but not sufficient condition for a causal law (BHASKAR, 1975: pp.10; 12). In addition, some intervening mechanism has to be discovered which causally links the phenomena in question; and the nature of this causal mechanism is the subject of scientific investigations. Thus, explanation is achieved by acquiring knowledge of the underlying structures and mechanisms at work which produce the observed phenomena. This involves the postulation of the existence of entities and processes that are not familiar; but this is claimed to be the only way of moving beyond mere appearances of things to their natures and essences. The realist account of scientific explanation, therefore, states that answers to "why-questions" (causal explanations) require answers to "how-questions"(which show the way in which structures and mechanisms respond to some change which in turn require answers to "what-questions" (that is, the discovery)of what the nature and essences of the entities involved are) (KEAT and URRY, 1975: p.31).

According to Harré, the clarity of the realist views is helped by the introduction of two concepts, those of reference and demonstration. Reference to entities is made with words which can be understood

separately from the entities they are used to talk about: whether or not those entities can be observed or presently shown to one. Demonstration (and the closely related "indication") differs from reference in that it involves an act typically performed by the gesture of pointing out an entity which cannot be indicated in its absence, but only in its presence. If an entity is indicated, then this is "the final, incontrovertible proof of its existence". It is possible to refer to many things which it is not possible to indicate. But if a thing previously referred to, is demonstrated (on some occasion), then this is proof of that thing's existence. In this sense, the concept of reference to some entity suggests a hypothesis that that entity exists; whereas demonstration of some entity constitutes proof that that entity exists. Now, the realist view does not state that every hypothetical entity exists (i.e. can be demonstrated): all it needs maintain is that some hypothetical entities are real. The realist principles are described by Harré as follows (HARRE, 1972: pp.90-91; 99):

"1. Some theoretical terms can be used to make reference (verbal) to hypothetical entities.

2. Some hypothetical entities are candidates for existence (i.e. some could be real things, qualities, and processes in the world).

3. Some candidates for existence, for reality, are demonstrable, i.e. can be indicated by some sort of gesture of pointing in the appropriate conditions".

These principles reveal a fundamental difference between the positivist and realist position with regard to the theoretical/observational dichotomy. Realism rejects the claim about the "ontological privilege" of the language of observation. Things that exist, or can be hypothesised to exist, should not be restricted only to those things

that can be observed or known with a high degree of certainty (as the Positivists would claim). Thus, the ontological commitments of a scientific theory are not limited only to those made in observational statements. Some theoretical terms can be used tc make reference to hypothetical entities; and some of these latter are "candidates for existence", and some of them are demonstrable. As to the epistemological privilege of the observation language, realists might accept that the truth or falsity of observational statements can be ascertained with greater certainty than that of theoretical statements (KEAT and URRY, 1975: p.37).

The problem of theoretical terms arises in the context of Positivism as a result of the positivist "criterion of scientificity" which is involved in order to distinguish scientific from non-scientific statements. According to this general principle a statement is scientific only if it is possible to assess its truth or falsity by way of direct observation. However, since theoretical statements contain terms that refer to non-observable entities, correspondence rules are applied as a way of solving the problem of testing theoretical statements by providing definitions for theoretical terms in terms of observables. If realists do not reject the whole concept of a general "criterion" of scientificity", and attempt to develop an alternative criterion, then such a criterion might be derived from the positivist general principle through certain modifications. Thus, the principle: "A statement is scientific only if it is possible to make observations that would count in some way for or against its truth or falsity" would allow acceptance of theoretical statements "at their face value" and render unnecessary their translation into the language of observables (KEAT and URRY, 1975: pp.37-38). Realists may give accounts of theoretical terms in a number of ways.

For example, it may be argued that the meaning of a theoretical term might be related by analogy to a term whose meaning is already understood; and this is often achieved by employing a model. Another approach may be to define a theoretical term by employing other terms that are already understood in some observational context, assuming that the meanings of the latter terms remain relatively unchanged in their non-observational uses (KEAT and URRY, 1975: pp.39-40).

The realist position on the purpose of scientific theories stresses their role in providing causal explanations of observable phenomena and of the regularities that obtain in them. Moreover, theories should refer to the underlying structures and mechanisms which causally generate the observable phenomena. Description of structures and mechanisms and of their operation in the process of generating the phenomena under observation will enable explanation of these phenomena. The statements of the theory are said to be true or false. It is not maintained that every statement in a theory is to be assessed instantly as either true or false; only that "since some theoretical statements have been judged true or false, other such statements can, in principle, come under that sort of judgment". Further, some of the hypothetical entities referred to in a theory do exist, are real, provided they can be demonstrated. However, other theoretical terms in a theory may be nothing more than illustrative or summarised versions of more complex expressions (HARRE, 1972: pp. 90-91).

The process of theory development in the context of Realism is discussed in the main text (Part II) of the dissertation. Very roughly, a model is first constructed in which structures and mechanisms that are causally responsible for the phenomena of interest are hypothsised, often

by way of analogy with some familiar source. In this sense, the model could be regarded as a hypothesis, much like the hypotheses of the hypothetico-deductive method, which should be tested by deducing its observable consequences. However, the realist view of the model as a hypothesis for testing does not take the model to be purely conjectural, in the manner of the classical account of the hypothetico-deductive method. Instead, it emphasises the analogical relationships that may exist between the model and some familiar source (domain of phenomena). Further, a model in the realist sense employs theoretical terms which may involve ontological commitments about the real existence of some underlying structures and mechanisms: that is, the existence of unobservable entities, which the positivists would reject. Unless such important differences between the models of the realists and the hypotheses of the deductivists are made explicit, it is misleading to state that the realist account of theory development involves the use of the hypothetico-deductive method. Thus, in the realist view the model is tested as a hypothetical description of actually existing entities and their relations. Such an approach must reject the inductive-deductive method of scientific inquiry (referred to in Part I) irrespective of the realist view of the "problem of induction". Inductive arguments can never justify the postulation of unobservable entities which is entailed in the realist version of model building.

REFERENCES: the preceding account of Realism is a far from exhaustive review of some of the realist views that are relevant in the context of a discussion of models in scientific inquiries. It is based mainly on: (KEAT and URRY, 1975); (HARRE, 1970); (HARRE, 1972); (BHASKAR, 1975); (in order of credits due to each work). Other sources that have been referred to or consulted are:

(BUNGE, 1959); (FEYERABEND, 1970); (HANSON, 1958); (HIRST, 1967); (KUHN, 1962/1970); (LACEY, 1976); (MACKINNON, 1972);(MACKINNON, 1975); (BUNGE, 1944); (SMART, 1963); (URMSON, 1960); (WALLACE, 1972/1974); (WARTOFSKY, 1968); (YOLTON, 1968/1973); (STANILAND, 1973).

(16) Ideal types

The notion of"ideal type" was introduced by Max Weber (WEBER, 1949: pp.89-112) to describe a process of reasoning in social science, concerning a kind of entity which it is known could never have existed. Consider, for example, the concept of "economic man" which is widely used in economics. It is acknowledged that this type of "man" (who is a rational decision maker, intent on maximising some presupposed criterion of utility, and in possession of full knowledge about the available courses of action and their consequences) neither exists nor could, in principle, be observed. Yet "he" has been the central, albeit typically fictional, figure in classical economics. This concept is an "ideal type" which has been regarded useful in understanding economic phenomena and in advancing hypotheses about them. Use of such concepts is not restricted to social science: the case of the "point mass" concept in Newton's laws of universal gravitation in an example from natural science (RYAN, 1970: p.92).

"Ideal type" theories are frequently encountered in many social scientific contexts. They postulate entities and processes which could not possibly occur in the real world and hence could not be observed even in principle. It is noted that arguments raised in connection with the ontological status of processes in such

theories, that is, whether these processes are "real" in any sense or are mere conventions, tend to reflect the prevailing state of scientific knowledge. For example, Newton's idea of gravitational attraction encountered serious difficulties in its initial acceptance because the mechanistic paradigm of science prevailing at the time did not allow for concepts such as "action at a distance" advanced in Newton's theoretical schema (RYAN, 1970: p.91). In an extreme formalist view, such theoretical (i.e. non-observable) terms are nothing more than arbitrary names for certain parts of the deductive machinery of the theory. They must be divested of any associations with some other entity or system -- e.g. some model -- which is intelligible independently of the explanandum, in the deductive system of the theory. In a less extreme view, these theoretical concepts acquire meaning which is wholly derived from the empirical consequences drawn from the theory. Their meaning is regarded as implicit or contextual, rather than explicit as is the case with observational concepts (BRAITHWAITE, 1962: pp.230-231). It is argued that this contextualist account remains controversial and that the notion of "contextual meaning" has not been fully explicated (HESSE, 1967[b]: p.358).

(17) Description versus explanation

Discussions of the logic of scientific inquiry often consider how explanation of an occurrence relates to a description of it. There is much contentious argument regarding whether or not description and explanation differ in any important sense. The view taken of science and scientific activity seems to influence the opinions

of philosophers of science on this matter. The issues involved in the debate are complex and have implications for the scientific enterprise as a whole. Obviously, it is not possible to discuss the subject fully, even in summarised form, in the context of this note. Only some aspects of the discussion are given brief consideration below (those that are taken to have a bearing on the general theme of this dissertation); and there are as yet no conclusive answers to the manifold issues being raised herein. As stated in the main text (cf. Part I), the usual way to contrast description and explanation is in terms of the kinds of questions each provides answers to in scientific inquiry. Descritpion is taken to answer "what-questions" -- and, in certain cases, "how-questions"; explanation answers "how-questions" and more often (some say always) "why-questions". Writers often refer to"mere descriptions" in contradistinction to more general explanatory statements which contain scientific laws (or theories) as well as descriptive statements describing what is the particular case.

