

ON THE DISTINCTION BETWEEN SCIENCE AND COMMON SENSE

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1 INTRODUCTION

One of the touchstones of all forms of empiricist philosophy since Aristotle has been the thought that the world of common-sense experience has a relationship of founding importance with regard to science. Since Bacon this view has, in many ways, been linked to a priority being given to observations together with a methodological inductivism from such observations. It is only more recently that the importance of theoretical conjecture in conjunction with a 'hypothetive-deductive' methodology has begun to hold sway over such views. However, along with these and other more recent trends in, the philosophy of science, I will argue that the relationship between science and commonsense has become problematic, posing a genuine threat to all forms of the traditional empiricist dictum of the relationship of science to the world of common-sense experience.

The first aim of this essay will be an attempt to locate the errors of these philosophical trends. In this respect it will be argued in regard to the efforts of the Logical Positivists and Logical empiricists that they have (a) failed to appreciate some important differences between the attitude of scientific investigation and the attitude of common sense toward the contents of the world of common sense experience, and (b) sought in vain for an epistemological certitude based upon the observation as 'informed common sense'. I will also argue that the epistemology of the so-called 'new philosophy of science'¹, supposedly anchored 'in the scientists, not the rules they wield'² is basically idealist in background, and that, as such cannot provide an adequate account of the relationship of science to common sense experience and so falls foul of giving an adequate account of the empirical character of science.

I will further argue that Popper's efforts to relate science to common sense amount to an attempt to marry epistemological idealism with ontological realism in a way that has not been able to bring forth healthy progeny. In fact, in the long run these efforts have served to aid rather than halt the trend away from giving an adequate account of empirical science as this is founded in common sense experience.

The second aim of this essay will be to sketch an account of both the continuity with and the differences between science and commonsense in such a way as to avoid the epistemological problems of all forms of {1} positivism and of all forms of Kantian idealism, and thereby to provide an adequate account of the empirical character of science as this both depends upon and differs from common sense experience.

2 SOME ASPECTS OF THE PROBLEM OF THE RELATION OF SCIENCE TO COMMON SENSE IN TWENTIETH CENTURY PHILOSOPHY

2.1 *Eddington's Two Tables*

A convenient starting point for the problem under discussion is that initiated by Sir Arthur Eddington in 1927³. In the introduction to his book 'The nature of the physical world', he talks of two tables, the one substantial, having extension, colour and shape – a thing – the table that the common sense man along with the man of science has no difficulty recognising. The other is the scientific table. His is mostly emptiness, with even the

supposed 'solid' electrons being possibly broken down into force fields. Of the relation between the two tables, he writes:

'I need not tell you that modern physics has by delicate test and remorseless logic assured me that my second scientific table is the only one which is really there – wherever 'there' may be. On the other hand I need not tell you that modern physics will never succeed in exorcising that first table – strange compound of external nature, mental imagery, and inherited prejudice – which lies visible to my eyes and tangible to my grasp'.⁴

In response to a rhetorical question as to the possibilities of these 'two worlds' being ultimately related as two aspects of the one world, Eddington is somewhat vague and unclear. On the one hand his remarks just cited lead one to suspect that 'the scientific table' is really real, whilst that of common sense is mistaken, but a nonetheless apparently necessary part of our belief and vocabulary. On the other hand he writes:

'Yes, no doubt they are ultimately to be identified after some fashion. But the process by which the external world of physics is transformed into a world of familiar acquaintance in human consciousness is outside the scope of physics. And so the world studied according to the methods of physics remains detached from the world familiar to consciousness, until after the physicist has finished his labours upon it. Provisionally, therefore, we regard the table which is the subject of physical research altogether separate from the familiar table, without prejudicing the question of their ultimate identification. It is true that the whole scientific enquiry starts from the familiar {2} world and in the end it must return to the familiar world; but the part of the journey over which the physicist has charge is in foreign territory'.⁵

In this way Eddington poses the problem in a way that may be likened to going on a journey with a necessity of changing planes. We begin on the plane of common sense. We change planes into the plane of physics. On the homeward journey we need to change planes again. The problem is that we seem to have no idea as to how the change in the mode of transport is effected. Moreover, it does not appear to be all that clear just whose responsibility it is to ferry passengers from one flight to the next. The physicist, so Eddington claims, is solely concerned with piloting the plane of physics. This situation may once have been somewhat different, but with the startling developments in twentieth century physics the situation is as we've just described. Thus he writes:

'Until recently there was a much closer linkage; the physicist used to borrow the raw material of his world from the familiar world, but he does so no longer. His raw materials are aether, electrons, quanta, potentials, Hamiltonian functions, etc., and he is nowadays scrupulously careful to guard these from contamination, conceptions borrowed from the other world'.⁶

In respect to the possibility of understanding how we may be ferried back to the plane of common sense from the plane of physics he writes:

'After the physicist has quite finished his world-building a linkage or identification

is allowed; but premature attempts at linkage have been found to be entirely mischievous'.⁷

In confronting these problems, Eddington the philosopher (as opposed to physicist) poses a solution during the course of his book. This solution involves the proposal that 'the stuff of the universe is 'mind-stuff', provided of course that the ordinary meaning of 'mind' and 'stuff' is suitably altered etc.⁸ In accordance with this metaphysical idealism, Eddington seeks to solve not only the problems cited above, but also the problems of the relationship of science to religion and many others. However, for the present purposes, it is significant that he does not seriously tackle the problem of relating physics to common sense upon the outward journey, i.e. how are the conceptions of physics arrived at from a common sense orientation to the world? His overall attempt at solving this problem would appear to involve an objectivising of the concepts of physical theory onto a metaphysical mind-substance that would still appear to leave the things presented to us in common sense, a mystery. {3}

2.2 THE DILEMMA OF THE SOLUTION POSED BY EMPIRICISM

During the present century the philosophies of science known as Logical Empiricism and Logical Positivism have generally sought to anchor all meaningful scientific (and other) discourse upon a foundation of observable qualities presented to our common sense. Whilst this world of common sense may have been construed phenomenally, in the sense that it has been interpreted as 'perceptions' or 'sense-data' presented to the human mind, it would nonetheless be true to say that the things of common sense that are observable by the faculties of sense have been understood to provide the ontological bed-rock of empirical science.

