CHAPTER III
UNIVERSALS REVISITED:
THE LOGIC OF IDENTITY

The foregoing analysis reveals that the thesis of theory-dependence of observation leads to context-dependence and incommensurability. More importantly, it involves the abandonment of the principle of empiricism. An attempt is therefore made at the re-interpretation of this thesis in the light of results drawn from the new theory of reference developed by Kripke, Putnam, Donnellan et al; as well as from developments in cognitive science. The implications of this reinterpretation for the problem of theoretical growth, theory change, and empirical constraints on scientific systems, will be subsequently analysed.

3.1 The New Theory of Reference

The new theory of reference developed by Saul Kripke, Hilary Putnam, Keith Donnellan and others is partly a reaction to the semantic tradition of Russel and Frege. This tradition construed names and general terms as attenuated description; and considered the reference of these terms to be a function of their Fregean sense. In contrast, amongst the views of the modern semanticists is that names have no intension in the traditional sense; and that at least general terms which designate natural kinds (naturally occurring species) are like names and thus do not
have their extensions determined by concepts. Instead reference is achieved by something like a causal chain rather than by associated descriptions. This new theory of reference poses, according to Stephen Shwartz [1977] the most serious challenge ever to traditional theories of meaning; and has important implications for the philosophy of science.

Shwartz says: According to traditional theories of meaning there is an intension/extension distinction i.e. concepts or meanings associated with general terms and names determine the set of things to which they apply or refer. The heart of the traditional theory of meaning is described by Hilary Putnam ([1975] p. 140) in the following way: 'On the traditional view, the meaning of say "lemon" is given by specifying a conjunction of properties. For each of these properties the statement "lemons have the property P" is an analytic truth; and if P_1, P_2, ..., P_n are all the properties in the conjunction, then "anything with all of the properties P_1, ..., P_n is a lemon" is likewise an analytic truth. The conjunction of properties associated with a term such as 'lemon' is often called the intension of the term 'lemon'. This intension determines what it is to be a lemon. Thus according to traditional theories intension determines extension. Putnam ([1977] p.119-120) says the ancient and medieval traditions also maintained that the concept corresponding to a term was just a
conjunction of predicates, and hence that the concept corresponding to a term must *always* provide a necessary and sufficient condition for falling into the extension of the term. According to Putnam ([1977] p. 120) Carnap also espoused a version of the traditional theory because for him, "the concept corresponding to a term provided (in the ideal case, where the term had "complete meaning") a *criterion* for belonging to the extension (not just in the sense of 'necessary and sufficient condition' but in the strong sense of *way of recognizing* whether a given thing falls into the extension or not.)"

(More recently) Irving Copi ([1972] p. 125) endorses the intension/extension dichotomy. He says" 'To understand a term is to know how to apply it correctly, but for this it is not necessary to know all of the objects to which it may be correctly applied. It is required only that we have a criterion for deciding of any given object whether it falls within the extension of that term or not. All objects in the extension of a given term have some common properties or characteristics which lead us to use the same term to denote them .... The collection of properties shared by all and only those objects in a term's extension is called the 'intension or connotation of that term'. Copi adds that 'extension is determined by intension but not the other way round'.

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A version of the traditional theory is the 'cluster theory' espoused by Wittgenstein wherein it is not a conjunction of properties, but a cluster of properties which is associated with a term. An object need not possess all the properties to be classified under the term; but must nevertheless possess a goodly amount of these. Cluster theorists (including Searle) deny essences i.e. essential properties; objects in the extension of the term are related only by 'family resemblances'; but clusters or criterial properties are nevertheless associated with a term and determine its extension.

The central features, therefore, of the traditional theory are: (i) Each meaningful term has a concept or intension associated with it. This meaning is known or present to the mind when the term is understood. (ii) Intension determines extension and (iii) Analytic truths are based on the meanings of terms (a cluster theorist would deny this). The new theory challenges all these tenets. Saul Kripke [1980] concentrates first on the analysis of proper names, and then extends the analysis to general terms which signify natural kinds. According to Kripke's thesis of a rigid designation, a rigid designation is a term which refers to the same individual in all possible worlds in which the individual exists. Names are rigid designators which refer to the same individual, even in counterfactual
situations, where associated descriptions might be false. This means that names refer to the same (not similar) individual whether or not he satisfies some list of commonly associated descriptions. So also general terms which signify natural kinds are rigid designators of kinds. They refer to the same substance in 'all possible worlds'; associated properties therefore are not criterial, and the statements attributing such properties to individuals in the extension, are not analytic. Furthermore if the terms of an identity statement are rigid designators, the identity statement if true at all, is necessarily true. But it is neither analytic nor a priori. Thus Kripke distinguishes between the metaphysical notions of necessity/contingency, the epistemological notions of a priori/a posteriori, and the linguistic notions of analytic/synthetic. This analysis, when applied to statements of theoretical identity like 'Water is H\textsubscript{2}O' or 'Gold is the substance with atomic number ---' implies that (i) the statements if true are necessarily true (ii) they are not known a priori for they are matters of scientific discovery and (iii) the statements are not analytic, for the scientific theory might be falsified; and in any case, if true, is true on account of the way the world is, and not on account of any fact about language.