Both description and explanation are essentially linguistic activities. Pictures and diagrams may respectively take their place,but the degree of ambiguity involved in such usage is narrowed down by employing words or conventionalised symbols (HARRE, 1960: p.4). The logical steps involved in the process of description have been identified by the German mathematical logician Gottlob Frege (1848-1925) as follows: (i) selection of something to be the subject of the description and (ii) recognition of the thing selected as belonging to a certain kind or as possessing a certain property. The expression in a suitable linguistic form of this <u>selection</u> and <u>recognition</u> is a <u>description</u> (HARRE, 1960: p.8). To formulate a description of a

happening it is essential to distinguish certain features of the happening: properties and relations of things to be described. All description depends on such distinguishing of features, which has been broadly called abstraction (GIBSON, 1960: pp.4; 8). It is argued that description of some happening or thing is always abstractive -- i.e. deliberately incomplete and partial -- for it is never certain that all the features of anything to be described (not just those that are taken to be relevant from some point of view or for the purpose at hand) have been distinguished (HAMPSHIRE, 1959: Ch.I); (BUNGE, 1967: p.56); (GIBSON, 1960: p.8); (RESCHER, 1970: pp.23-24). Even if it were possible to make certain of a "complete" description of a given occurrence, it would not be very useful in the context of scientific inquiry for not all the information provided could be relevant to the aims of the inquiry (BUNGE, 1967: p.56). Moreover, "descriptions of observations cannot be entirely independent of theory either in form of in content", and "both scientific and metaphysical theories enter into descriptions" (HARRE, 1972: p.25). Since theorising is never completed, absolutely accurate and complete descriptions are not possible (BUNGE, 1967: p.56): changes in the theories will involve changes in the way observables are described. Such arguments are also employed to suggest that the distinction between observational (i.e. purely descriptive) and theoretical vocabularies or languages, which is advanced by certain empiricist philosophers, is untenable (cf. Part I ; Part II ; and this Appendix, entry: "Positivism"; "Realism").

Scientific explanation is briefly discussed in the main text (Part II). For the purposes of this note suffice it to state that from among the several views on the logical structure and content of scientific

explanation, the one associated with the "covering law model" still commands relatively greater support. On this account, an explanation should state general laws and initial conditions which together logically entail what is to be explained (i.e. the explanandum). Thus, the explanandum is deduced from(is a logical consequence of) certain premisses which are called "the explanans"; or, to put it in a different way, it involves the subsumption of the facts to be explained under tested and confirmed general laws (RESCHER, 1970: p.10). Two different kinds of premisses are involved in this view of scientific explanation: universal laws (generalisations, theories) and initial conditons. The latter provide descriptive information for they are sentences describing in relevant detail what pertains to the particular case. They "never suffice by themselves as an explanation"; at least one universal law is always required as well. Any explanation which is based on initial conditions alone would be incomplete. However, not every explanation which conforms to the "covering law model" is also an adequate explanation. A satisfactory explanation would further involve submitting the universal law on which it is founded to test cases which are <u>independent of the explanandum</u> (POPPER, 1972: pp.349-352). This means that a satisfactory explanation involves theory; and such explanatory theory must always <u>assert more</u> than what was already contained in the explanandum -- more than the"mere" description of the empirical facts of the occurrence to be explained. It must transcend the empirical instances which gave rise to the theory; for if it does not it merely leads to circular explanations (ibid.: p.355). Theories clearly differ from descriptions of the observations they are invoked to explain (HARRE, 1972: p.26). This view suggest that a detailed description of some occurrence is insufficient in itself to obtain proper scientific knowledge of the occurrence. It informs on what has happened; but science is also

interested in what might happen and what cannot happen; and this can only be conjectured by employing some theory. The latter will provide a coherent and cohesive account of the particular facts that are separately given in experience. The theory will bind together the separate empirical facts -- something that their "mere" description cannot do (BUNGE, 1967: p.56).

Various kinds of scientific explanation can be distinguished according to the principles employed. For example, one principle might be "the strength of the explanatory link between explanans and explanandum" (RESCHER, 1970: p.20). Explanations which involve laws of the kind "all A's are B's" are called <u>deductive-nomological</u> for they "effect a deductive subsumption of the explanandum under principles that have the character of general laws" (HEMPEL, 1965: p.337). Another important kind of scientific explanation is the one which involves laws of the sort "a proportion of A's are B's". Such laws are referred to as statistical or probabilistic in contrast to general or universal laws; and explanation which makes use of theoretical principles of a statistical form has come to be called "statistical explanation" (ibid.: pp.376-380). In this kind of explanation, the materials employed to form the explanans render the explanandum <u>probable</u> rather than <u>certain</u> -- subject to the premisses. Hempel further divides statistical explanations into <u>deductive-statistical</u> and <u>inductive-statistical</u>. The former "involve the deduction of a statement in the form of a statistical law from an explanans that contains indispensably at least one law or theoretical principle of statistical form" (ibid.: p.381). The so-called inductive-statistical explanation is explicated in the main text (Part II); cf. also this Appendix, entry: "Positivism".

Another principle employed to distinguish scientific explanations is the "conceptual machinery ...used in the explanatory account" (RESCHER, 1970: p.20). Thus, there are explanations in terms of "causes", so-called "causal explanations"; in terms of motives,purposes, functions, (especially in the human sciences) -- so-called,respectively, "motivational", "teleological", and "functional" explanations. Scientific explanations are often taken to present a"cause" (reason), or something logically prior to the explanandum in the system concerned, in which case they are referred to as "causal explanations". There is no general agreement on causal explanations since all views come up against one of the fundamental questions of philosophy and science: the problem of causation. Various contrasting theses on causation have already been considered (cf.this Appendix, entries: "Empiricism", "Positivism", for the Humean view of causation as "constant conjunction of events"; and entry "Realism", for a rival view which recognises "necessity in nature" -- viz. Harré's "generative theory of causality"). On Popper's account of scientific explanation,use of the term "cause" to refer to the state of affairs described by the singular initial conditions (in the "covering law model"), and of the term "effect" to refer to the state of affairs described by the explanandum is better avoided. The theory or the law involved in the explanation constitutes the logical link between "cause" and "effect" (POPPER, 1972: p.352). In another view (LAMBERT and BRITTAN, 1970: p.37), "to explain some event is not simply to subsume it, deductively or inductively,under some true generalisation, but to subsume it under a 'causal law'." But this requires a definition of the notion of "causal law", which presents a number of problems (ibid.: p.37 ff.).

A conception of explanation in terms of "reasons" (or "causes") is also advanced by Harré. On his account, explanation of a particular

occurrence has the following characteristics: (i) it gives reasons for the occurrence by mentioning some characteristic(s) of the antecedent situation; (ii) it either implies or directly states the relevance of these characteristics to the occurrence concerned (HARRE, 1960: p. 26). Different kinds of explanation result depending on the way in which the above requirements are satisfied. To explain a particular happening it is necessary to isolate the conditions under which it occurs. A logical condition for this isolation is the existence of some generalisation (some law) linking the happening in question with other occurrences which could be settled on as whole or part "causes" of the happening. However, when the problem is to explain types or whole classes of occurrences rather than particular happenings, explanation must be beyond the isolation of particular causal conditions, and must enable understanding. This can be achieved either by discovering some illuminating analogy to the phenomena whose character is not understood, or by exposing a hidden mechanism the workings of which inevitably result in the occurrences to be explained; or by doing both of these things.

The role played by models in this conception of scientific explanation is, therefore, highly important (cf. main text, PartII : "the explanatory function of models") (HARRE, 1960: p.82). This view of explanation suggests the following distinction between it and description. In giving an explanation, the explanatory material must be on a different logical level from what is to be explained, which must be seen, in one of many different ways, as a consequence of it. In contrast, in giving a description, the material is all on one level: observables are linked without introducing concepts of which the particular values of observables would be a consequence (ibid.: p.83). Thus, "a scientific explanation is not just an account of the conditions under which

phenomena occur, but must include an account of the means by which, in those conditions, the effects are brought about ..." (HARRE, 1972: p.33); and "... to explain some pattern of happenings, we must be able to describe the causal mechanism which is responsible for it" (ibid.: p.178). Such causal mechanisms are, in general first hypothesised or imagined rather than discovered initially by observation. Their features and properties may be derived by analogy with entities already known. These hypothesised or imagined entities are represented by models (cf. main text, Part II : "Realist view of models and scientific method"). In this view, description and explanation, on the one side, and observation and theory, on the other side, "are neatly distinguished aspects of the same distinction. What is observed can be described,if the resources of language are equal to it, and typically one makes use of theory in giving scientific explanations. It is hardly a scientific explanation of phenomena merely to describe some other phenomena with which they are associated, unless one has some conception of how this association comes about. Then that conception is what is really doing the explaining and is the heart of the theory" (ibid.: p.24) (emphasis added).

On another account of scientific explanation, the so-called "pattern model" (KAPLAN, 1964: p.329 ff), explanation performs something else than the mere description of what it is explaining and may be seen as a "concatenated description". However, it fulfils its task "not by invoking something beyond what might be described but by putting one fact or law into relation with others. Because of the concatenation, each element of what is being described shines, as it were, with light reflected from all the others; it is because they come to a common focus that together they throw light on what is being explained" (ibid.: p.329). Thus descriptions only describe something: "they do

not put it into relation with other processes or events" (ibid.: p.330).

The last two views of scientific explanation referred to above seem to be founded on a conceptualist account of scientific laws, according to which universals (cf. this Appendix, entry: "Realism", discussion of "universals")are neither real entities existing independently of the particular facts in some ideal realm nor mere names or conventional marks for a set of particular facts. In this view, the statement of relations between particular facts goes beyond the facts by contributing something more than the mere listing of the particulars. This "surplus element" is the discovered order or relation among the particulars; it is that in virtue of which these particulars permit themselves to be grouped commonly. The mind discovers and makes explicit the connections which are implicit in the particular facts. The "universal"(or law) is, therefore, conceptualised as the order which is revealed by inquiry; it is constructed in the mind.