If the advocates of the more technical Logical Empiricism were largely concentrating upon the matters of specific concern to the philosophy of science, then other strains of empirical philosophy have generally been preoccupied with an analysis of our everyday world by means of a microscopic analysis of everyday language. To that extent they may be said to have been more concerned with common sense knowledge than the problems presented by science or with its relationship to common sense knowledge. Nonetheless, as Popper has pointed out⁹ there has also been a tacit acceptance on the part of this strain of empirical philosophy to the effect that there is a continuity between science and common sense, and that that continuity is founded in the things presented to us in common sense.

However, whilst all forms of empirical philosophy may have held the doctrine to the effect that common sense experience (however it might be conceived) is foundational and continuous with science, the schools of philosophy known as Logical Positivism and Logical Empiricism have worked hard at trying to give a rigorous account of the scientific endeavour as its entities are deemed meaningful in relation to real or potential 'sense data'. In terms of Eddington's two tables, this has amounted to a rigorous attempt at linking up the terms employed in the 'scientific table' with the terms used in regard to referring to the actual or potential observations that are made of 'the common sense table'. This has proved a daunting task insofar as this tradition of philosophy is concerned. H. I. Brown has given a useful concise summary of the history of the attempts to solve the problem in his book 'Perception, Theory and Commitment'.¹⁰ These include Russell's attempt to substitute logical constructions for inferred entities, Bridgman's Operationism, Carnap's

reduction sentences, the attempted deployment of Craig's Theorem and the attempted use of correspondence rules in respect to the supposed two parts of a scientific {4} theory - the part containing only observation terms, and the part containing only theoretical terms. Nonetheless, given the basic epistemological and ontological assumptions of Logical Empiricism, the problem relating to the two tables in order that they might be connected or identified remains unsolved. Only by breaking with these assumptions, has any progress been able to be made, and, as Brown notes, the most recent attempt on the part of Carl Hempel to solve the problem¹¹ amounts to a conferring of meaning upon theoretical terms that leaves unclear the relationship of these terms to real or potential sense experience¹².

2.3 THE PROBLEMS OF THE POST-KANTIANISM OF 'THE NEW PHILOSOPHY OF SCIENCE'

In 'Perception, Theory and Commitment', H. I. Brown seeks to identify 'a new philosophy of science' in a way that seeks to group the varying paradigmatic contributions of Michael Polanyi ('Personal Knowledge')¹³, Paul Feyerabend ('Explanation, Reeducation and Empiricism')¹⁴, N. R. Hanson ('Patterns of Discovery')¹⁵, and Thomas Kuhn ('The Structure of Scientific Revolutions')¹⁶, as 'a new philosophy of science' in opposition to the 'old philosophy of science' of Logical Positivism and Logical Empiricism. The central features of this new philosophy as it is described by Brown, would appear to be the following:

- 1) a rejection of the notion that the meaning of scientific terms and concepts need to be related to common sense experience in a coherent and demonstrable way. Scientific activity is principally one of theorising, not of observing. Thus, for example, Polanyi writes in answer to the question as to the true lesson to be taken from the Copernican revolution:

"Copernicus gave preference to man's delight in abstract theory, at the price of rejecting the evidence of our senses, which present us with the irresistible fact of the sun, the moon, and the stars rising daily in the east to travel across the sky towards their setting in the west... This would imply that, of two forms of knowledge, we should consider as more objective that which relies to a greater measure on theory rather than on more immediate sensory experience. So that, the theory being placed like a screen between our senses and the things of which our senses otherwise would have gained a more immediate impression, we would rely increasingly on theoretical guidance for the interpretation of our experience, and would correspondingly reduce the status of our raw impressions to that of dubious and possibly misleading appearances'.¹⁷ {5}

Paul Feyerabend, writes that

"A scientist who wishes to maximise the empirical content of the views he holds and who wants to understand them as clearly as he possibly can must therefore introduce other views; that is he must adopt a *pluralistic methodology*. He must compare ideas with other ideas rather than with 'experience' and he must try to improve rather than discard the views that have failed in the competition knowledge so conceived is not a series of

self-consistent theories that converges towards an ideal view; it is not a gradual approach to truth. It is rather an ever increasing ocean of mutually incompatible (and perhaps even incommensurable) alternatives, each single theory, each fairy tale, each myth that is part of the collection forcing the others into greater articulation and all of them contributing via this process of competition, to the development of our consciousness."¹⁸

- 2) an interest in the history of science and philosophy as a tool for providing criteria for an understanding of the philosophy of science. Thus conceived, scientific activity is part of an ongoing historical development of theorising in relation to a set of scientific problems. In this respect the fact and nature of scientific revolutions has provided perhaps the main stimulus to this interest in the history of science for philosophy of science. Brown writes, for example, that –

'The new philosophy of science is an attempt to bring out a philosophical revolution and the concept of a scientific revolution, taken over from older theories of science, is changed in the process. This is perhaps most clearly indicated by the use of the term 'revolutions' in the plural, a usage which makes no sense if we take 'scientific revolution' to refer to a unique event. The new approach to the philosophy of science has grown out of the failure of the older approach to solve its problems and out of anomalies revealed by modern studies of the history of science. In the constriction of the new approach it is clear that, both the sense and reference of the term 'scientific revolution' has been changed. On the one hand, at least one strand of meaning from the older notion remains: a scientific revolution is still viewed as a fundamental change in the way we think about reality'.¹⁹

- 3) a location of the standards of scientific debate within the extant and ongoing life of practicing scientists and the public organs that they promote, rather than in any attempt to spell them out in terms of a prescriptive methodology. Brown again, for example writes that

'My proposal, then, is to take the man of practical wisdom as a model of the maker of crucial scientific decisions which cannot be made by appeal to an algorithm, and I offer the making of these decisions as a model of rational thought. {6} It is the trained scientist who must make these decisions, and it is the scientists, not the rules they wield, that provide the locus of scientific rationality'.²⁰

It is my contention that the contours of 'the new philosophy of science' just cited arise from a Post-Kantian idealist epistemology that has a major problem avoiding either a relativist or an elitist notion of truth in science and in other fields of human endeavour.

To substantiate this claim, we might try to identify Kantian epistemology according to the following three theses:

1. What is presented to us by our senses has to be ordered by our faculties of reason and understanding. There is a set of categories in terms of which our conceptual apparatus

- orders our otherwise inarticulate mass of sensations, thereby bringing order to them.
2. These categories are fixed, and do not change from one period of history to another. They provide the basis for the apriori synthetic truths of mathematics and physics.
 3. In the ordering of our sensations there is no basic distinction made between scientific theory and commonsense. Our intellectual apparatus unconsciously and universally orders all our experience according to the pattern laid out in Kant's Critique of Pure Reason.