Hilary Putnam 1977] has been the most important influence in the application of the new ideas on reference
This sentence is misleading. You have rightly contradicted on 118-119. For, if the theory is taken to be a semantic taxonomy, does it not follow that extension is determined singly by intention (though here we are extending the concept of 'intention')?
to natural kind terms. He holds that water, for example is \( \text{H}_2\text{O} \) in all possible worlds. Thus water is necessarily water. This means that anything that is not \( \text{H}_2\text{O} \) is not water, even if it satisfies some list of superficial features that we think characterize water. These features or properties traditionally associated with a natural kind term merely provide, according to Putnam, a 'stereotype' which helps to fix a reference. It is the true, scientific theory associated with a term which determines its extension. Thus water is \( \text{H}_2\text{O} \) in all possible worlds because nothing would count as a possible world in which some stuff that was not \( \text{H}_2\text{O} \) was water. Thus, it is not the satisfying of some descriptions analytically associated with the terms, but the having of a particular scientific nature or structure, that determines the natural kind to which objects belong.

Keith Donnellan [1977] distinguishes between the referential and the attributive uses of descriptions/properties. In the case of the referential use, the reference might succeed even where associated descriptions/properties are false.

The general position of the new theory of reference can be further analysed as follows: Firstly, the properties associated with a term, in particular the 'observable' properties do not determine its extension. They do not
constitute its meaning in the traditional sense. What then, is the role of the associated properties? In this context, Kripke [1980] distinguishes between fixing the reference of a term and giving its definition. When we fix the reference of a term, we give a description that helps the hearer pick out what we have in mind. Thus the description fixes the referent of the term, not its meaning in the traditional sense. One has a definite kind of thing in mind when applying the term, and one wants to help the audience pick it out. It is in this way that the descriptions associated with natural kind terms function. Of particular relevance is Kripke's ([1980] p. 54-56) extension of the notion of 'fixing a reference' to encompass 'operational definitions' in science. According to Kripke, the operation of measurement does not define the term, it only fixes its reference; and this holds even for operations of fundamental measurement where standards of reference are involved. Thus, for example, the operation of marking off a certain length (of stick or rod) as 'one metre' does not define the term 'one metre'; for under certain easily conceivable counterfactual conditions (of stresses and strains, of heating and cooling or whatever) it is quite possible to assert that the length in question would not be what in fact it is. 'Operational definitions' 'therefore do not express synonyms, they merely fix the reference; these statements whilst epistemologically a priori, are nevertheless
metaphysically contingent'.

Hilary Putnam ([1975] p. 52-54) can be interpreted as making the same point (albeit in a different context) with his distinction between 'law-cluster' concepts and general terms which express nominalistic essences. Law-cluster concepts are constituted not by a bundle of properties as are typical general terms like 'bachelor' and 'man' (where 'man' is used conventionally as in Aristotle's definition viz. 'Man is a rational being') but by a cluster of laws which determine the identity of the concept. What distinguishes law-cluster concepts from nominalistic ones is that changes in the former, whilst not mediated by experiment, are nevertheless based on theoretical considerations; and do not amount to mere changes in linguistic conventions, as in the case of nominalistic concepts. In sum, the element of stipulation or convention in natural kind terms (i.e. associated properties or operational definition) only fix a reference, they do not constitute its meaning in the sense of determining the extension.

Prima facie it might seem that the scientific theory

1 The important point that Kripke is making is that the stipulative or conventional element in scientific terms does not determine its meaning. This is in agreement with Popper's [1969, 1972] contention that universals are dispositional and cannot be operationally defined.
associated with a natural kind term determines its extension, if it is the true theory of the kind. But in the absence of this Utopian ideal of privileged access to ontological realities, what is the role of 'current best theory'? Shwartz [1977] explains the position in the following manner. He says Kripke and Putnam hold, for example, that water is necessarily $H_2O$; $H_2O$ is the true nature of water. 'Water' rigidly designates $H_2O$ regardless of what superficial properties the $H_2O$ might or might not have. Shwartz says that at this point it is very easy to confuse the new theory with a possible refinement of traditional theories. Such a confusion would ensue if we thought that 'Water is $H_2O$' is analytic. It might be thought that Kripke and Putnam are merely trying to replace ordinary definitions with scientific ones so that instead of defining water as a clear, colourless liquid, we define it as $H_2O$. This is not the view of the new theory. One would come closer to the position of Kripke and Putnam if one simply said that 'water' has no definition at all, at least in the traditional sense; and is a proper name of a specific substance. The reason why the 'current best theory' cannot constitute the intension, cannot generate analytic truths is that firstly, it could turn out to be false, and secondly that scientific theories are a matter of scientific discovery and not of conventional definition. Hence the current best theory generates if anything, only an epistemic
certainty or a priority; the certainty of a well-established empirical theory, not the necessity that ensues from access to metaphysical or ontological realities. Nevertheless, since theories are a matter of scientific discovery, not of definition, it would appear that scientists are at least approximating to metaphysical i.e. necessary truths. A scientific investigation into the atomic, chemical or biological structure of some kind of thing is an investigation into the essence of that kind. Irving Copi [1972] and Quine [1977] sympathize with this view.

If the reference of natural kind terms is not determined by the current best theory; what then does determine their reference? Here Kripke, Putnam, Donellan et al invoke causal chains emanating from original acts of 'ceremonial baptism' (of objects/persons in the case of proper names, and of 'paradigm' instances or samples in the case of natural kind terms). Putnam's view is that we 'baptise' what we take to be good examples or paradigms of some substance such as water; and then use 'water' to refer to whatever has the same nature as the paradigms. When we introduce the term it is not necessary that we know the nature of the stuff we are naming, but hope that such knowledge will come with empirical scientific investigations. The term, once introduced, can be handed on
from person to person in the referential chain, maintaining its original reference at each link. Putnam calls such a term 'indexical', from which it follows that the term is rigid in Kripke's sense.