In one version of this view a law of nature is taken to be in nature but not apart from the particular and concrete processes of nature. Relations among particular facts are potential and are actualised by the process of conceptual discovery and construction. They are implicit in the real relations among events; and the mind makes explicit such relations or order by creating an ideal imitation of nature (a model of nature). Scientific laws represent natural processes in the form in which these become known through reasoning or conceptual judgment. On a conceptualist account of scientific laws, "a law explains in the sense that what is implicit in experience is brought into conscious and explicit form as an object of the understanding ... Explaining and bringing to conscious understanding

or to explicit conceptual formulation are thus one and the same" (WARTOFSKY, 1968: pp.252-258).

The view of scientific explanation which takes it to be the reduction of the unfamiliar to the familiar is one version of the conceptualist account of laws as explanations of particular occurrences. Moreover, it often takes models and analogies to be important aids in understanding and explanation for they help reduce an unfamiliar set of relations (rather than discrete and isolated events) to some familiar configuration (ibid.: p.258).

Certain older philosophical schools (e.g. older versions of positivism) reject "reasons" and"causes" in scientific explanation for they view these notions as transcending empirical fact (KAPLAN, 1964: p.329). For them, science should restrict itself to providing complete and parsimonious descriptions of factual or possible phenomena in the best way it can. Scientific inquiry, they argue, should not address itself to answering "why-questions" but only "how-questions". In this view, explanation would be dispensable or even misleading. This position has been referred to as "descriptivism" (BUNGE, 1967: p.54); it has appeared in different versions. In one, radical version, only observations and inventories of observation reports are accepted in science; and, at most, hypotheses which summarise such observational data. There is the scientist, and there is the world, "as it is" : a complex of facts in a multitude of relationships with each other. These relationships will reveal themselves in any degree of detail if they are subjected to a systematic method of classification, which will make possible the description of observed regularities in terms of lawlike generalisations. Science is conceived as a method of

abridging the recording of experiences; as descriptive generalisation from brute facts; as a one way movement of thought from facts to laws. Approached without mystification, the observable facts must display the properties that are intrinsic to them, and independent of their perception or misperception by the observer.

This view is inimical towards hypotheses which transcend description of immediately observable occurrences and attribute to the facts unobservable properties (or essences). It rejects intuitive leaps beyond the strictly observable -- the sort of "bold hypotheses", advocated by Popper, "that open up, if possible, new domains of observations" (POPPER, 1972: p.355) -- in favour of "careful generalisations from 'given' observations" (ibid.). Popper calls this view "positivistic , naively empiricist (or inductivist)" (ibid.). Moreover, this view rejects the sort of hypothesising which would offer an explanation of some occurrence by positing some underlying structure or mechanism generative of the occurrence in question. Such "naive empiricist" views claim that there is no distinction between description and explanation. For an "exhaustive" description would leave nothing to be explained. Thinkers espousing this view, such as Ernst Mach (1838-1916) with his version of positivism, claim that rigorous identification of the facts and their observable connections in itself constitutes explanation (KOLAKOWSKI, 1972: Ch.6).

This derives from a nominalist view of scientific laws, according to which universals (cf. Appendix, entry: "Realism", discussion of "universals") are the mere aggregation of concrete particulars. Thus, a scientific law which purports to account for a set of particular facts is taken to be only a convenient shorthand description or summary of those facts. Therefore, laws cannot be said to explain at all --

if by explanation is meant an answer to a "why-question" which goes beyond the empirical facts. At most, a scientific law gives a description which is "true" of all the particular instances to which it applies. Now, the meaning of "true" in this context is no more than "adequately described". The law stands as a conveninent mark or name understood by means of some linguistic convention. It is just the same principle as that employed by legal experts in legal documents -- viz. to give a name (some descriptive sentence) to the party which consists of a number of individuals (or organisations), which is subsequently used in the remainder of the document instead of all and only those individuals to whom it applies.

The so-called "radical descriptivist" view is not easily to be found in the writings of contemporary philosophers of science. In another, more moderate (or liberal)version of"descriptivism " -- which Bunge refers to as "black-boxism", and takes it to be linked to the philosophical outlooks known as "conventionalism" (cf. Part I; also this Appendix) and "instrumentalism" (q.v. in this Appendix) (BUNGE, 1967: pp.54-55) -- it is contended that the inventories of observation reports which science consists (or should consist) of should be adequate and economic rather than true: they must consist of compressed empirical information. On this account, science cannot represent reality -- cannot build a "picture" of the world -- nor is it natural history in the sense of carrying out a continuous accumulation of facts. Science may systematise experience and predict it. This view, unlike "radical descriptivism", does recognise the artificial element in conceptualisation -- the so-called "contribution of the knower to the known". The scientist is seen as conceptualising empirical realities by employing a range of pragmatic, aesthetic, and other criteria rather than

formulating concepts and verbal designations which are simply forced upon him by observational evidence. Thus, hypotheses and theories which transcend the facts may be allowed in this version of "descriptivism", "as long as they are not assigned any meaning beyond what can be observed" (BUNGE, 1967: p.54).

While in the radical version of "descriptivism" there is no place for explanation beyond "exhaustive" description of the facts, in its moderate version this outlook "allows subsumptive explanation (i.e. logical subsumption of the explanandum under some law) while calling it description"; and rejects scientific explanation which is based on hypothesised structures and mechanisms underlying the observable facts -- which Bunge calls "interpretive explanation" and sees it as an attempt to " get an insight into the'inner workings of things' " (BUNGE, 1967: pp.26; 55). On the "moderate descriptivist" account, the empirical data can be described in different ways, from different purposes. This does leave a certain flexibility for interpretation of the empirical material. There may be alternative and logically acceptable descriptions of the same set of experiences. These would not claim to be comprehensive (or exhaustive) descriptions or explanations of all available facts, but would describe relationships in order to answer specific questions of the facts concerned. "Theoretical descriptions" of this sort might be taken as "computational engines" or "instruments" to be employed in attaining specific scientific goals such as prediction. There would be no reason to sharply distinguish such "theoretical descriptions" -- which presuppose a temporary commitment to some theory or theories -- from subsumptive explanations for "in this sense, accurate theoretical description is a kind of explanation" (ibid.: pp.26; 58).

To sum up the preceding discussion, various accounts of scientific explanation have been put forward. The way in which the relations of laws to their instantiations is conceived -- i.e. the relation of "universals" to "particulars" -- has a bearing on the sense in which laws will be taken as explanation of particular events or occurrences. Accounts of scientific explanation have been advanced in metaphorical, psychological, or metaphysical terms -- i.e. changing the unfamiliar to the familiar, removing perplexity, or giving the causes of an event or class of events (NIDDITCH, 1968: p.3); (MORGENBESSER, 1968: p.117). It may be argued that the first two approaches emphasise the psychological conditions obtaining in the search for an explanation in preference over the formulation of an analysis in logical terms which is represented by the "deductive-nomological model" of scientific explanation. Explanation in terms of causes does not suffer from "psychologism"; but it "cannot count as an adequate theory of explanation. At best it is a partial account of the explanation of events, but not of regularities, dispositions, and other types of phenomena ..." (MORGENBESSER, 1968: p.117). However, if it is accepted that " a causal statement entails a lawlike one ... then the approach to explanation which emphasises causation is compatible with the deductive and nomological models" (ibid.: p.118). Moreover, what gets explained in scientific explanation is <u>not</u> an event as such, but certain relevant aspects of it; that is, "not the event itself ... but the event <u>under a given description"</u> (ibid.: p.121) (emphasis added). Thus, more refined descriptions of an event may result in new or revised explanations even though an adequate explanation of that event could be provided on the basis of a more rough or partial description.

It is possible to distinguish three broad positions on the issue of "description versus explanation", each of which corresponds to a particular view of science and scientific theorising: (1) descriptivism, which originates from a phenomenalist version of positivism (q.v. this Appendix); (2) instrumentalism, which is akin to a conventionalist view of science and which shares with descriptivism the view which rejects the realist intepretation of theoretical terms as referring to actually existing, even if unobservable, entities; and (3) realism, which shares with descriptivism the claim that scientific theories are assertions about the world and not mere instruments for computation and prediction as is argued in the instrumentalist account of theories. These positions are briefly discussed in this Appendix under the respective entries : "Positivism", "Instrumentalism", and "Realism". The views expounded within each of these positions with regard to scientific theories are referred to, very concisely, below.

(1) The so-called descriptivist position (NAGEL, 1961: pp.118-129) originates in a version of positivism -- that of so-called phenomenalism -- which reflects a radical empiricist view of science. In its modern form, phenomenalism is an extreme version of empiricism which claims that material-object statements are reducible to or translatable into statements about directly observable facts (sense-data) (URMSON, 1960: p.291). Those scientific statements that are neither analytic nor empirical -- e.g. metaphysical statements -- are to be eliminated as meaningless (cf. this Appendix, entry: "Empiricism"; "Positivism and Logical Positivism"). On the descriptivist view, the logic of scientific inquiry is to provide only accurate descriptions of observable phenomena. A theory is taken

to be a convenient and memory assisting device describing empirical reality. Theories may be couched in terms referring to observables and in terms referring to non-observables (i.e. theoretical terms), but the latter terms must be reduced to the former. The"language of observation" is claimed to be epistemologically and ontologically prior to the "language of theory". The desired relationship between a theory and its assumptions and consequences is (ideally) one of logical equivalence : a theory has to be logically equivalent to statements of facts (observational reports). One way of achieving logical equivalence is by reducing theoretical terms to terms referring to observables by means of correspondence rules (q.v. in this Appendix), or bridge statements.