This Kantian epistemology has come into difficulties with 2. Scientific theories may be improved upon in a manner that can call for modification and possible overthrow even in very well attested theories. Hence the categories do not do the job they are supposed to in a way that can avoid historical modification. Attempts to modify the above epistemological framework taking this feature into account produces a post-Kantian Idealist Epistemology, which, to all intents and purposes may be identified with Brown's 'new philosophy of science'. It may be identified in the following three theses:

1. What is presented to us by our senses has to be ordered by our conceptual apparatus. There are no fixed categories by which this may be done. Scientific, Philosophic, Commonsense and all other forms of theorising orders our otherwise inarticulate mass of sensations, thereby bringing order to them.
2. With regard to scientific and philosophic theorising, there is always a given problem situation which sets the terms for an ongoing debate. This ongoing debate, in its attempts to solve its problems, may result in revolutions in our conceptions of reality. {7}
3. There is no fundamental difference between commonsense concepts and scientific concepts. Whilst the former, rightly refined, may form the observable part of scientific theorising, all are the result of an ordering of our experience by the conceptual apparatus produced by our various theories.²¹

This, I suggest, is the core of what Feyerabend, for example, puts forward in the following:

"...the influence, upon our thinking, of a comprehensive scientific theory goes much deeper than is admitted by those who regard it as a convenient scheme for the ordering of facts only.... scientific theories are ways of looking at the world... We may even say that what is regarded as 'Nature' at a particular time is our own product in the sense that all the features ascribed to it have first been invented by us and then used for bringing order into our surroundings."²²

The central problem posed by a Post-Kantian idealist epistemology is the problem of truth, and of the institutional means of promoting open discussion dedicated toward the pursuit of truth. On this matter the advocates of 'the new philosophy of science' are divided. Fearing the alternative of elitism on the part of one group of scientists, Feyerabend favours the anarchism of a pluralism that presumes a radically different notion of truth than the one that has shaped the activity of science throughout the greater part of its history. Polanyi, Brown and others, on the other hand, place their confidence in the personal and collective insights of the scientists to make the right decisions in regard to facts and theories. The problem with this view is that it would appear to place the rest of

mankind in the hands of a new priesthood, whose word they must take upon complete trust. {8}

It would be interesting to know just how the various representatives of the 'new philosophy of science' would deal with the problem of Eddington's two tables, and, *ipso facto*, the problem of the relationship of Science to Commonsense. On this matter one can only conjecture. However, one suspects that Feyerabend would simply say that the Commonsense table, along with the Scientific table and any other theory about the table (perhaps that it was King Arthur's Round Table!) were all competing theories regarding the table, each to be improved upon, but none to be considered false. Polanyi on the other hand might consider the scientific table something along the lines of a Platonic ideal, with the commonsense table as a pale reflection given to the faculties of sense.²³

2.4 *Popper's View on the Relation between Science and Common Sense*

Sir Karl Popper, it may be claimed, had a very clear insight into the aforementioned problems confronting the theory of knowledge. He argued against the Logical Positivists and Logical Empiricists, rejecting not only the verificationism in their epistemology, but also the whole Humean empiricist orientation to it. He also appreciated the problems of a Post-Kantian epistemology²⁴ and fought strongly against both dogmatic and relativistic trends in scientific epistemology. Indeed one may construe his whole contribution to epistemology as an endeavour to give a rational account of a theory of knowledge that avoided both these dilemmas, whether in relation to scientific endeavour or in relation to the organization of human society.

My argument is that whilst Popper had the correct intuition and aspiration, his attempt at giving such a theory has an Achilles heel, the same Achilles heel that confronts 'the new philosophy of science'. I believe the problem of the relation of science to common sense to be central in regard to this problem. Hence I shall begin arguing my case by seeking to expound and expose Popper's view of the relation between Science and Common Sense. {9} {10}

Popper's views on the relationship between science and common sense are cursorily dealt with in the 1958 preface to his 'Logic of Scientific Discovery' and considerably elaborated in several essays that have since been collected in 'Objective Knowledge'²⁵. In the 1958 preface to the 'Logic of Scientific Discovery', Popper discusses the relationship of science to common sense against the background both of analytic philosophy with its concern for elucidating the usage of words in everyday language and also of the fashion of Logical Empiricist philosophy of science. His claim is that the kind of concerns he has in respect to epistemology, as opposed to the two former trends, may be identified with almost all the great philosophers of the West²⁶. 'Its most important representatives during the last 200 years', he claims 'were Kant, Whewell, Mill, Peirce, Duhem, Poincare, Meyerson, Russell, and - at least in some of his phases - Whitehead. *Most of those who belong to this group would agree that scientific knowledge is the result of the growth of common-sense knowledge. But all of them discovered that scientific knowledge can be more easily studied than common sense knowledge. For it is common sense knowledge writ large, as it were. Its very problems are enlargements of the problems of common sense knowledge.*'²⁷ (emphasis mine)

In elaborating the underlined thesis, Popper, in the 1958 preface, may be construed as putting forward four theses:

1. That the problem of epistemology may be approached from two sides
 - i) as the problem of ordinary or common sense knowledge or
 - ii) as the problem of scientific knowledge.²⁸
2. That scientific knowledge is an extension of common sense knowledge.²⁹
3. That scientific knowledge is easier to analyse than common sense knowledge.³⁰
4. That the most important problems of epistemology must remain completely invisible to those who confine themselves to analysing ordinary language or common sense knowledge or its formulation in ordinary language. Specifically, the problem of the *growth of knowledge* transcends any study which is confined to common sense knowledge as opposed to scientific knowledge, for the most important way in which common sense knowledge grows is, precisely, by turning into scientific knowledge.³¹ {10}

Throughout this preface Popper's main concern is to criticise common sense linguistic analysts for not taking sufficient notice of the philosophy of science for epistemology and to criticize Logical Empiricists and others whose main concern has been to erect a special 'Language of Science'. He asserts the above four theses over against the latter two trends in philosophy, but does not discuss the character of the relationship of science to common sense in any detail.

The above four theses may be understood in basically one of two ways. The first, having the more empirical strain about it, would be to consider that common sense knowledge has both a genetic and an epistemological priority in regard to science. It has a genetic priority in the sense that scientific knowledge, whether in relation to the individual person or to the history of the human race, comes after some common sense insight of the world has been attained. It has an epistemological priority in the sense that what we know by means of common sense serves as a fallible, but nonetheless reliable background from which scientific theories are posed, refuted modified, and partially confirmed by empirical facts.