According to Shwartz [1977] the extension of the causal theory to natural kind terms is admitted to be quite rough. Thus Kripke ([1980] p. 353) says, after an account bearing many similarities to Putnam's: 'Obviously, there are also artificialities in this whole account. For example, it may be hard to say which items constitute the original sample. Gold may have been discovered independently by various people at various times. I do not feel that any such complications will radically alter the picture'. Shwartz ([1977] p.34) comments: 'What Kripke is trying to do is present a better picture of how reference takes place than the traditional one, and this can be done without supplying complicated and complete analyses'.

The central thesis of the new theory of reference then, is that universal terms are names which designate the same substance or kind in all possible worlds; and that reference is achieved indexically through causal chains. From this it follows that the two fundamental intuitions underlying the new theory are (i) existents (natural kinds) come first, associated properties and (scientific) theories follow; and (ii) the fundamental logic of universals is based on
identity (Universals as names designate the same substance or kind in all possible worlds). Claim (i) challenges the fundamental tenet of theory-laden observation viz. that all observation (of natural kinds) is in the light of theory (i.e. universals are intensionally defined); and claim (ii) is in contrast to the traditional theory of universals which stresses resemblance as the logic of classification. (Properties which constitute the intension are the properties in respect of which objects in the extension are similar). The merits of the first claim are assessed in the light of current research in cognitive science. This is undertaken in 3.2. Subsequently, in 3.3, a comparative analysis is presented of the logics of similarity and of identity in relation to universals.

3.2 The Psychology of Perception

In this section two models are presented from current perception theory viz. the computational model developed by Fodor, Marr, Gilson et al; and Gibson's ecological optics. Both seek to establish that basic perception (observation) though theoretically structured, involves principles of organization which are endogenously specified and not exogenously imposed. This is in contrast to the position of certain philosophers of science (including Hanson and Kuhn) who often cite empirical evidence (from the psychology of perception) to suggest that observation, even at its most
fundamental level, is influenced by socio-cultural and linguistic factors. The computational model is introduced by way of a critical discussion of the Kuhnian position by Daniel Gilman [1992]; whilst Rom Harre' [1986] sets forth the main ideas of Gibsonian ecological optics as a solution to the inadequacies of the computational model. Finally, implications are drawn from this analysis for the claims regarding universals of the new reference theorists.

The analysis can be elaborated as follows: Daniel Gilman [1992] maintains that criticism of the observation/theory distinction generally supposes it to be an empirical fact that even the most basic human perception is heavily theory-laden. Gilman offers a critical examination of the experimental evidence cited by Thomas Kuhn [1970] and Paul Churchland [1988] on behalf of this supposition. He argues that the empirical evidence cited constitutes inadequate support for the claims in question. He further argues that we have empirical grounds for claiming that the Kuhnian discussion of perception is developed within an inadequate conceptual framework and that a version of the observation/theory distinction is indeed tenable. Before presenting Gilman's argument in detail however, it might be instructive to juxtapose it with the views of N.R. Hanson [1958] who is considered as archetypically representative of the position Gilman claims to be attacking.
Hanson's ([1958] p. 71) discussion of observation has the twin goals of discrediting the 'Received View's' doctrine of a neutral observation language, and establishing the point that observation is 'theory-laden'. The Received View postulates the existence of an intersubjective observation language which can be given a direct semantic interpretation, independently of any theories which employ it; as such the observation language is theory neutral. Since assertions in the observation language can be verified by direct observation, its intersubjective nature requires that all who employ the language see the same things when looking at the same objects. Hanson challenges this assumption: according to him, when two people with varying theoretical backgrounds view the same objects, they see different things. One might claim they do see the same thing since they have a common visual experience - but if by this is meant that their eyes receive similar stimutis or retinal impressions, it does not follow that they see the same thing; for receiving a retinal impression is to be in a physical state, whereas to see is to have a visual

2 Frederick Suppe ([1977] p. 3) points out that in response to developments in physics in the 1920's it became commonplace for philosophers of science to construe scientific theories as axiomatic calculi which are given a partial observational interpretation in terms of a neutral observation language, by relating 'theoretical' terms to 'observational' terms via correspondence rules. Hilary Putnam [1962] dubbed this the 'Received View'. Obviously the postulate of a neutral observation language is crucial to the Received View.
Hanson goes on to reject what Frederick Suppe ([1977] p.153) terms the 'sensory core theory' viz. that persons with different theoretical backgrounds do have a common visual experience inasmuch as they perceive the same 'sense datum' but only interpret it differently. This rejection proceeds by way of a Wittgensteinian consideration of various ambiguous figures such as duck-rabbits, perspex cubes etc. which are sometimes perceived as one thing and at other times as another thing by the same viewer. This is construed by sensory core theorists as interpreting the same sense-datum variously. But Hanson argues that: (1) If seeing the same figure differently is interpreting differently, then having a different interpretation just is to see something differently. (2) Interpretation is a kind of thinking, whereas seeing is an experiential state; therefore 'interpreting' would appear to be an inappropriate concept for describing differences in perception. (3) The appropriate account would be in terms of a difference in conceptual organisation. (4) Conceptual organisation is a function of the context as well as person's background knowledge and theories. (5) Hence seeing is an epistemic achievement; it involves a logical component of 'seeing that' whose nature is linguistic and inferential (i.e. involving ampliative inference to future and counterfactual
behaviour). (6) Hanson concludes that all observation especially in science, necessarily incorporates the element of 'seeing that' which renders it theory-laden.