On the descriptivist account, so-called "explanatory theory" is taken to be an honorific title given to a theory which provides better description of some domain of observables. This programme rejects apriorism -- a more precise term employed to refer to Rationalism (cf. this Appendix, entry "Empiricism") -- but is not being criticised for it. The main criticisms are focused on what the programme takes as an alternative to apriorism, that is, radical empiricism. The programme of establishing logical equivalence between theories and observational reports was shown to be impossible to achieve because of insurmountable logical and epistemological difficulties. Firstly, on logical grounds, the logical form of a theory precludes the latter's logical equivalence to a set of observational statements. A theory includes at least one unrestricted universal statement of the form: "For all x, if x is A, then X is B"; no spatial and temporal coordinates are specified in this universal statement. An observational statement (or basic statement), on the other hand, has the form: "There exists an x with property A, at place s -- time t ";

and this specifies spatio-temporal coordinates. It is a singular existential statement specifying that something exists or occurs at a certain place and date. Since an unrestricted universal statement (theory) is not equivalent to a finite conjunction of observational statements (basic statements), a theory is not logically equivalent to a set of observational statements (POPPER, 1959/1972: sect. 28-29).

The conditions which a theory has to satisfy in order to be rightly called explanatory have been discussed in (POPPER, 1959/1972) and (POPPER, 1963). Very roughly, the explanans -- viz. the set of statements which do the explaining, the axiom set -- must logically entail the explanandum -- viz. the set of statements which are to be explained. The explanans must not be known to be false and must be testable independently of the explanandum. This implies that the explanans must have testable consequences over and above those in the explanandum. Thus, the explanans must be richer in explanatory power and empirical content than the explanandum. Further, the explanans must also include at leastone universal law -- to preclude "ad hoc" explanations. Now, an explanans which is logically equivalent to the explanandum has no surplus empirical content, but is merely a restatement of the explanandum. There is no evidence for the explanans apart from that for the explanandum (POPPER, 1959/1972: ch.3); (POPPER, 1963: pp.385-388); (BRAITHWAITE, 1953: ch.3).

Secondly, on epistemological grounds, the view that there exists an independent observational language in which to ground theories and theoretical terms -- i.e. terms referring to non-observables -- has been shown to present serious difficulties and to be untenable (POPPER, 1959/1972: Appx. X); (ACHINSTEIN, 1968: chs. 3-6); (PUTNAM, 1962[a]);

(SUPPE, 1971: pp.57-76). The view that knowledge consists essentially of observational reports is incompatible with the generally accepted view that all observational terms are theory-laden (HANSON, 1958) (KUHN, 1962/1970); (LAKATOS and MUSGRAVE, 1970). Thus, descriptivism in its pursuit of pure descriptions designs a theory not to go beyond the facts : the theory consists in just a restatement of the facts.

(2) The position known as instrumentalism may be understood to result from descriptivist -- phenomenalist, positivist, operationalist (q.v. in this Appendix) -- criteria of meaning accepted either implicitly or explicitly by the proponents of the instrumentalist view of scientific theories. The thesis that a scientific theory is merely an instrument for deriving "observational predictions from other observational statements", known as instrumentalism (q.v. in this Appendix), is clearly described and extensively criticised in (POPPER, 1963: pp.97-119). On the instrumentalist account , a theory cannot be properly called true or false. It is never a descriptive, possibly true statement, but merely a mathematical tool for making predictions. It is tested only by the conformity of its predictions with observable facts. In this view, explanation is not among the aims of science, only description and prediction (ibid.). Taken as a descriptive account of science, this position has been strongly attacked as inadequate and false. Further, it is claimed to have a retarding effect on science and is characterised as obscurantist and anti-intellectual for not seeking to explain why the predicted results occur; and for not assigning importance to the truth or falsity of theoretical statements, but only to predictions. Although such predictions do "go beyond the facts", thus making this position different from the descriptivist account, the emphasis that is placed

on prediction discourages the raising of questions concerning the truth or falsity of a theory or its constituent propositions.

That prediction is the only goal of science is a generally disputed thesis. It is not clear whether science has only one goal and that prediction is that goal. Description (but not explanation); explanation (but going beyond mere description); explanation and prediction; have been viewed as goals of science. If predictive success were the only aim of science, the Ptolemaic theory of planetary motion might still be asserted to date for it is characterised by successful predictions. On the other side, the Copernican theory, at its initial introduction, was notably inferior to the Ptolemaic system in terms of predictive success; and even today the one theory cannot be chosen over the other on the grounds of predictive success alone.

Accepting the premises: (i) that science is not able to demonstrate the truth of its theories but only yield tentative, corrigible hypotheses, and (ii) that it is not possible to establish so-called "crucial experiments" to conclusively refute scientific laws and theories; instrumentalists such as Pierre Duhem (1861-1916) and Henri Poincaré (1854-1912) concluded that some (but not all) scientific laws and theories were nothing but terminological conventions, having no descriptive, empirical content. In this conventionalist view science should elaborate theories whose purpose is not to explain but simply to systematise phenomena in ways which science finds convenient. A law or theory found to be successful for predicting becomes analytic: nothing is any longer allowed to count as falsifying it.

On another version of instrumentalism, so-called"moderate instrumentalism", which differs from Popper's account of the instrumentalist thesis, it is accepted that scientific theories may contain -- apart from observational statements and empirical laws -- at least some theoretical statements which are either synthetic (empirical) though not equivalent to any observational sentences, or analytic, or else indeterminate, i.e. neither true nor false. Though some such sentences may be neither true nor false, they may still serve as premises in explanations of the deductive-nomological type, conceived as redescriptions of observable facts in the language of scientific metaphors or "fictions".

(3) In the realist view, theories are assertions about the world and not mere computational and predictive devices, and hence have to be assessed for their truth or falsity. Moreover, theoretical terms in theories may be interpreted as referring to actually existing, even if unobservable entities. The ontological commitments of a scientific theory are not limited only to those made in observational statements. The meaning of a theoretical term might be related by analogy to a term whose meaning is already understood, often by way of a model. The role of scientific theories is seen as one of providing causal explanations of observable phenomena and of the invariances that obtain in them. Theories are taken to be attempted descriptions of unobservable underlying structures and mechanisms and of the way these operate to generate the phenomena that are to be causally explained (however,see relevant footnote in last chapter of Part II). Such unobservable structures and mechanisms are said to be the "essence" of the concrete features of the phenomenal world, or world of appearances, and are to be depicted or represented in the language of description and symbolic representation.

Thus, there is a realm of underlying or essential realities, say, entities A and B whose essential properties are E. Then there is the realm of appearances, the universe of observable phenomena where A and B fall within the experience of the observer as a and b respectively, which are generated by A and B in this phenomenal realm. Finally a and b are expressed in the representational realm, viz. in the universe of descriptive language and symbolic representation, as α and β which symbolically represent or describe the underlying realities A and B. The essential properties, E, of A and B are described in the representational realm as ε which is the model or theory representing the essential properties of A and B. Thus, from ε and α one is said to be able to deduce β i.e. to explain with the help of ε WHY a leads to b, or is the CAUSE of b (POPPER, 1963: ch.3).

REFERENCES : (ACHINSTEIN, 1968); (BRAITHWAITE, 1953); (BUNGE, 1967); (GIBSON, 1960); (HAMPSHIRE, 1959); (HANSON, 1958); (HARRE, 1960); (HARRE, 1972); (HEMPEL, 1965); (KAPLAN, 1964); (KOLAKOWSKI, 1972); (KUHN, 1962/1970); (LAKATOS and MUSGRAVE, 1970); (LAMBERT and BRITTAN, 1970); (MORGENBESSER, 1968); (NAGEL, 1961); (NIDDITCH, 1968); (POPPER, 1959/1972); POPPER, 1963); (POPPER, 1972); (PUTNAM, 1962[a]); (RESCHER, 1970); (SUPPE, 1971); (URMSON, 1960); (WARTOFSKY, 1968).

(18) Naturalism (in the social sciences).

Naturalism in one of the senses of the term, is the doctrine which claims that the methods employed by the natural sciences, e.g. physics and chemistry, are the only legitimate or appropriate methods to be employed in scientific inquiries aimed at acquiring knowledge of any kind -- i.e. whether that knowledge relates to phenomena in the world of matter or in the world of man and society. Although naturalism in epistemology is not as simple as it is suggested by the preceding statement, most naturalist methodological programmes tend to share at least some form of the above claim. This may be seen by referring to : (i) the methodological programmes of Auguste Comte and J.S.Mill, in the nineteenth century; (ii) the "logic of science" of the Logical Positivists of the Vienna Circle, in the 1920s and 1930s; (iii) the so-called "methodological debate" in the social sciences -- begun in late nineteenth century and still ongoing -- which revolves around the question of whether thre is a common method of inquiry in the natural and social sciences; (iv) the anti-positivist, critical rationalist method of Karl Popper; (v) the version of "scientific method" advanced recently by neo-realist philosophers such as R.Harré (BHASKAR, 1975), and its application to social behaviour (HARRE and SECORD, 1972), sociology (KEAT and URRY, 1975), social anthropology (HANSON, 1975); and (vi) the pragmatist (instrumentalist) philosophy of John Dewey and related modern formulations by Quine (QUINE, 1969: pp.69-90).

Now, the differences between these methodological programmes are far greater than their common elements. This suggests that the principle

of the unity of method, or naturalism, presents many ambiguities. Different conceptions of the "method of science" -- each influenced by some particular view of science (POPPER, 1957/1961 : p.2) -- tend to generate widely divergent methodological programmes. Although the latter may appear to share the principle that problems, if solvable at all, are to be approached by means of the "method of science", they are seen to disagree as to the exact means of problem-solving and, consequently, as to the nature itself of problems for investigation. Such a situation can be exemplified by contrasting the programmes of, say, operationalism and anti-positivist philosophies (cf. this Appendix, entry: "Operationalism"; "Realism").