The second way to understand the above four theses would be to consider that whereas common sense knowledge may be genetically prior to scientific knowledge, it is not epistemologically prior. Common sense is genetically prior in the sense that it constitutes a set of attitudes and beliefs that has appeared amongst the human race prior to the development of the attitude that is characteristic of science.

In this sense scientific knowledge can contradict and radically change our common sense beliefs and attitudes in far reaching ways. For similar reasons science is epistemologically prior to common sense in the sense that an epistemological theory based upon an understanding of the progress of science, together with the elements of an ontological theory of reality are taken as the basis for explaining common sense knowledge.

It is my thesis that Popper advocates the second of the two alternative ways of understanding the aforementioned theses advanced in the 1958 preface of 'The Logic of Scientific Discovery'. His views in this respect, are made clear in his book 'Objective Knowledge'.

In his essay "Two Faces of Common Sense", which is the second chapter of this volume, he makes the following claim: {11}

"Science, philosophy, rational thought, must all start from common sense. Not, perhaps, because common sense is a secure starting point: the term "common sense" which I am using here is a very vague term, simply because it denotes a vague and changing thing - the often adequate or true and often inadequate or false instincts or opinions of many men.

How can such a vague and insecure thing as common sense provide us with a starting point? My answer is: because we do not aim or try to build (as did, say, Descartes or Spinoza or Locke or Berkeley or Kent) a secure system on these 'foundations'. Any of our many common sense assumptions - our common sense background knowledge, as it may be called - from which we start can be challenged and criticised at any time.¹³²

Nowhere, does Popper get any closer than this to saying what he means by common sense. On the one hand he adheres strongly to the "common sense belief of realism", "Realism is essential to common sense. Common sense, or enlightened common sense, distinguishes between appearance and reality. But common sense also realises that appearances (say, a reflection in a looking glass) have a sort of reality; or in other words, that there can be a surface reality - that is, an appearance - and a depth reality. Moreover there are many sorts of real things."³³ On the other hand he makes it abundantly clear that he rejects the commonsense notion that things are given to us directly in experience.

'...There is nothing direct or immediate in our experience: we have to learn that we have a self, extended in time and continuing to exist even during sleep and total unconsciousness, and we have to learn about our own and other's bodies. It is all decoding, or interpretation. We learn to decode so well that everything becomes very 'direct' or 'immediate' to us,¹³⁴

and he also rejects common sense in regard to epistemology³⁵.

Why then, is common sense important to Popper's epistemology?

His principal interest is in the progress of knowledge, which he develops according to the schema:

$$P_1 \rightarrow TS \rightarrow EE \rightarrow P_2$$

In this respect he considers that we are always confronted with problem situation (P_1); P_1 , in its turn gives rise to a tentative solution to the problems at hand (TS). This tentative solution may be held dogmatically, and be shielded from criticism, but should be {12} ruthlessly exposed to critical discussion, and so result in error elimination (EE), giving rise to a new problem situation (P_2), and the process keeps on going³⁶.

Popper goes on to claim³⁷ that what we call science begins with the Ionians in the fifth century BC, and that the crucial feature of this development was in the attitude taken

toward the myths that had been inherited by the tradition. In this, respective myths are to be seen as tentative theories to solving problems. Thus, the attitude of critical rationalism (EE error elimination), is, in Popper's view, the element introduced by the Ionian tradition, and thus to provide the impetus to the scientific tradition. Popper further claims³⁸ that biological organisms have knowledge in a 'subjective' sense in the form of dispositions that are by and large inherited genetically, and are capable of modification by the process of evolution in a fashion that parallels the growth of science, philosophy and rational thought.

He further develops these views within an overall ontological theory of World 1, World 2, and World 3, that would appear to be an emergent evolutionism³⁹. Within this context he develops the distinction between 'subjective' and 'objective' knowledge. The former consists of dispositions and beliefs, and belongs to individuals within World 2, whilst the latter belong to World 3, having an existence which is distinct from individual persons. With this background it is quite clear that what Popper calls 'common-sense knowledge' is effectively a primitive theory. In the first place, he claims that all knowledge is produced as the result of modifying previously held beliefs, dispositions or theories. For example, he writes that:

"The epistemological idealist is right, in my view, in insisting that all knowledge, and the growth of knowledge — the genesis of the mutation of our ideas — stem from ourselves, and that without these self-begotten ideas there would be no knowledge ... Kant was right that it is our intellect which imposes its laws — its ideas, its rules — upon the inarticulate mass of our 'sensations' and thereby brings order into them'.⁴⁰

In the second place, as has been noted above, he discredits the view that anything is *given* to us in our experience. {13} Rather, all knowledge of our experience consists in a decoding of chaotic messages. He writes, for example, that

'Learning to decode the messages which reach us is extremely complicated. It is based upon innate dispositions. We are, I conjecture, innately disposed to refer the messages to a coherent and partly regular or ordered system: to 'reality'. In other words our subjective knowledge of reality consists of maturing innate dispositions.... However this may be, we learn the decoding by trial and error elimination, and although we become extremely good and quick at experiencing the decoded messages as if they were 'immediate' or 'given', there are always some mistakes, usually corrected by special mechanisms of great complexity and considerable efficiency. So the whole story of the 'given' of true data, with certainty attached, is a mistaken theory, though part of common sense.'⁴¹

Thus, I would submit that in Popper's view, there is nothing 'given' or 'immediate' regarding common sense knowledge in an epistemological sense. Common sense is simply a platform of dispositions/beliefs that have been inherited partly by means of biological inheritance and partly by means of being brought up in a tradition. To this extent common sense is a vague background of primitive theory that may serve him as a starting point for his theory of the growth of knowledge according to the process of critical rationalism discussed above. In this sense common sense is *genetically* prior to the

development of critical rationalism with the Ionians in the fifth century B.C. My main point in all of this is that common sense is construed by Popper in terms of his theory of the growth of knowledge, and moreover that his theory of the growth of knowledge is linked with dispositions in the 'subjective' sense. The result is that his overall viewpoint of the relationship between science and common sense is thoroughly connected with the following features of his philosophical theories:

- i) his theory of the growth of knowledge in the sense of the dialectic of critical rationalism,
- ii) his connecting (i) with the Darwinian theory of evolution
- iii) his emergent evolutionary theories as these relate to the World 1 / World 2 / World 3 hypothesis.
- iv) the legacy of Kantian idealism in his epistemology. It is with this in mind that I claim that the supposed continuity between Science and Common sense in Popper is such that science is epistemologically prior to common sense, not the other way around. It is moreover at precisely this point that I would claim that his attempt to marry epistemological idealism with ontological realism comes unstuck. {14}