Frederick Suppe [1977] considers Hanson's mode of argument which he says is patterned after that in Wittgenstein [1953] as persuasive but not conclusive; it might still be tenable to maintain that there is a kind of seeing which is not 'seeing that'. However Suppe thinks Hanson's major point viz. that all observation in science involves ampliative inference, as well taken.

Hanson's views on basic perception are challenged by Daniel Gilman [1992] who offers a computational and modular theory of perception. Gilman grants that perception is a complex business which is inferential in character, and which exploits assumptions as well as received information; but holds that (owing to modularity) such assumptions have nothing to do with the sorts of beliefs and theories which differentiate members of the scientific community; or which divide cultures and languages in the present or over time.

Gilman's argument assumes the following form: First he interprets the thesis of modularity in Fodor's ([1983] p. 37) terms as 'domain specific, innately specified, hardwired, autonomous, and not assembled'. The point about maintaining that a system is modular is that it is sealed off to some interesting extent, not that the computation it
performs is purely autonomous. Next Gilmaan presents Marr's [1982] theory of perception as a computational process: According to Marr there are three basic levels at which one has to approach any complex information processing system. The first and highest level is that of 'computational theory'. Here we develop an account of what we take the process to be for, of the abstract structure of the process, and of how the process is suited to its purpose. Second is the level of representation and algorithm which is concerned with how information is to be represented at both the beginning and the end of the process. Finally, the third level is that of 'hardware implementation'. Marr's discussion of vision is primarily in terms of the first two levels. According to him, vision (Marr [1982] p. 3) is 'the process of discovering from images what is present in the world, and where it is'. We may know by looking, what shapes things have, and how they are laid out in front of us. The source of this knowledge, is the light which strikes the eye, and which forms an image on the back of the retina. In studying vision we are studying how it is that the mind is able to extract and represent this information about the world from the original image.

Part of what Marr offers is a rigorous analysis of how the visual system can construct reliable models of the world it encounters by (computationally) operating on the stimulus
presented to the retina. We ought to note that this construction depends upon a number of intermediate transformations producing, and operating upon, a number of intermediate representations. Finally, we must note that the system is generally successful despite computational and informational limitations, because it has evolved 'internalised assumptions' about the typical structure of the world and about the relationships which typically hold between retinal images and that physical structure. Marr thus conceives of vision (perception) as a complex computational process which is theoretical and inferential in character; but which involves internalized assumptions that are not accessible to permeation by external theories.

Gilman holds that there is no significant empirical evidence against the modularity thesis (of the encapsulation) of perception. He questions the relevance of the experimental literature (from the psychology, biology and neurology of perception) cited by Kuhn [1970] and Churchland [1988]; which purports to establish that perception, even at the most fundamental level is influenced by exogenous theories. But Gilman points out that this literature concentrates on experimental studies of abnormal, damaged or impoverished (conditions of) vision; and apart from considering the conclusions to be often unwarranted, Gilman fails to see its relevance to the central paradigm of normal vision.

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Finally, Gilman ([1992] p. 303) thinks that Fodor is 'quite tidy' on ambiguous figures as evidence for the theory penetrability of perception. Fodor ([1988] p. 190) says: 'One doesn't get the duck-rabbit (or the necker cube) to flip by "changing one's assumptions"; one does it (for example) by changing one's fixation point'. Fodor thinks that (external) beliefs and theories play no role in deciding which forms are illusory, nor in how ambiguities get resolved. Cases such as the vase/face ambiguity might appear to favour the conceptual (permeation) theory. But even Richard Gregory [1970] reports that properly constructed abstract forms, which bring no general (kind of) object to mind, will appear likewise ambiguous. And Edgar Rubin (Gilman [1992]) describes certain contours as generating a sense of an object seen against a ground independently of our ability to recognize the object as anything other than a form, or what he calls the 'thing-character' of an object. Gilman concludes that ambiguous figures indicate only that perception involves plasticities which are inherent in the computational process; but do not constitute evidence for theory-penetration.

Reviewing the argument Gilman ([1992] p.300) arrives at the general conclusion that (the experimental studies from) 'New look psychology' is right in emphasizing that perception is a complex problem-solving process (as opposed
to a simple stimulus registration process); which exploits, theoretical assumptions as well as received information. But it fails to take note that both the assumptions and the available forms of inference may be endogenously specified. The computational approach, on the other hand, takes this into account, and conceives of a fundamental level of perception which is intersubjectively stable; and in which (computationally structured) objects and their properties are representationally 'given'.

Rom Harre' [1986] considers the computational model of perception as totally inadequate for supplying the metaphysics (ontology) of experience, demanded by a realist (and referential) interpretation of science. To be a realist. According to Harre' (p.146) is to acknowledge an 'aboutness' in one's discourse, a referential tie to something other than one's own states.³

But the computational theory is only the culmination of a (three-hundred year old) representationalist tradition which construes perception as a mere representation, rather than part of a world of actual human experience.