The principle of the unity of method in the natural and social sciences implies that the same methodological rules and conventions of the "experimental method" are to apply in social inquiries in so far as the social sciences claim to provide knowledge. Such an implication seems to preclude the use of other methods that might be taken to be appropriate to the study of man and society -- methods such as intuitive or interpretative understanding, so-called "verstehen", empathy, hermeneutic understanding, etc. However, there does not seem to be a common standard of the "method of science" which is shared by all proponents of naturalistic methodological monism in social science. For instance, Karl Popper's anti-positivist naturalism advances the rules of hypotheticism (conjectures) together with the principle of rationality and social engineering (POPPER, 1957/1961); (POPPER, 1972: ch. 6). In contrast, the anti-positivist, anti-behaviourist naturalism endorsed by Noam Chomsky in the field of linguistics (cf. Appendix to Part I) views the "experimental method" from an "apriorist",rationalist perspective and accepts at least some 'a priori' knowledge.

Chomsky's claims would be strongly contested by other anti-positivist naturalists for such claims would come into conflict with views held by most naturalists, viz. that extra-scientific or supra-scientific methods -- "apriorist" and irrationalist methods -- are not valid in the social sciences and cannot be prior and superior to the "methods of science". Notwithstanding this agreement among naturalists, there are lengthy debates involving many naturalists and originating from their different conceptions of science and its methods. Thus, on the one side, there are writers who emphasise the role played by philosophical , sociological, and historical elements in the advancement of knowledge and criticise those who espouse the approach of rational reconstruction for its producing unrealistic or even fictitious results (cf. main text, Part I).

On the other side, there are those who contend that the "logic of science" should not be attributed non-rational, external elements, such as political, sociological, and economic. Aspects of these debates may be seen in the Kuhn/Popper controversy regarding the growth of knowledge -- though disagreement between Kuhn and Popper does not seem to be due so much to issues concerning the logical structure of the results of scientific inquiries as to diverging views on "the dynamic process by which scientific knowledge is acquired" (KUHN, 1970: p.1). It does not seem to be possible to adjudge between naturalism and its alternatives by reference to some account of the "method of science" for there are many such accounts which appear incompatible with one another since they derive from different views of science and epistemology. Further, deciding which of these accounts to accept would again involve some version of the "method of science"; and this leads to infinite regress.

Alternatively, it might be suggested that all available accounts of "scientific method" should be ignored in favour of direct study of practising scientists "doing science". Their methods could then be employed in accordance with the naturalist programme. However, a new problem emerges in this case for it is not obvious whether or not the methods applied by any one scientist are informed by, or are in accordance with, any "prior philosophies". Hence it appears that the adoption of the naturalist doctrine in the social sciences may ultimately be a question of choice -- an irreducible, 'a priori' element of both science and philosophy (GIEDYMIN, 1972).

Methodological naturalism is frequently, but erroneously, identified with positivism in contemporary anti-postitivist literature on the subject of the "methodological debate" in the social sciences. Equally misleading is the tendency to identify anti-positivist social thinkers with methodological anti-naturalists. Given that the main argument of methodological naturalism is that both the natural and the social sciences have the same aims and methods, confusion arises when these aims and methods are viewed in different ways by, say, phenomenalists, instrumentalists, or realists. The existence of such divergent conceptions of science and "scientific method" renders ambiguous the principal contention of methodological naturalism. For <u>to argue in favour of that methodological doctrine in the social sciences involves as much ways of looking at the social sciences as ways of looking at the natural sciences.</u> Thus, one might conceive of positivist, conventionalist, or realist versions of methodological naturalism in the social sciences, each of such versions being different from the others.

Many anti-naturalist discussions in the context of the "methodological debate" tend to neglect these issues and present grossly oversimplified accounts of the various naturalist and/or positivist views they endeavour to criticise. A taken-for-granted identification of methodological naturalism with positivism may be said to be defective in two respects. (1) By so conceiving of positivism, it renders the designation of this position inapplicable to those positivist writers who have never stated explicitly and systematically any views on the methods and aims of the social sciences but have restricted their attention to natural science alone. For a view of science may be called positivist even if it endorses one or more positivist doctrines and excludes considerations of methodology in the social science. (2) It creates confusion and ambiguity by failing to recognise that a position of methodological naturalism can be maintained without it being necessarily connected with any other positivist tenets. Examples of such positions are those which can be characterised as anti-positivist naturalist, such as the views of Popper and his followers, or the position of neo-realists such as Harré (cf. Appendix, entry: "Realism"), or that of Chomsky and his associates (cf. Appendix to Part I).

Further, there are those writers who subscribe to most of the positivist doctrines but excluding methodological naturalism. Hence, it is necessary to distinguish such positions from the positivist naturalism of, say, Comte and Skinner (the latter's contribution to psychology being known as "behaviourism" -- cf. this Appendix, entry: "The Mind/Body Problem"); and to acknowledge the existence of other views which may be referred to as anti-positivist anti-naturalist and are reflected in the work of Winch, the phenomenologically oriented sociologists, or von Wright (WINCH, 1958); (SCHUTZ, 1967); (vonWRIGHT, 1971).

Many writers who endorse methodological naturalism in the social sciences may accept that descriptions of the phenomena of the social world need not be couched in phenomenalist or behaviourist terms. The latter correspond to an extreme form of empiricism which accepts as scientific only statements about directly observable facts and dismisses as meaningless sentences which are neither analytic nor synthetic (this Appendix, entries: "Empiricism"; "Positivism"; "Analytic and synthetic statements").

Moreover, explanations of social and human actions need not be couched in terms of a mechanistic context without reference to human goals, beliefs, values, intentions, available means and existing obstacles, institutional and/or political constraints, etc. These writers contend that many methodological and heuristic advantages accrue if a "practical" technological approach is adopted in the study of relations between means available and ends pursued by social agents. They are opposed by anti-naturalists who seem to have wrongly conflated methodological naturalism with (social) behaviourism, and who have failed to recognise that many modern naturalist theses appear to have been modified or abandoned their earlier behaviourist orientation.

The controversy between naturalism and anti-naturalism in the social sciences arises from the principal contention of methodological naturalists that the natural and the social sciences share basically the same goals and objectives as well as methods; and naturalists generally take the goals and methods of natural science to be prediction and explanation by means of empirical hypotheses. In contrast, the anti-naturalists' understanding of the goals and methods of the social sciences involves very specific features which are claimed to be peculiar to social phenomena and whose nature is compatible with

the nature of such phenomena. Hence they speak of explanation of individual actions in terms of intentions,beliefs,values,motives,etc. Putting aside certain approaches to social studies which appear to adopt full-blooded idealism,the dispute between methodological naturalists and anti-naturalists seems to be more apparent than real (GIEDYMIN, 1975).

REFERENCES : (BHASKAR, 1975); (GIEDYMIN, 1972); (GIEDYMIN, 1975); (HANSON, 1975); (HARRE, 1970); (HARRE, 1972); (HARRE and SECORD, 1972); (KEAT, 1971); (KEAT and URRY, 1975);(KUHN, 1970);(POPPER, 1957/1961); (POPPER, 1972);(QUINE, 1969); (SCHUTZ, 1967); (WINCH, 1958); (vonWRICHT, 1971).

(19) Linguistic philosophy.

This is comonly characterised as one variety of analytic philosophy -- the latter being a general term applicable to several philosophical movements more or less recent. Linguistic philosophy shares with those other movements -- such as the logical atomism of Russell and the "early" Wittgenstein of the "Tractatus", or the logical positivism of the Vienna Circle --a distrust towards metaphysical statements, a fragmented approach towards studying philosophical problems, and a belief in the existence of some specific method, viz. that of analysis, which if adhered to will provide secure results from philosophical investigations. Linguistic philosophy has followed the trend of twentieth century's philosophers' preoccupation with

the language in which the thinking of the mind is expressed -- as against the British Empiricists' concern with the analysis of ideas in the mind and of the way in which they are constituted by simple ideas acquired through the senses.

From the 1930s onwards, linguistic philosophers have pointed to the linguistic nature of the subject matter of philosophy. Wittgenstein has been one of the most influential figures in linguistic philosophy being the originator of two quite distinct movements. In his earlier work, he set out to discover the limits of meaning in terms of what could be thought and what could be said rather than dealing with what could be known as in traditional epistemology. The technical advances in formal mathematical logic, as exemplified in the pioneering contributions of Russell and Moore in the beginning of the twentieth century, enabled systematisation of linguistic investigations aimed at unmasking the secrets of notation and suggested exclusion of certain seemingly meaningful expressions (such as metaphysical statements) from the area of legitimate knowledge. In his later work, Wittgenstein abandoned his earlier view of formal logic as <u>the</u> instrument of analysis in favour of an informal style of linguistic investigation which is aimed at dissolving rather than solving philosophical problems. It endeavours to do this by dispelling puzzlement through clarification of the flexible rules of ordinary language and recognition of the many uses that language is put in many contexts of everyday life.

The view of language that is advanced in this account is at variance with the standard view of the empiricist tradition which sees it in terms of matching sentences to sensations or single observations and then building up from this a picture by adding grains of empirical

material culminating in an evaluation of the whole edifice. Rather, the actual employment of language is shown to be closely interwoven with the contexts of everyday life, social institutions, and customs. The movements which originated from the work of the later Wittgenstein and the Oxford ordinary language philosophers share the concern to unmask metaphysical theses which contradict common sense by showing that their propositions rely on reasoning which rests on mistaken assumptions about the actual use of everyday language.