For example, he writes that

"As mentioned before, I am a realist. I admit that an idealism such as Kant's can be defended to the extent that it says that *all our theories are man made*, and that we try to impose them upon the world of nature. But I am a realist in holding that the question whether our man made theories are true or not depends upon the real facts; real facts which are, with very few exceptions emphatically not man made. Our man made *theories* may clash with these real *facts*, and so, in our search for truth, we may have to adjust our theories or give them up" (emphasis his)⁴²

For the clash between man made theories and real facts to take place in a way that avoids the description in terms of a Post-Kantian 'anomaly'⁴³, it is necessary to have a more-or-less accurate description of the facts that is not simply in extension of the theory. My claim will be that an adequate distinction between science and common sense does indeed provide a basis whereby 'facts' have a different epistemic status to 'theories', and, as such can provide the needed contact with reality. I shall also argue that the claim that Popper makes in this respect is a correct intuition and aspiration, but that his failure to give common sense the status it deserves constitutes a major weakness in his philosophical theories being able to achieve these goals, and actually live up to his correct intuitions.

To illustrate the point it would be instructive to enquire just how Popper's views of science in relation to common sense would deal with the problem of Eddington's two tables. He writes, for example, that

'Common sense provides us with an insecure starting point that may be modified by correction or transcended and replaced by a theory which may appear to some people for a shorter or longer period of time as being more or less 'crazy'.'⁴⁴

Such a description might well fit the situation in which the Aristotelian World Picture,

with its stationary earth at the centre of a revolving universe etc., being described as 'common sense' against the 'scientific' rival of Aristarchus-Copernicus. However, if we were to use this as a paradigm for dealing with Eddington's two tables, then we would be led to view the common sense table as a primitive theory, and, because of the greater explanatory power entailed in modern physical theories, we would be led to give up the former view of the table in favour of the 'scientific table', being prepared to be described as more or less crazy by some! {15}

Despite this, I have the feeling that Popper would not be entirely happy with this kind of application of his theories, for, it truly does expose the fact that science has somehow lost its footing with reference to common sense facts.

2.5 *The Central Problem with a Post-Kantian Epistemology*

a) *Post-Kantian Epistemology Defined*

By a Post-Kantian epistemology I mean an epistemology that is characterised by the following three features⁴⁵:

1. What is presented to us by our senses has to be ordered by our conceptual apparatus. There are, however, no fixed categories by which this may be done. Myth, Science, Philosophy and common sense are all attempts at ordering and understanding our experience, with varying degrees of success.
2. With regard to scientific and philosophic theorising there is always a given problem situation that sets the terms for an ongoing debate. This ongoing debate in its attempts to solve its problems, may result in revolutions in our conceptions of reality.
3. There is no fundamental difference between common sense concepts and scientific concepts. Whilst the former, rightly defined may form part of scientific theorising, all are the result of an ordering of our experience produced by our various theories.

b) *The Problem*

From the epistemological point of view just outlined, a given theory or set of categories has two different roles to play in regard to scientific investigation. The first is the role of predicting experience; the second that of ordering and organizing experience. The central problem with any epistemology espousing the above three tenets as a major part of its viewpoint, is simply that these two roles conflict to such an extent that it is well nigh impossible for a theory to be shown to be false, (let alone true!).

A scientific theory seeks to make predictions. In this sense the more general ideas that characterise the theory, taken together with more specific conditions, make forecasts as to how these more specific conditions may change or alter. Generally speaking, it is assumed in most day to day science that these forecasts or predictions may be checked by observation or experiment, thereby providing a test of the theory in question. The possibility of the test depends upon the ability of an observation to confirm or refute a forecast or prediction. If the observation confirms the prediction, then this is usually taken as giving support for the general ideas embodied in the theory. If the observation does not confirm the prediction, then this is taken as a problem or 'anomaly'. {16}

What is the nature of the problem here described as 'anomaly'? Two basically different

kinds of answers may be offered. If it were possible to make observations with a minimum of error and in a way that was quite independent of the theory under consideration, then a conflict between prediction and observation would have to rule in favour of there being something wrong with the theory (or the supporting theories). Among other things such a point of view would require that the theory under test have a minimal, if not non-existent, role in organizing our actual experience. Only then would it be truly possible to describe the anomaly as a conflict between theoretical prediction and observation. The Post-Kantian point of view is precisely that the theory (or some theory) has a prime function in organizing our actual experience. From such a point of view an 'anomaly' cannot simply be interpreted as a problem with the theory or a problem with the observation in relation to the theory, for the theory and the observation are inextricably intertwined. In this respect the problem is rather one of the ability of the theory to order our experience in a non-contradictory way. In this respect 'the anomaly' is such a contradiction, and, as such, has shown up some deficiencies in our 'mind set', the categories that so organise our experience. There are then all manner of ways (and research projects!) in which this problem might be looked into. None, however, are deemed to involve anything like a straight forward dealing with a theory in relation to an observation in the manner held by the point of view just discussed.

It would be true to say that Sir Karl Popper espoused a view of the scientific enterprise that aspired to be in tune with the former of the above two views of 'anomalies'. It would be equally true to say that he thought that 'the critical rationalism', of which his philosophy of science was an integral part, provided a view-point that was able to deal with the dual problems of elitism (dogmatism) and anarchism (relativism), not only in science but in all human endeavour. To this extent it is perhaps significant that later Post-Kantians (and I shall argue in the next section that Popper's epistemology is Post-Kantian in the sense discussed above, albeit that it had the aspiration not to be) tend either toward elitism (Polanyi, Brown, Kuhn) or toward anarchism (Feyerabend) in regard to their theories of science. In this respect it would appear to be symptomatic of epistemologies of this kind that they would generally appear to be unable to deal with the issue of relativism/dogmatism in the wider and more general sense. {17}

c) Popper as a Post-Kantian

In 1948 Popper delivered a paper in German under the title 'Naturgesetze and theoretische Systeme', which has since been translated into English and updated to appear as the essay 'The Bucket and the Searchlight: Two Theories of Knowledge', an appendix to 'Objective Knowledge'. A footnote⁴⁶ informs us that this paper anticipates many of the ideas developed more fully in 'Conjectures and Reputations'. I would like to begin with this essay in an attempt to discover in what sense Popper may be described as a Post-Kantian. He begins this essay by criticising what he calls 'the bucket theory of science' or 'the bucket theory of the mind' (which would also appear to be exactly the same as the commonsense theory of knowledge already alluded to in previous sections of his essay). Of this view he writes:

"According to this view, then, our mind resembles a container - a kind of bucket - in which perceptions and knowledge accumulate. (Bacon speaks of perceptions as 'grapes, ripe and in season' which have to be gathered patiently and industriously, and from which, if pressed, the pure wine of knowledge will flow).