Harre' sketches the main features of this tradition in the following manner: Classical perception theory inserts

³ This notion of a referential tie is fundamental to the thesis of indexicality emphasized by the new theory of reference. In general, realism (i.e. existents) is a presupposition of the theory.
two stages between world state and percept. In the first a causal relation is supposed to obtain between world state and sensation. In the second stage the sensation is reworked in some cognitive process to yield the percept. Reliabilism is the doctrine that scientific support can be found for confidence in the verisimilitude of the product of that causal relation; so that the sensation is, in some measure a correct representation of the state of things that produced it. The reliabilist's move is to try to find that justification in the results of a scientific investigation of the causal conditions of perception.

The reliabilist theory of perception has two main versions: According to naive reliabilism, at least some of the properties of the representation accurately reflect, corresponding properties of the real world. Harre considers 'Locke's theory of primary qualities and Descartes' doctrine of 'natural geometry to be naive reliabilist theories. In the theories of perception of Reid and Whewell (Harre [1986]), naive reliabilism is transcended. Sensations are not reliable representations of that which causes them; as for the reliability of the representational percepts produced by the cognitive reworking of sensations, both Reid and Whewell seem ready to accept an answer couched wholly in cognitive terms. In Reid's psychology the question of the verisimilitude of sensations is displaced in favour of the
problem of the representational quality of percepts. From the point of view of (a defence of) scientific realism (and of reference), Harre' considers this shift in emphasis as deeply disturbing.

Harre' views the computational model of perception as a mere reworking of Reid's theory; and hence as involving the same disturbing implications. His criticism of this model is of Fodor's (Harre [1986]) version of it; and takes the following form: Harre' says Fodor's account relies heavily on two technical notions. First, it is an exercise in the formal science of mind. Mental processes are treated as computations which take account only of the structural or syntactic properties of the states in which representations of external states of affairs are realized. The computational model necessarily cannot take into account any semantic properties of representations such as their meaning or truth. This, says Fodor (Harre [1986] p. 152) is 'tantamount to a sort of methodological solipsism. If mental processes are formal... they have no access to the semantic properties of such representations'. Hence no mental (cognitive) process can be used to tell whether a representation is true or false.

The second important notion is of 'referential opacity'. This can be elucidated in the following manner: According to Fodor (Harre [1986] p. 152-153) perceptual statements like 'Jim saw a bird on the bough' might be true,
even if it is 'objectively false', because from the point of view of the psychology of perception, it is what Jim thought he saw that matters. Referential opacity is actually a corollary of the computational model, which cannot make the semantic distinction between veridical/non-veridical perception.

Harre' considers these shortcomings as powerful reasons for rejecting the computational model. In fact he rejects the entire representationalist tradition because it runs counter to scientific referential realism. Harre' traces the root of the problem to the ubiquitous assumption underlying four centuries of perception theory viz. that perception is built out of sensations. It is just this unexamined foundation that is challenged by Gibson's [1979] ecological optics. Both clauses of the representationalist tradition are challenged: that percepts are cognitively transformed sensations; and that the basis of perception is an awareness of states of the brain that are the remote effects of physical causes.

Harre' presents the basic Gibsonian ideas as follows: Information pick-up and non-cognitive perceiving: According to Gibson ([1979] p. 242) physical objects and their properties are specified by information present in the 'ambient array'. The ambient array is a flux of energy shaped by the presence of both the perceiver and that which
is perceived. Sensations do not specify physical things and their states. They specify only the current state of the sensory organs. 'Information' in the ambient array 'specifies' the object which structured the array. An organism, in actively exploring that array for higher-order invariants 'picks-up' that information. It is as the 'pick-up' that perception occurs.

Gibsonian 'information' is sharply distinguished from information in the sense of informational content: It is an optical structure not similar to its sources but specific to them. This structure lawfully and uniquely maps the structural properties of the object. It is on account of the specificity of the information that it is non-inferential. It is important to note that the structures recognized are in the ambient array, not in the pattern of events at the retina, or any sensory representation of them. Thus Gibson stresses that perceptual systems are active, exploratory, interconnected systems rather than passive receptor channels.

Whilst largely accepting the Gibsonian theory of perception Harre cautions that it offers a solution only to the problem of how generic information is possible. It explains how we can have experience of the physical world mediated by perception, yet unmodified by cognitive work. But what we perceive directly in the Gibsonian sense is coarse-grained with no more subtle categorization than those
from which Kant deduced the system of the schematisms. Gibsonian theory shares with the Kantian account of perception, the principle that the organisation of experience as it is manifested in things, events and so on, is not extracted from the sensory flux. But it is non-Kantian in that what corresponds to the schematisms, higher-order invariants, are not a priori, but are found in the exploration of the ambient array. Accepting the broad outlines of Gibsonian psychology permits us to hand-over responsibility for the defence of the reality of perceived things and events, and of certain general types of relations, to the psychology of perception.

In attempting to draw conclusions from the foregoing discussion on the psychology of perception, it is perhaps needless to caution that theories in the field are highly speculative. But since no analysis of the methodology of the empirical sciences can do altogether without some assumptions regarding the nature of what is 'given' in observation, we might draw some minimal conclusions as follows: Whether computationally processed or informationally 'picked up', perception theorists stress that the objects of even fundamental perception are highly structured in contrast to the sense-datum theorists of yore. But they concur in rejecting the thesis that this structural or categorical organisation is the result of the
permeability of higher-level (conceptual) theoretical systems. Hence it would appear that we have intersubjective perceptual access only to generically structured objects and their properties, which is relatively stable. Moreover the acceptance of Gibson's ecological optics provides not only the ontological foundation for scientific realism; but in its emphasis on active exploration (of the environment) introduces the conceptual possibility of experimental manipulation (of objects) as part of observation. This notion is of particular significance in view of current opinion in the philosophy of science that the appropriate distinction in science is not between observation and theory; but between experiment and theory. 