These movements tend to attribute greater credibility to common sense -- seen as the source of general beliefs about the world which are normally accepted without querry in everyday life -- than other philosophical outlooks (e.g. logical positivism). Hence, in cases of conflict between common sense views about the world and the philosophers' accounts which often express sceptical doubts about such views, the variance is said by the ordinary language philosophers to occur because of misunderstandings of a linguistic nature. Wittgenstein's notion of "language as a form of life" and his reference to "language games"; and the tendency to seek to relate language usage and meaning to some particular social context and culture with its own rules for intentional human action, have informed a number of sociologically oriented studies of human conduct and associated critiques of the ideal of a science of society modelled on the natural sciences (usually on the logical positivist account of the natural sciences). The work of Peter Winch is notable in that area.

REFERENCES: (FOGELIN, 1976); (MUNDLE, 1970); (SELLARS, 1963); (URMSON, 1956); (WARNOCK, 1958); (WINCH, 1958); (WITTGENSTEIN, 1921/62); (WITTGENSTEIN, 1953/68); (AUSTIN, 1965).

(20) The Mind/Body problem.

The questions involved in considering aspects of freedom of the will and determinism in the conduct of human individuals clearly have bearings on the so-called "mind/body problem" and the kind of answer that is given to it. This problem has emerged from posing the question whether or not a difference may be postulated to exist between the mind (with consciousness occasionally being added to or substituted for it), on the one side, and the body and bodily phenomena, on the other side: between mental and physical events. There is today a whole branch of philosophy, known as "philosophy of mind", which investigates the various issues originating from the mind/body problem. All the different views that have been and are currently held regarding this problem seem to run into at least some kind of difficulty and, in this sense, none presents a foolproof, universally accepted solution to the problem. The nature of the discussions concerning these issues is highly technical and outside the scope of this dissertation. Nonetheless, a rough categorisation and explication of the most important views on this problem should prove informative especially in relation to the attitude to be adopted regarding the development of theoriesand models of social-spatial phenomena.

Any attempt at theorising about phenomena involving free-acting, conscious human individuals must face the need to accept some attitude towards this problem; and most theoretical undertakings in the social sciences do so implicitly. Broadly speaking , one may distinguish two main groups of views on the mind/body problem: dualist and monist. Dualist views are not widely held in contemporary

discussions of the problem. They hold that the realm of mental phenomena is radically and irreducibly distinct in nature from the realm of physical phenomena. There are various dualist accounts starting, in the sixteenth century, from Descartes' view of mind as conscious and of body as extended object occupying space. This view asserts that there is somehow a division in reality between the conscious human subject and the external objective world -- between observer and observed, the knower and the known -- which are two distinct but interacting spheres (interactionism).

Another dualist view, one version of which was put forward by Leibniz, takes physical (bodily) and mental (psychical)events to form separate chains which run a parallel course without affecting one another. However, causal effects within each chain are accepted (psycho-physical parallelism). A variant of the preceding doctrine, so-called occasionalism, asserts the possibility of such causal effects between such chains when God so wishes. The dualist doctrine known as epiphenomenalism, which is not currently fashionable, stipulates that there are causal relations between the otherwise distinct realms of the mind and the body. Mental events are seen as epiphenomena, that is, as radically non-material and entirely caused by physical events or occurrences in the brain or central nervous system of the organism. Mental events do not cause any bodily or other mental events themselves. Bodily events are accounted for as parts of physical nature excluding any mental causal influences. This is a form of weak materialism inspired by the conception of strict determinism of the material world.

Monist accounts generally assert: (i) either that there is really only one fundamental kind of thing involved in considering

mind and body; and this is held to be either all mental, as in idealist views, or all matter, as in materialist views; (ii) or, in weaker versions, that the things in question are related together, or unified, in some significant way. Idealist views assert that all reality is spiritual in character and matter does not exist independently of minds except in the form of ideas in the mind or as manifestation of mental activities. Only minds or mental states, or both, are said to be real.For instance Hegelian absolute idealism provides a monist account of the mind/body problem asserting that there is only one ultimately real thing which is spiritual in nature: The Absolute. Other things are dependent fragments or partial aspects of this Absolute.

In materialist views it is argued that whatever can be said to really exist in the universe is material in nature. Minds and mental states are denied substantial existence unless they are identified with certain states of the brain and the nervous system, or with perceptible manifestations in behaviour. Physical monism is a set of views asserting that all phenomena of mind and nature can be reduced to laws of physics and biology. The term physicalism is also used to refer to some views in this context, to the efeect that all meaningful statements can be translated into the language of physics. Physicalism "à la Carnap" takes all scientific statements to be translatable into statements about publicly observable objects or space-time points -- as opposed to electrons, social systems, human desires, and the like -- and requires all such statements to be publicly verifiable. Neurath saw the doctrine of physicalism as enabling the realisation of the ideal of the unity of science: that there is no difference in the method of study or, fundamentally, of subject matter between the sciences of nature, on the one side,

and the sciences man and society, on the other side.

In its original formulation, physicalism took statements about mental events to refer to the dispositions of living human bodies to behave in various manners and was thus associated with the doctrine known as behaviourism, especially in the context of logical positivism. In its most common version, behaviourism is the policy of reducing mental states and events to publicly observable behaviour of living bodies. Often presupposing an operationalist and physicalist approach, behaviourism prescribes that only unambiguously observable and preferably measurable behaviour is to be studied, excluding consciousness and introspection; and aims at yielding general laws of behaviour. However, this doctrine often does not restrict itself only to prescribing methodological rules concerning what is to be permitted to count as evidence in psychology, but also extends to philosophical claims about what exists. Thus, mental events and states are seen as nothing but actual and directly perceptible aspects of behaviour.

In its philosophical version the doctrine of behaviourism asserts that knowledge of the inner experiences or minds of others can be obtained not by introspection but by inference from the perceptible manifestations of various states of mind in speech and behaviour. Thus, statements about mental events and states of mind are taken to be equivalent to statements about the behaviour of the embodied persons in whose minds the events or states are said to occur. Mental states and events are often identified with dispositions to behave in a certain way, much like, say, inflammability is a disposition of certain natural objects: if certain conditions are satisfied, certain predictable results will ensue. Hence, if an

individual is challenged in a particular way he is likely to respond in some predictable manner. The psychological theory of behaviourism has been extended to social scientific inquiry in general -- the latter version being referred to as "behaviouralism".

The differences between psychological behaviourism and the broader approach to social science are based on convenience rather than principle. Linked with social inquiry, the doctrine of behaviourism has received various formulations most of which accept subjective states of mind such as feelings, attitudes, beliefs as subjects for investigation, providing they are either reduced to publicly observable external behaviour of social agents or explained as determined consequences of preceding non-mental variables. This approach appears to concern itsel with prediction and control of social system states rather than with understanding of subjective mental states of social agents which might involve some kind of empathetic interpretation of mental events,or an introspective approach.

It often focuses on the relations between social behaviour and the environment within which it is manifested and assumes that behaviour is shaped and maintained by the consequences of previous behaviour. There follows that by adjusting and manipulating the environment it may be possible to evoke preferred responses through rewarding and so reinforcing them. Critics of this approach point out that it does not provide any means for deriving the direction of changes in behaviour which take place in response to environmental modifications. They also raise questions regarding the selection and implanting of fundamental social values, goals, and objectives which guide environmental manipulation, and the problem of who is to be responsible for authorising any such changes in existing social arrangements.

These questions seem to be closely related to certain important issues in urban planning. Earlier approaches to urban planning problems -- now almost defunct -- favoured so-called "physical determinist" solutions. The predominantly social problems of the cities were seen as largely caused by environmental "ills" such as inadequate or obsolete housing, congestion due to high density living or extensive travelling within the city, lack of recreational facilities and playgrounds, lack of amenity, inadequate accessibility to socially important locations in the city, insufficient separation of noxious industry from areas of residence, and the like. Most planning undertakings operated on the assumption that environmental manipulation in the form of systematic elimination of the various "ills" of the environment would necessarilly result in the solution of the social problems as well. One manifestation of such approaches was the programming and development of a series of new towns in post-war Britain.

The main aims were to provide an improved environment for living and working in relation to what was available or even possible in existing cities, and to relieve congested urban centres from excessive population and industrial and service activities. However, as many critics have pointed out, the environmental changes effected either in existing cities or in the form of new communities did not bring about the anticipated elimination of social problems most of which remained the same or assumed new forms. In certain cases, the failures of environmental adjustment were said to be monumental. The issues raised by social critics of early "physical determinist" urban planning approaches do not appear to vary significantly from the points made by critics of social behaviourism, especially in what concerns the alleged emphasis on overt behaviour

and neglect of subjective states of mind of social agents affected by environmental adjustments. An effort at empathetically interpreting such states of mind is held by some to be essential in any study of man-environment relationships and purposeful intervention in them. Recent interest in so-called "social conceptions of space" reflected in a number of studies (GOLLEDGE and RUSHTON, 1976), (DOWNS and STEA, 1973), suggests at least partial recognition of the importance of mental states in issues of the environment.

The doctrine of physicalism has been revived by exponents of another monist, materialist account of the mind/body problem, the so-called identity theory of mind. The latter postulates that what seem as the private states of mind or consciousness of human individuals are actually identical with certain states occuring in the brain and the nervous system which are accessible, in principle, to public scientific observation. This view of the mind and conscious mental life does not reject self-consciousness and does not claim that mental and neural terms are synonymous. The identity of the states these terms refer to is said to be contingent or empirical rather than logically necessary. The identity theory of mind bears certain connections with two other monist doctrines, namely neutral monism and the double aspect theory, which are discussed below. Neutral monism (or mental monism) is the view which asserts that physical and mental phenomena and states can both be analysed in terms of a common underlying reality (neutral stuff). It takes sense-data, viz. the immediate unanalysable private objects of sensation or experience, as the ultimate constituents of reality. These experiences are seen as neither mental nor physical. Both material objects and minds are said to be no more than ordered collections of such experiences.