Strict empiricists advise us to interfere as little as possible with this process of accumulating knowledge. True knowledge is pure knowledge, uncontaminated by those prejudices which we are only too prone to add to, and mix with, our perception, these alone constitute experience pure and simple. The result of these additions, of our disturbing and interfering with the process of accumulating knowledge, is error. Kant opposes this theory: he denies that perceptions are ever pure, and asserts that our experience is the result of a process of assimilation and transformation the combined product of sense perceptions and of certain ingredients added by our minds. The perceptions are the raw material, as it were, which flows from outside into the bucket, where it undergoes some (automatic) processing - something akin to digestion, or perhaps systematic classification - in order to be turned in the end into something not so very different from Bacon's 'pure wine of experience'; let us say, perhaps, into fermented wine.

I do not think that either of those views suggests anything like an adequate picture of what I believe to be the actual process of acquiring experience, or the actual methods used in research of discovery. *Admittedly Kant's view might be so interpreted that it comes much nearer to my own view than does pure empiricism.* (emphasis mine) I grant of course that science is impossible without experience (but the notion of 'experience' has to be carefully considered). Though I grant this, I nevertheless hold that perceptions do not constitute anything like the raw material, as they do according to the 'bucket theory' out of which we construct either 'experience' or 'science'.⁴⁷ {18}

Over against the bucket theory, Popper points out that in science it is observation rather than perception which plays the decisive role; and that observation is a process in which we play an *active* part. He then goes on to develop 'the searchlight' model of knowledge in which man actively proposes his hypotheses, conjectures, observations according to his interest. In this respect, according to 'the searchlight theory', theories, conjectures, hypotheses always have precedence over observations in the sense of having a *predictive* role in regard to experience.

"The hypothesis (or expectation, or theory, or whatever we call it) precedes the observation, even though an observation that refutes a certain hypothesis may stimulate a new (and therefore temporally later) hypothesis.

All of this applies, more especially, to the formation of scientific hypotheses. For we learn only from our hypotheses what kind of observations we ought to make; whereto we ought to direct our attention; wherein to take an interest. Thus it is the hypothesis which becomes our guide, and which leads us to new observational results.

This is the view which I have called the 'searchlight theory' (in contradistinction to the 'bucket theory'). (According to the searchlight theory, observations are secondary to hypotheses).⁴⁸

If observations are deemed secondary to theories, hypotheses, conjectures etc., in the

sense that the latter are *predictive* in regard to the former, then Popper's position in respect to the Post-Kantian epistemology discussed in this essay hinges upon the answer to the following question: *In what sense, in Popper's view, are Theories deemed to organise our actual observations?*

It must be said that Popper's standpoint on this matter is not unequivocal.

On the one hand, it is clear that he *wants* observations to be able to refute false hypotheses, conjectures and theories in a conclusive fashion. He writes, for example, that

'Observations play... an important role as tests which a hypothesis must undergo in the course of our (critical) examination of it. If the hypothesis does not pass the examination, if it is falsified by our observations, then we have to look around for a new hypothesis.'⁴⁹ {19}

'It is through the falsification of our suppositions that we actually get in touch with 'reality'. (emphasis his).

It is the discovery and elimination of our errors which alone constitute that 'positive' experience which we gain from reality'.⁵⁰

"The epistemological idealist is right, in my view, in insisting that all knowledge, and the growth of knowledge - the genesis of the mutation of our ideas - stem from ourselves, and that without these self-begotten ideas there would be no knowledge. He is wrong in failing to see that without elimination of these mutations through our clashing with the environment there would be not only be no incitement to new ideas, but no knowledge of anything. (Cp. 'Conjectures and Reputations, esp. p.117). *Thus, Kant was right that it is our intellect which imposes its laws - its ideas, its rules - upon the inarticulate mass of our 'sensations' and thereby brings order into them.* (my emphasis). Where he was wrong is that he did not see that we rarely succeed with our imposition, that we try and err again and again, and that the result - our knowledge of the world - owes as much to the resisting reality as to our self-produced ideas'.⁵¹

However, whilst it is clear that Popper *wants* observations to be able to refute false conjectures, *it is by no means clear that his epistemology gives an account of how this is possible.* There are, I suggest, two reasons for this.

i) In the first place Popper has asserted that ordinary language is full of theories, and, consequently any observational statement is bound to be theory-impregnated. For example, he has written that

'My point of view is, briefly, that our ordinary language is full of theories; that *observation is always observation in the light of theories* (emphasis his); and that it is only the inductivist prejudice which leads people to think that there could be a phenomenal language, free of theories, and distinguishable from a 'theoretical language'.⁵²

The above quotation may be interpreted in a weak sense. (i.e. it may be taken to assert that the statements both of ordinary life-experience and of scientific observations are influenced in some limited, specifiable way by theories. On the other hand, it could be interpreted in a strong (i.e. Kantian or Post-Kantian) sense, in which theories are deemed necessary instruments in giving order to our otherwise 'inarticulate mass of sensations'. If the former view is to be taken unequivocally, then some attempt should be made to specify a way in which observations, perceptions etc. may be organized in a manner that, at least in part, is not the result of conjectures, hypotheses, theories etc. Popper's writings contain no such attempt. On the contrary they seem to lend support to the Kantian view: {20}

'Kant was right that it is our intellect which imposes its laws - its ideas its rules - upon the inarticulate mass of our 'sensations' and thereby brings order into them'.⁵³

Despite the fact that Popper, qualified his support for Kant by asserting (a) that our attempts rarely succeed and need to be subject to revision and (b) that reality can 'refute' our theories, he does not refute the Kantian view that it is 'our intellect which imposes its order upon the inarticulate mass of our sensations, thereby bringing order into them', presumably with regard to both science and common sense.

(ii) As I have already pointed out⁵⁴ Popper has a somewhat ambiguous attitude toward the continuity between science and common sense. A cursory reading of Popper would probably give the impression that he espouses a view in which common sense provides an empirical foundation (albeit a fallible one!) with respect to science. A more careful reading, however, makes it clear that he puts forward the thesis that common sense knowledge is but one stage in the growth of knowledge, all the stages being characterised by dispositions, conjectures, hypotheses or theories that have been made by an active subject (with the qualification that 'the activity' of a previous generation may be 'implanted' or 'learnt' by the present generation) in respect to their environment. Thus, I would suggest that it is erroneous to view Popper's assertion of a continuity between science and common sense as one that would, of itself, lend science an empirical foundation in common sense.