Secondly, although perception theorists concur in granting that (generic) categorial organisation is endogenously specified in perception; they resist the suggestion that the more subtle, (species) specific

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4 In this context of the distinction between experiment and theory, Frederick Suppe ([1977] p. 690) represents Dudley Shapere's position thus: 'His approach is to begin with an examination of the scientific use of "observation" and "direct observation" in astrophysics; and he finds that astrophysicists regularly write, for example, of detecting neutrino fluxes as yielding direct observation of the centres of stars. Moreover the astrophysical use of "observation" or "direct observation" (as well as "detection" and "probe") is not used in opposition to "theoretical" but rather in opposition to "experimental" - experiment involving interfering with processes which will allow us to test our hypotheses at will and in the most convenient manner, whereas observation generally does not involve such intereference or manipulation.
organisation involved in the recognition of natural kinds is also thus specified.

3.3 The Thesis of 'Primitive' Classification: Similarity or Identity?

In the light of these results from the psychology of perception, the reference theorists' contention that universals name kinds which are indexically indicated needs careful interpretation: (i) If the claim is that natural kinds are endogenously specified by perceptual mechanisms, then this thesis is not supported by current perception theory. Obviously the specification of kinds involves exogenous factors; and observation (of kinds) is in this sense, theory-laden. It is (culturally and linguistically) context-dependent. (ii) If however, the further question is whether the exogenous contexts are intensionally defined or extensionally exemplified; then not only the reference theorists, but also philosophers of science including Kuhn, Hesse, Quine et al, emphasize that the acquisition of classificatory structures (relating to natural kinds) takes place through exemplars. (cf. Putnam's paradigms, Kripke's samples, Kuhn's exemplars et al.). This is Hesse's ([1974] p.67) thesis of 'primitive' classification viz. that the 'intensive design' (Rom Harre' [1986] p. 104) of natural kinds is causally given in recognition, not explicit.
The thesis of primitive classification of natural kinds involves ontological and logical commitments: If the observation of natural kinds is in the context of a causal or referential tie between the observer and the world then this presupposes existents. This constitutes the ontological presupposition. The logical constraint is on the 'intensive design' or principle of classification of natural kinds. This principle must be in terms of a 'primitive' relation i.e. a relation which can only be extensionally exemplified, not intensionally defined. According to the reference theorists this constraint is satisfied by the relation of identity.

However, the reference theorists' contention runs counter to the mainstream tradition in the philosophy of science, which emphasizes the relation of similarity as the principle of classification, as well as the mode of reasoning (i.e. by analogy and metaphor) in science. A defence of (the principle of) identity is therefore undertaken in three stages: (i) by a comparative analysis of the logics of (the relations of) similarity and of identity, in relation to universals (ii) by citing experimental laws from the corpus of physical science as exemplifying the relation of mathematical identity in the form of laws of

5 Hesse’s concept of a primitive relation as a principle of classification of natural kinds will be shortly elaborated.
functional dependence, and (iii) by adducing examples of theoretical structures (from physical science) which indicate that theoretical growth employs as its fundamental principle of inference, Leibniz's principle of the Identity of Indiscernibles. Whereas (ii) and (iii) are undertaken in the next chapter, stage (i) of the analysis of the logics of similarity and of identity as principles of classification, is presented as below.

The general features of the resemblance theory of universals are set forth by Hesse ([1974] p.45) under the rubric 'A Network Model of Universals'. Hesse first contrasts the resemblance theory with the absolute theory: According to the absolute theory P is correctly predicated of an object 'a' in virtue of its absolute quality of P-ness. According to the resemblance theory, on the other hand we predicate P of objects a and b in virtue of a sufficient resemblance between a and b in a certain respect, which is the same for all pairs of objects in the extension. Wittgenstein's [1953] theory of family resemblance provides a twist to the classical theory in its suggestion that objects may form a (conceptual) class to the members of which a single descriptive predicate is ascribed in common language, even though it is not the case for every pair of members that they resemble each other in any respect which is the same for each pair. Hesse adopts Wittgenstein's
theory which she thinks is the general case which accommodates both the absolute theory and the classical theory (of resemblance) as limiting cases.

The resemblance theory of universals exemplifies the relation of similarity; and powerful objections have been raised against its suitability as principle of classification. Thus Popper ([1972] p. 420-421) points out that one of the main characteristics of similarity is its relativity. Two things which are similar are always similar in certain respects, and therefore may always be similar in different respects. Moreover things which are similar in some respects, are always dissimilar in other respects, unless indeed, they are identical. Generally speaking, similarity presupposes the adoption of a 'point of view' i.e. a theoretical stand-point. But if (the judgement of) similarity presupposes the adoption of a point of view, or an interest, or an expectation; it is logically necessary that points of view, or interests, or expectations, i.e. theories, are logically prior, as well as temporally (or causally or psychologically) prior, to (the judgement of) similarity. Hence similarity cannot be a constitutive principle for classification.