This doctrine is based on an empiricist account of the theory of knowledge according to which the sole direct objects of empirical knowledge are individual momentary experiences. These are ordered into hypotheses and then tested against factual evidence. It is assumed that nature cannot be known (perceived) directly but only through the mediation of the human observer (the so-called sense-datum theory), hence both nature and mind are defined by the kinds of observations that are made and the nature of the inferences that are drawn from them. In this sense, the phenomenalist view that statements about material things are equivalent in meaning to statements about actual and possible sense-data is extended to minds taking these to be no more than observed collections of experiences. The double aspect theory asserts that there is only one single substance in the world, and that mind and matter as a whole or individual minds and their corresponding bodies are two aspects of that substance. Finally, in the dialectical materialism of (Marx and)Engels, mind is seen to originate in matter but also to be distinct in nature from it.

REFERENCES : (SHAFFER, 1966); (CAMPBELL, 1970); (ARMSTRONG, 1968); (RYLE, 1949); (RUSSELL,1926); (SMART, 1963).

(21) The phenomenological method.

There are two senses in which the term "phenomenology" is used. One is general and refers to any descriptive, orderly study of phenomena, or appearances : of a given subject matter. The other, narrower sense (which is the subject of this note) refers to the descriptive study of phenomena "as phenomena", by means of direct awareness; it marks a particular philosophical movement in Germany loosely centred on Edmund Husserl (1859-1938). He employed the term "phenomenology" in the early 1900s to denote a way of doing philosophy by using the phenomenological method. Indeed, philosophical phenomenology is essentially a method of philosophcal analysis rather than a school within philosophy.

The various attempts to develop a philosophy that is based on the data of intuition may be seen as antecedents of modern phenomenology. In particular, the "method" or "procedure of doubt" put forward by Descartes,which involves suspension of all beliefs and acceptance as true of only those ideas which are presented "so clearly and distinctly as to exclude all ground of doubt", is said to have inspired the method of Husserlian phenomenology. The reasoning underlying this orientation of the phenomenological method is that while judgments about the world -- about anything which "transcends" experience -- could be mistaken, there can be no doubt concerning the "immanent" experiences about the world -- about any alleged or imagined objects. Thus, it is attempted to reconcile the 'a priori' validity of formal reasoning, on the one side, and the physical processes, on the other; and to extend the scope of the 'a priori' to the entire field of experience. By delimiting the entire, endless realm of all types

of experiences a self-contained field of inquiry can be defined. If all beliefs in existence, or in truths of any kind, are suspended (temporarily) there remain the experiences themselves and the objectivities as meant by the experiences. The two sides of experience, i.e. the meaning side (noetic) and the meant side (noematic), are viewed in a"correlative" mode; and by suspending all beliefs and assumptions, whether metaphysical or epistemological, it is possible to speak of "pure subjectivity" or of "pure experience".

In this sense,phenomenology serves as a well-defined idealistic philosophy which opposes naturalism (q.v. in this Appendix). The doctrine of naturalism is associated with various methodological programmes which "have at least in common the claim that the method of natural science is the only legitimate and appropriate method to be used in attempting to acquire knoeledge of whatever kind" (GIEDYMIN, 1972: p.45). However, it is not a unified philosophical school. The conflict between the phenomenological method and methodological naturalism seems to be inevitable since phenomenology is not taken to be an empirical discipline in that it does not describe empirically observable matters of fact. Nonetheless, it is "empirical" in its insistence on a continuous, unbiased scrunity of experience, but not "empiricist" as the word is commonly used to refer to explanation through past experience (sensory observation). Indeed, the various schools of naturalism originate from the criticism of so-called apriorist, speculative, and irrationalist trends in philosophy which (like phenomenology) underrate empirical science and claim that there is an intuitive or specifically philosophical method of acquiring knowledge, prior and superior to the "method of natural science" (however the latter may be defined).

In his arguments in favour of idealism Husserl contends that "if mind or spirit were removed there would be no nature; for spirit is what gives meaning to being" (URMSON, 1960: p.294). In this view, mind is neither determined by the sensory perceptions of the human organism (as most empiricists would accept) nor is it an abstract concept (as rationalists might claim). Mind does not exist in a part of man's body (e.g. in the brain); rather man lives in his mind. However,"it is possible to formulate a strictly methodological version of phenomenology, with no ulterior commitment to idealism or any other dogma. The phenomenological procedure is then subsumed under the general class of methods of inquiry .... Although its findings may well be valuable for all other disciplines, it is also true that it could have no subject matter without the factual "mother-ground", which is primarily represented by the natural and cultural sciences" (URMSON, 1960 : p.295).

Husserl argues that there are two kinds of statements : empirical and non-empirical. Phenomenological statements are to be non-empirical in that their truth or falsity is not to be dependent on sensory observation. The truth conditions of phenomenological statements relate to the accuracy of descriptions of <u>phenomena</u>. Such statements are not true because other statements are true. For the phenomenologist, a phenomenon is whatever appears to the observer in immediate experience (which is not uninterpreted and unclassified sensory observation or "raw sense data"). In this view all possible kinds of objects are phenomena if examined and described in the particular way that reveals them as phenomena (which is a circular explication of the concept of "phenomenon" until the alternative ways of doing philosophy, which are excluded by phenomenological description of

phenomena, are specified). True descriptions of phenomena can only be achieved by suspending initial assumptions : phenomena are examined and then described as they present themselves to the oberver's unprejudiced view. In this there are no prior theoretical commitments, only the practical one to examine all phenomena and take none for granted until all have been carefully explicated and described. This leads to a descriptive and presuppositionless phenomenological science.

The entire phenomenological enterprise is involved in a so-called "methodological circle". Phenomenology does not exist as a set of doctrines but at best as a method; and this method is to be developed by applying phenomenology to itself (reflexivity).. Even the phenomenological method is still in the process of being clarified, properly described and elaborated; and is, at least to date, quite incomplete. Thus only while doing phenomenology is it possible to clarify its method. The following three properties of phenomenological statements may be identified:
(a) Phenomenological statements are nonempirical; (b) they are descriptive; (c) they describe phenomena. Most of the differences within the phenomenological movement originate in disagreements about the set of conditions necessary for anything to be a phenomenon. The following five conditions are specified which any statement about phenomena must satisfy.

(1) Phenomena are "essences"; they are not particular observable objects by reference to which one could confirm or refute empirical statements. "Essences" are the general, necessary, and invariant features of objects. Since phenomenological statements describe phenomena, they must be statements about "essences".

(2) "Essences" are not empirical objects, hence they have to come to consciousness not by means of empirical observation but through some kind of intuition. Thus, phenomenological statements describing "essences" are not to be arrived at by abstraction from a number of examples of similar objects (since if they did they could be termed empirical statements); instead "essences" have to be intuited. This second condition is imposed on epistemological grounds. For statements about "essences" are to be non-empirical hence their truth or falsity is not to depend on experiential evidence but intuition. However some phenomenologists, including Husserl, claim that it is not sufficient to state that phenomena are revealed in the intuition of essences. It is necessary to specify the meaning of "intuition" to distinguish it from simple sensory observation. These writers attach further conditions for anything to be a phenomenon.

(3) Phenomenological descriptions must be preceded by "bracketing existence", which will provide a further guarantee that such statements are non-empirical. Thus, objects can be described as phenomena only after suspending belief in their existence or "bracketing existence" -- what Husserl calls the phenomenological epoché (from the Greek "ἐποχή", meaning "pause" or "temporary suspension"), or phenomenological reduction: phenomenological statements are made while existence is and remains bracketed. This kind of (phenomenological) reduction is unlike other senses of "reduction". By "suspending belief in the existence of objects" the descriptions of objects or situations do not serve as premises for some inductive generalisation or an abstraction but as examples (in the phenomenological sense of the term). In this sense, an example serves both an illustrative and an evidential function and need not be an actual existent. If phenomenological statements

are true then they are not so because they describe something which has been directly observed. They are not warranted by a series of observations of particular events. They do not imply the past or present existence of particular objects in the same way that empirical generalisations imply it. A phenomenological statement can be claimed to be true if its description of a particular example is accurate. Since the existence of the example has been "bracketed", it is not possible to confirm the accuracy of its description by reference to observation of that example with respect to a particular time and place. Instead, the accuracy of the description of an example is established through a procedure which Husserl calls "free imaginative variation". It involves adding or deleting any given property contained in the description of some example and assessing whether the altered description can still be said to describe an example of the same kind of object as that originally depicted in the example.

This procedure does not make any appeals to empirical observation; neither is it arbitrarily decided that some particular characteristic is essential. If additions or deletions do not affect some core set of essential features of a given kind of thing which is exemplified by the example, then the "essences" of that thing has been discovered: that is, necessary and invariant characteristics of the object that the example must possess if it is to be recognised as an example of that kind of object. A phenomenological statement would assert that, say, if any being is an example of a human individual, then it must have sense organs; hence it would make an assertion about the necessary relation of properties. This phenomenological method leads to another kind of circularity (on top of the previously mentioned "methodological circle" which results from the clarification by phenomenology of its own method while using it): the so-called "epistemological circle".