I would venture to suggest that a similar conclusion may be drawn in regard to the empirical character of the basic statements that are deemed "to constitute the tests of hypotheses, conjectures or theories. In regard to actual observations and perceptions he suggests that the truth of empirical statements as grounded upon perceptions are deemed to rest upon feelings of conviction or certitude on the part of the observer⁵⁵, and finds such 'subjectivism' unacceptable. In its place he suggests that the empirical character of science is best guaranteed by a logical chain of statements about things that are deemed testable by experience, adding that:

'If, as a result, he rejects the statement, then it will not satisfy us if he tells us all about his feelings of doubt or about his feelings of conviction as to his perceptions. What he must do is to formulate an assertion which contradicts our own, and give us his instructions for testing it. If he fails to do this we can only ask him to take another and perhaps a more careful look at our experiment, and think again.'⁵⁶
{21}

Again it needs to be said that what is here asserted may be taken either in a weak or in a strong (i.e. Kantian or post-Kantian sense). The former would simply say that observation statements are fallible and are partially influenced by theories. The latter however, would assert that theories organise observations to the extent that they order the whole of our experience. From this standpoint a problem that is currently viewed as a conflict between theory and observation is actually a problem of the ability of our theory to organise our experience, whence it needs modification. If people hold different theories, then their observations of 'the same thing' may be seen as different things. Popper's advice in this respect - "take another look and think again" - would seem to offer little by way of an empirical test that could be deemed adequate to solve the problem.

If Popper does not wish to be taken as giving support to the Post-Kantian standpoint, then the empirical character of observations needs to be given far more reliability and truth then he would seem prepared to advance or defend. Instead, he writes that

'I differ from the conventionalist in holding that that the statements decided by agreement are *not universal but singular*. And I differ from the positivist in holding that basic statements are not justifiable by our immediate experiences, but are, from the logical point of view, accepted by an act, by a free decision reached in accordance with a procedure governed by rules: the old procedure of trial by jury'.(emphasis his) ⁵⁷

"The empirical basis of objective science has thus nothing 'absolute' about it. Science does not rest upon rock bottom. The bold structure of its theories rises, as it were, above a swamp. It is above the swamp, but not down into any natural or 'given' base; and when we cease our attempts to drive our piles into a deeper layer, it is not because we have reached firm ground. We simply stop when we are satisfied that they are firm enough to carry the structure, at least for the time being."⁵⁸

There is nothing in such statements to cause the Post-Kantian viewpoint any difficulty. On the contrary it might well be pointed out that juries have often been known to have been divided down the middle because of the way the differing and opposing viewpoints of defense and prosecution interpret or order 'the facts'. Further, it might be pointed out that because, in their view, there is no other way to gain a grasp upon reality except via our theories, and that the latter as such, though bold, may well be described as 'piles driven into the swamp of empirical reality'.

Hence, I would submit that Popper gives no adequate defense for a 'weak' interpretation of the way theories are deemed to organise our actual observations. {22}

Popper's position in regard to 'the new philosophy of science' (i.e. the Post Kantian epistemology) has been described by Brown as being transitional.⁵⁹ I would suggest that the reason for this is his lack of equivocation in respect of his answer to the question: "*In what sense and to what extent are theories deemed to organize as opposed to predicting our actual observations?*" He has given every indication that he *wants* to be able to answer this question in a way that would say that 'theories partially organise observations

and the extent to which they do so does not prevent them from enabling the observations to function as potential falsifiers of the theories used to predict them'. However, he does not develop his epistemology in a way that defends such a position. Indeed I would suggest that without major revisions such a defense is impossible.

Against the Logical Empiricist philosophical background in which Popper's views were first developed, the empiricist epistemology in respect to observations tended to cast a certain light upon Popper's views. (He admits that this is true for example, in respect to the way his view of falsifiability was taken up by them.) Against a background in which reliable, theory-free, observations were taken as the foundation of science, it would be natural to cast a weak interpretation upon 'the theory-impregnation of observations', particularly in view of the fact that he put forward a position in which it is claimed that observations are capable of refuting theories. However, with the advent of the Post-Kantian epistemology of 'the new philosophy of science' his failure to give an account or a defense of a commonsense knowledge of reality over against theories has, I suggest, exposed an Achilles heel in his epistemological theories.

To summarise:

1. Popper had an aspiration for his epistemology to be free both of Post-Humean positivism and Post-Kantian idealism.
2. In fact his epistemology is not unequivocal in respect to the matter of the way theories are deemed to organise our experience in general and our observations in particular.
3. The principle reason for this equivocation lies in the fact that he views common sense as a primitive theory, and, to that extent - though it may be genetically prior to science, it is, in his terms, epistemologically posterior, in the sense that common sense knowing is construed according to Popper's philosophical theories. {23}
4. The above cited equivocation in Popper's epistemology means that his theories are open to very different interpretations, depending upon the philosophical climate in which they are discussed. The 'old philosophy of science of Logical Empiricism or Logical Positivism' lent one interpretation, whereas 'the new philosophy of science' or what I have termed Post-Kantianism has lent another.

Hence my conclusion that Popper's philosophy of Science is Post-Kantian, despite the fact that he had and no doubt continues to have every aspiration for it not to be.

Hence, too, his philosophy being able to be described as 'transitional with regard to 'the old' and 'the new' philosophies of science.

2.6 *A Sketch of an Alternative Epistemology*

The epistemological alternative that I wish to put forward to both the positivist strain of 'the old philosophy of science' and 'the Post-Kantian' strain of 'the new philosophy of science' may be summarised in the following three theses, which will be developed in the next sections of the present essay.