Nelson Goodman (Hesse [1974] p. 66-70) offers criticism in a similar vein: Suggesting that theory 'creates' or
'governs' judgements of similarity, he says: 'The fact that a term applies .... to certain objects may itself constitute rather than arise from a particular similarity among objects. Again he maintains: 'We cannot repeat an experiment and look for a covering theory; we must have at least a partial theory before we know whether we have a repetition of the experiment. More generally, Goodman lists 'seven strictures on similarity'. (i) It does not distinguish between representation and description. (ii) It does not pick out 'tokens of a common type' or replicas. (iii) It 'does not provide the grounds for accounting two occurrences as performances of the same work, or repetitions of the same behaviour or experiment. (iv) It does not explain metaphor or metaphorical truth. (v) It does not account for our predictive, or more generally our inductive practice. (vi) (As a relation) between particulars it does not serve to define qualities. (vii) It cannot be equated with or measured in terms of possession of common characteristics. 6

6 Strictures (ii) and (iii) are particularly relevant to our analysis and can be explicated thus: The burden of (ii) and (iii) is that similarity is non-vacuous as a principle of classification only if it is construed as similarity in relevant respects. This is because (as Popper has pointed out) all objects are similar in some respects; hence if the relevant respects are left unspecified, then the relation is rendered vacuous for purposes of classification. On the other hand, if the relevant respects are specified, then similarity cannot explain reductively, classifications based on identity:

Contd.
Hesse ([1974] p. 167) defends similarity as a primitive, symmetrical and intransitive relation between objects. Primitive in the context means the similarity is recognized i.e. extensionally exemplified, not intensionally defined. Hesse says: 'It is a relation given in the causal interaction of the perceiver and the world. It follows that it is not possible to state further conditions for the relation to hold'. Hesse thinks this answers Goodman's strictures because firstly if similarity is a primitive relation which is only extensionally exemplified and not intensionally defined then we are under no onus either to explicate identity reductively in terms of similarity (i.e. to explicate in what respects a is similar to a); nor to explicate the metaphorical/non-metaphorical distinction. Again, because similarity (in the sense of family resemblance) is an intransitive relation; it is not, in any case possible to state the respects in which all objects in the class are similar. Therefore, Hesse believes the concept of similarity developed in her network model answers Goodman's objections.

Contd...

for example, when two objects or experiments are construed as repetitions of the same type, then they must be accounted as similar in all respects; whereas similarity is specified (for classification) only in relevant respects. Goodman concludes that similarity cannot account reductively for classifications based on identity.
Kuhn ([1977] p.475-482) also emphasizes that the classification of natural kinds is 'primitive' in Hesse's sense of the term viz. that the principles of the classification are extensionally exemplified, and not intensionally defined. Kuhn agrees with Hesse that 'primitive' does not mean that the classification is endogenously specified (by perceptual mechanisms); but only that it is extensionally exemplified. This is Kuhn's thesis of learning by exemplars, which is the same as Hesse's thesis of primitive classification. Thus Kuhn asserts that the principles of classification are never explicitly articulated; instead in everyday contexts, one learns to apply terms, based on the implicit recognition of resemblances and dissimilarities between objects which are ostensively (indexically) indicated. Similarly, in the context of science, exemplars which are concrete problem solutions, as well as direct exposure in the course of laboratory work, teach the student the application of scientific terms. Presumably such application is also based

7 Hesse ([1974] p. 48-54) makes it clear that by a primitive relation (or classification) she does not mean one that is purely endogenously specified by perceptual mechanisms. Thus, the primitive relation of similarity she defends has both a 'correspondence component' and a 'coherence component'. The correspondence assumption is that classification is in terms of similarities which are recognizable i.e. given causally in 'the physics and the physiology'; whereas the coherence component allows for the aims of classification in modifying the initial classification. Nevertheless there are ambiguities in Hesse's account.
on the implicit recognition of similarities and differences.  
Quine ([1977] p. 157) whilst suggesting that 'the notion of 
a kind and the notion of similarity or resemblance seem to 
be variants or adaptations of a single notion'; emphasizes 
'the dubious scientific standing' of both. He says: 'The 
dubiousness of this notion is itself a remarkable fact. for 
surely there is nothing more basic to thought and language 
than our sense of similarity; our sorting of things into 
kinds. The usual general term, whether a common noun, or a 
verb, or an adjective, owes its generality to some 
resemblance among the things referred to'. But, Quine goes 
on to maintain: '...and yet, strangely, there is something 
logically repugnant about it. For we are baffled when we 
try to relate the general notion of similarity significantly 
to logical terms'. What Quine is emphasizing is that the 
logic of similarity in relation to kinds, is elusive.

Quine illustrates this in the following manner: First he criticises the attempt to define similarity in terms of 
kinds. Like Popper and Goodman, Quine points out that the 
notion of similarity is non-vacuous as a principle of 
classification (of kinds) only if the significant respects 
(or properties) of resemblance are specified. But if the 
significance (of properties) is referred to the principles 
of kinds (i.e. the significant respects are the ones in 
which members of the kind are similar); then since the
notion of kinds is itself ambiguous, this is tantamount to accepting the notion of similarity as undefined.

Quine is equally critical of the converse project i.e. of attempting to define kinds in terms of similarity: Thus if we set up a 'paradigm' case and specify the kind as consisting of objects similar to it (in a greater degree than to other objects); then this once again raises the problem of specifying the relevant respects (of similarity). Furthermore, Quine points out that the Carnapian version of this attempt (at defining kinds in terms of similarity) yields classes or sets which are counter-intuitive as kinds.

Quine concludes that the notions of similarity and of kinds is correlative; and that our sense of similarity, and therefore of kinds, is primitive; by which he means that it is innate.