The circularity arises because phenomenology confirms its statements by reference to examples and then attests to the accuracy of the descriptions of these examples by reference to the statements derived from them. An examination of a second sense of "bracketing existence" is said to eliminate the possibility of construing this as an argument against phenomenology. The method of free imaginative variation leads to the discovery of the necessary conditions for recognizing a certain kind of object. Now, recognition of something as an example of a certain kind of object need not involve the ability to provide a full description of that object (there is a difference between "knowing how" and "knowing that"; between being able to recognise an object from among a number of other objects and being able to describe that object in a statement). Thus, by varying examples in the imagination, it is always possible to discriminate between the object that would be recognised as a certain kind of thing and the object which would be regarded either as a different sort of thing or something totally unknown. The criteria that are implicit in such recognition can be stated explicitly only through reflective thinking by stating the essential characteristics of any given kind of object. Thus, the other sense of "bracketing existence" refers to the transition from non-reflective to reflective thinking. According to Husserl, phenomenology involves reflection in order to bring to light what was hitherto obscured in human performances ("Leistungen"). This is a common theme of interpretative and hermeneutic approaches to the study of socio-cultural phenomena (cf. main text, Part I).

Reflection is about examples and not about facts or particular actions: it results in a statement about the necessary conditions for an object to be an example of the kind of thing that is being reflected upon.

The transition from non-reflective to reflective thinking is well described by the expressions "bracketing existence" and "suspending belief in the existence of objects". When reflection begins, belief in the existence of the object that is being reflected upon is suspended in order to afford awareness of the possibility that preconceptions or presuppositions about that object might be wrong. There follows that phenomenological statements are the products of reflection undertaken after existence has been bracketed: they describe activities performed in everyday life which it is not possible to describe at the time of performing. Criteria for correct and appropriate performance and identification of such activities are possessed by the individual, but he/she is ordinarily unable to formulate them explicitly. This is achieved through reflective thinking after suspending belief in existence. The programme of reflecting upon all knowledge and experience may well have an emancipating effect upon thinkers (one might notice here the similarities with the conception of "emancipation" from domination, so common in the writings of the Frankfurt School of "critical theorists", which is rooted in Hegelian idealism). But fulfilment of this condition, i.e. that phenomenological statements are the product of exemplary reflection that requires bracketing existence, still does not assure that statements so discovered would not be empirical. Husserl and certain other phenomenologists introduce a fourth condition for phenomena, which provides arguments to show that phenomenological statements are non-empirical.

(4) This additional condition requires that statements about phenomena be limited to statements about <u>intentional</u> acts. The terms "intentional" and"intentionality" are key concepts in Husserlian phenomenology where they do not have the ordinary English denotation of "intended action". Husserl acknowledges his debt to his teacher,

Franz Brentano, for the doctrine of intentionality (BRENTANO, 1874/1924-25). The latter created the concept to distinguish between : (i) mental activities (comprising the development of ideas or judgments, emotions such as love or hatred, etc.); and (ii) physical phenomena. On this view, mental activities were taken to possess the distinctive characteristic of "intending" their object in the sense of focusing consciousness onto it and thus bringing it to the attention of the subject. In his attempts to analyse the intentional structure of consciousness and describe objects as they present themselves to consciousness, Husserl contends that all acts of perception, in which a subject becomes conscious of something, have a directional character. They imply the movement of consciousness in a way which transcends itself to include, in the sense of "intend", an object within its sphere.Thus, on his account "intentionality is an internal relation of subject and object and the whole method of phenomenological reduction, whereby the "ego", in a grandiose mental act, is able to shed the empirical world, is dependent upon this beginning-point" (GIDDENS, 1976: p.26).

Intentionality thus refers to the state of an entity: the state of being intentional, which is a charcteristic of acts. It is not only one charcteristic of phenomena but is itself a phenomenon. Intentional acts are characterised by four distinct elements. Consider for example the sentence "he claims that angels guard the city". Here it is possible to distinguish the following four aspects: (i) the subject of the intentional act (or the agent), i.e. the individual involved in it (e.g. "John", "he/she", "the Pope", "the Chairman of of the District Council"); (ii) the activity the subject is enganging in (the action) -- (e.g. "claims"); (iii) the intentional object of the act, i.e. that which the act is about (e.g. "angels"); and

(iv) the manner in which the intentional object is object of the act, i.e. the means employed or what is asserted about the intentional object (e.g. "angels guard the city").

The truth of a statement describing someone's intentional act does not allow the inference of either the existence or non-existence of that which the act is about. Intentional acts differ from other four-term relations in that it is not inconsistent to deny the existence of the final element of the four-term relation of the intentional act and to assert that the relation is described truly (e.g. "angels guard the city" is a belief which does not allow the inference that there are indeed angels or that they actually guard the city). This is a defining feature of intentional acts and is called the "non-inference criterion". It is a non-empirical statement in the sense that it is not refutable by way of an empirical statement. The preceding four conditions for phenomena are not sufficient for a complete definition hence a fifth condition is required.

(5) With respect to intentional acts, phenomena serve as criteria of <u>coherence</u>. Statements about phenomena must, besides satisfying the above four conditions, be about the criteria of coherence governing single intentional acts or consequences of intentional acts. To take an object as a phenomenon is to attempt to discover the criteria for coherence of those intentional acts in which the object (or its name, or its descriptions) can figure. The criteria of coherence both of individual acts and of series of acts are presupposed and not arrived at by inductive generalisation; hence statements formulating these criteria cannot themselves be empirical generalisations. The need for this fifth condition can be shown to arise from the following considerations. It is possible to distinguish two sorts

of intentional acts:

(1) Purposive; these may be said to be adequate to their intentional object if the means chosen accomplish their purpose. Rules about correct performance of purposive intentional acts are empirical rules in the sense that they can be discovered by empirical study, since there are correct and incorrect ways of performing which are a matter of empirical fact.

(2) About something; these acts may be said to be adequate to their intentional object if what is performed is actually the case: if what is believed is true, what is doubted is indeed doubtful, what is questioned is questionable, etc. Rules about correct performance of "about something" intentional acts are mostly empirical. A given intentional act may be assessed for its adequacy to its intentional object only if it is a genuine intentional act. To establish this is necessary to decide on a set of rules determining which elements of the four-term relation of the act (agent-action-intentional object-assertion about intentional object) can be combined with one another to form a coherent and intelligible intentional act.

"Purposive" intentional acts are incoherent if, for instance, the means used to attain the purpose of the act are inappropriate to the intentional object (e.g. shooting a ghost) or to the action (e.g. to cause suffocation with excessive love). Intentional acts that are "about something" are also subject to similar incoherences. According to Husserl, coherence and intelligibility can characterise series of intentional acts. While an intentional act as a single act may be coherent, it may be totally out of context with an act which precedes or follows it and thus may not make any sense at all. It is possible to understand what an individual is attempting to do

if his/her actions form a coherent series. Thus, series of intentional acts are governed by sets of rules of coherence of the series and of adequacy of the series to its collective purpose. These sets correspond to those established for individual acts. The emphasis on a parts/whole relationship is clear in this context. The term "horizon" is employed by Husserl in a metaphorical sense to refer to the relations of coherence of intentional acts. The "horizon", being the edge of the perceptual field, leads to the expectation of a continuation of what is perceived: a given intentional act suggests further acts that would be continuous or coherent with it. It is impossible that any intentional act should be unrelated to any other act, i.e. should be without "horizons". "Horizons" are the necessary conditions for any series of assertions or activities to be intelligible. Phenomenology has the task of clarifying these conditions or "horizons". This is called "intentional analysis" which yields statements of the criteria or of the coherence of series of intentional acts.

To sum up, Husserl's programme for establishing an essential, presuppositionless foundation for the knowledge of experience differs fundamentally from programmes developed within empiricist epistemology which seek to arrive at "positive" knowledge of the world of nature and man. One major difference is that the Husserlian project maintains that only phenomena are given and that in these phenomena are the "essences" of that which exists. Thus, the phenomenological method focuses on the what -- viz. the essential, necessary properties -- of phenomena as they are given to the human individual in conscious experience. It does not seek to discover whether things exist in an "apriorist" or rationalist (Cartesian) sense or in an empiricist (Baconian) sense, and hence it is said to transcend the epistemological

arguments advanced by either of these theories of knowledge. Husserl views the "subject" not as remaining within a strictly cognitive realm, but as"intending" a world. In this sense, "the subject" is not identical with "being" -- as in Descartes' "I think therefore I am" -- but is "intentionally" directed towards a world which is not independent of the subject's immediate awareness and is the lived experience of the subject.

All conscious acts and feelings exist within a field which is related with, and is open to influences from, any objects that appear in it. This field is the "life-world" or "Lebenswelt"; and within its "horizon" everything sensed, felt or understood by the human individual has its place. All seeing is converted into construing and interpreting if this intentional, "horizon" structure of experience is accepted. The domain of science is seen as an abstraction from the "life-world", and may not make any ultimate claims (to knowledge, to truth). Rather it is a special form of perception and constitution. The "life-world" is to be grasped as a whole, and the essential nature of the phenomena of consciousness is to be apprehended, by first bracketing off the common sense, constructed notions of the "natural standpoint"(viz. the viewpoint of the natural sciences) and, subsequently, by reflecting on the phenomena of consciousness and effecting a series of "reductions" (HUSSERL, 1931/62: Sect.27-32). Post-Husserlian phenomenologists have tended to eschew the main objective of developing a formal presuppositionless philosophy and have focused, instead, on application of the"bracketing" technique or principle to psychological and sociological phenomena.

The work of Alfred Schütz, 1899-1959, (SCHUTZ, 1967) has opened up a whole new tradition of sociological studies (cf. main text for

a brief discussion of phenomenological approaches to the study of social life). The relevance of the phenomenological method in the study of social life in relation to geographical space has been explored in a number of recent works in the field of geography (TUAN, 1971), (TUAN, 1976), (RELPH, 1970), (BUTTIMER, 1976). These studies focus on the "meaningful" aspects of space which differ from the direct, empirical awareness of the physical environment as a container of things and human individuals, or even from behavioural (in the sense of "behaviourist"; cf. this Appendix, entry: "The mind/body problem") conceptions of space. They find scope for peculiarly human-centred or"humanistic"approaches in investigations of the way man exists in and experiences his environment.

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