The foregoing discussion makes it clear that Hesse, Quine and Kuhn defend similarity as the principle of classification for natural kinds, on the grounds of it being a primitive relation. By 'primitive' Quine seems to indicate that the relation (and the classification based on it) is endogenously specified by perceptual mechanisms. This intuition, it has already been noted, is not supported by perception theory. Hesse and Kuhn, on the other hand, construe 'primitive' to mean mainly, that the classification of natural kinds is only extensionally exemplified, not
intensionally defined. But the logic of similarity is primitive in this sense, only if similarity is interpreted in the Wittgenstenian sense of family resemblance, as an intransitive relation.

The logic of the relation of identity on the other hand, as conceptualised by Leibniz’s principle of the Identity of Indiscernibles, is without qualification, a primitive relation i.e. incapable of intensional definition. It is therefore the appropriate principle for a system of ’primitive’ classification for natural kinds.

The case is argued as follows: Tarski ([1965] p. 54-64) says: ‘Among the logical concepts not belonging to sentential calculus, the concept of Identity or Equality is probably the one which has the greatest importance’. The relation is expressed in phrases such as ‘x is identical with y’, ‘x is the same as y’ and ‘x equals y’. All these forms are symbolically transcribed as ‘x=y’ whose negation is ‘x ≠ y’.

The fundamental form of the concept of identity is Leibniz’s Law of the Identity of Indiscernibles which Tarski formulates as: ‘x=y if, and only if, x has every property which y has, and y has every property that x has’. Tarski points out that the law has the form of an equivalence, and enables us to replace the formula ‘x = y’ which is the left side of the equivalence, by its right side, that is; by an
expression no longer containing the symbol of identity. With respect to its form this law may therefore, be considered as the definition of the symbol \( '=' \).

From Leibniz's Law as the definitional law for identity, we can derive the laws of reflexivity, symmetry and transitivity for identity, which Tarski lists as follows:

(i) Law of Reflexivity i.e. \( x = x \)

(ii) Law of Symmetry i.e. If \( x = y \) then \( y = x \)

(iii) Law of Transitivity i.e. If \( x = y \) and \( y = z \), then \( x = z \)

Further properties of identity which follow directly from the definition of this relation by Leibniz's Law can be stated as follows: Things or substances are identical only to themselves. This follows directly from the definition of identity because if two things or substances share all their properties in common, then they are the self-same substance. Hence identity is necessarily an internal relation which can hold only between a substance and itself; or else internally between properties of the same (not similar) object. This is brought out by Donald Rutherford ([1995] p. 133) in his explication of Leibniz's Law. He says: "It follows from

8 Donald Rutherford's explication of Leibniz's Law as well as the following explication by Robert McRae are within the context of a discussion of Leibniz's metaphysics i.e. his theory of monads. But the general logic of the relation (of identity) holds, even outside this context.
the principle of the identity of indiscernibles not simply that there must be some difference among monads, but that "each monad must be different from every other. For there are no two things in nature that are perfectly alike, two beings in which it is not possible to discern an internal difference that is, one founded on intrinsic denomination".

Again, Robert McRae ([1995] p. 179) stresses the internal complexity of the relation: "The principle of the identity of indiscernibles or "that there is no perfect similarity anywhere" requires that these simple substances must be distinguished by their internal qualities and that there must then be a plurality of affections and relations within the unity of the simple substance. The only way in which this plurality in unity can be conceived is as we find it in our own experience, namely the plurality in unity which characterizes a perception'.

McRae's analysis leads directly to the main thesis viz. that the logic of identity is that of a primitive relation which can only be indexically indicated (in perception) and not intensionally defined. This is because the concept of identity (as defined by Leibniz's principle) is identity in all respects; and if we consider that any object or substance has an indefinite number of properties (including relational properties), it follows that the respects in
which identity holds cannot *in principle* be intensionally
defined. The relation of identity therefore is without
qualification, a primitive relation, and *a fortiori*, the
classification of natural kinds which it generates, is
likewise primitive i.e. only extensionally accessible and
not intensionally defined.

In concluding this analysis we note its implications
for the problem of theory-ladenness observation in science.
The primary tenet of this thesis is that (universal) terms
in science are intensionally defined by theories. This
leads (as argued in Ch. II) to methodological
conventionalism to meaning-variance and to the abandonment
of the principle of empiricism. Reference theorists reject
the thesis that universals relating to natural kinds are
intensionally defined. Their counter-thesis of indexicality
viz. that universals name kinds which are indexically
indicated can be interpreted to imply: (i) that natural
kinds are endogenously specified by perceptual mechanisms
and/or (ii) that the logic of classification of natural
kinds is 'primitive' i.e. in terms of a relation which can
only be extensionally exemplified and not intensionally
defined. Whilst (i) is not supported by research in
cognitive science; (ii) is lent credence by the logic of
identity. This tenability of the reference theorists'
thesis in terms of the logic of identity dissolves the
problems of meaning variance and of incommensurability; it also indicates the empirical constraint for scientific taxonomies — the taxonomies must employ 'primitive' logics i.e. structural principles which can only be extensionally exemplified in empirical contexts. Further constraints on scientific classification are analysed in the next Chapter.

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9. This should be clear from the following: If universals in science are not intensionally defined, then they have no meaning or concept attached to them. Scientific classifications therefore are not conceptual frameworks. Since scientific theories do not constitute the meaning of terms, nor determine the reference of these terms, changes in theory do not lead to meaning-variance or to incommensurability.