- i) What we are presented with in experience is a world of things which have a unity and diversity of properties - Tables, trees, people, flowers, houses, beetles, stars, stones, etc. Common sense experience is characterised by a

focus upon the concrete fullness of these things in a way that is aware of the richness of both their individual properties and of the wider environment in which these things exist and are experienced. These things are given to us directly in the sense that they (not sense data, impressions, ideas, theories (primitive or otherwise) constitute the prime datum of our experience. True, learning is necessary to grow in knowledge of the world, but there is a sense in which the objects of that knowledge are already known, albeit vaguely, in this learning process. Common sense experience thus conceived, is deemed to have a direct ontological character, from which a heritage of fallible common sense knowledge arises within the history of both an individual and a community. A variety of factors influence this commonsense knowledge, but the chief factor is the direct relation of consciousness we have in relation to real things and to imaginatively elaborated 'invented reconstructions' that together form the basis of the common sense experience of all human beings. {24}

- ii) Scientific and philosophic theorising involves a shift in the focus of attention from the concrete fullness of things to a focus upon *certain* of their properties to the neglect of others. The concern of this shift in the focus of attention is one of understanding and explaining the facts relating to the properties thus singled out for attention. This concern for understanding and explanation is characterised by a high degree of logical rigour.
- iii) With regard to scientific and philosophic theorising there is always an historical problem situation which sets the terms of an ongoing debate concerning them. To this extent scientific theories do make predictions with regard to the fullness of the concrete reality from which their original and subsequent problems have been abstracted. Moreover, attuned and controlled common sense experience in the form of experiments is able to provide observational tests that are not the prime result of an organization of that experience by the theory concerned.

2.7 Eddington's Two Tables Revisited

In Section 2.1 we likened Eddington's problem to that of going on a journey with the necessity of changing planes. We begin on the plane of common sense; we change planes into the plane of physics and later make the return journey. The crucial problem is one of identifying the means by which we are ferried from one plane to the other — both upon the outward and the return journey. To solve this problem we need

- a) to identify the process whereby we leave the plane of common sense to join the plane of physics, and,
- b) to identify how the knowledge gained on that journey relates to that obtained on the plane of common sense.

From the viewpoint to be developed in the following sections, these problems will be dealt with along the lines of the following theses:

- (i) In common sense experience we are confronted with a thing that we recognise and experience as a table. In this respect the table has a great diversity of properties. It has size and shape; it has a certain number of legs; it is constructed from wood, stone, plastic or metal; it has characteristic properties that make it more suitable for use either in a kitchen, a garden, a dining room, a study or a hallway; it has a certain style of design

that give clues as to the historical time and place in which it was constructed; it is heavy or light, hard or brittle, strong or fragile. All these properties and many others are apparent, albeit without precision, in the common sense experience of the table. Moreover, the latter is a thing in which all these properties are instantiated in the unity of the thing that we experience. {25}

(ii) In common sense experience it is apparent that certain of the cited properties of the table are shared with other things. An unhewn log of wood, for example, has size and shape; it is heavy or light. However, it does not generally have the regular shape and other stylistic features that are characteristic of human design.

(iii) From common sense experience we can learn that wood floats on water whilst stone sinks. We can also learn that if a log is hollowed out, its ability to float is greatly enhanced. Questions arise to why these facts of common sense experience are so. The answers to such questions are not only applicable to the particular log of wood, hollowed out for the purpose, but for all logs of wood, for stones, for tables etc. To this extent the attempts to answer questions regarding certain properties of things involve implicit or perhaps explicit implications for the similar properties of all the things of common sense experience. Moreover, the properties relevant to distinguishing a kitchen table, a telephone table, a Maori canoe and an unhewn log of wood are not directly relevant to a discussion of the kinds of problems that are posed in regard to the flotation properties of these things.

The cited attempts to answer the problems of flotation may be viewed as resulting from an activity of abstracting certain common properties from what are in many ways otherwise different and diverse things, in an attempt to explain and thereby understand the said properties of the various things concerned.

With this observation in mind many scientific theories are developed less in relation to particular things, such as a table, but more in relation to certain properties that are instantiated in different things that are similar in certain respects, albeit that they may be very different in others.

Two important consequences follow from such a view:

- a) A science like physics has, at least in the first instance, to neglect certain types of properties to gain its explanatory power.
- b) Although there is a process of abstracting properties going on in the development of the sciences, the results of this process should not be viewed as inhabiting a Platonic heaven that is distinct from the common sense things of our experience. The properties concerned relate, to the fullness of our common sense experience of things, and may not rightly ever be divorced from the fullness of that experience.

(iv) With respect to the internal development of the science of physics, many of the theories and the meanings of the terms associated with them reach beyond ordinary common sense experience. Despite this the properties concerned may be considered to belong, at least conjecturally, to the things postulated by these theories at the macro or micro level. {26}

(v) A table presented to common sense experience is a thing with a coherence of all manner of properties. The theories of modern physics may, at first glance, be unrelated to these properties. These theories are, however, related to the general physical properties of a table, a log of wood, a stone etc. in ways in which both physicists and philosophers need to elucidate. However, as a particular science investigating physical properties, physics cannot be *assumed* to exhaust the properties of the table (such a thesis would at least have to be argued!). Geometry, sociology, history, aesthetics would all seem to have something to say about the table, simply because the kinds of properties with which each of these disciplines is concerned, are also instantiated in the table of common sense experience. The latter can only be put back together again in the fullness of a coherence of all its properties, if all relevant disciplines and their inter-relationships are taken into account. In Summary: there are not two tables, but one. The table presented to common sense is a thing with an integral, coherent set of properties instantiated in a unique individual thing. The science of physics presents us with a provisional account and explanation not only of the table, but also of many other things. As such, therefore, this science cannot be presumed to give as the full account of our table. Such an account would require due attention being given to all the properties of the table presented to our common sense experience in a way that bore in mind the individuality of this particular table. Once this was done we should not have two contradictory tables, but rather one table with a considerably deepened and extended, albeit tentative understanding of its various properties. {27}

3 The Distinction and Relationship between Pre-Scientific and Scientific Thought

3.1 Introduction

By way of a preliminary and introduction to the nature of the distinction between science and common sense to be discussed in section 4 of the present essay I will critically survey the ideas and views set forth on this topic presented by three influential authors on the subject: viz. P. Frank, E. Nagel and M. Wartofsky⁶⁰. This survey will conclude with an summary of theses that will be elucidated at greater length in the subsequent section.

3.2 Philipp Frank: Commonsense and Abstract Structures

Philipp Frank, for example, claims that

'when we speak of science we always speak on two levels of discourse or abstraction. The first of these is the level of everyday common sense experience; e.g. we observe some dark spot moving with respect to some other dark spots. This is the level of direct observation.... The second level to which we have referred to is that of the general principles of science. This is completely different from the level of common sense experience. The latter can be shared by all; the former employs language very far from that of everyday experience. Science consists essentially of these general principles.... The central problem of the philosophy of science is how we get from common sense statements to general scientific principles'.⁶¹

Moreover, he goes on to say of the two levels just cited that

'it is not too much to say that most of the misunderstandings in the philosophical interpretation of science have arisen because the distinction between these two levels and the way in which they are connected have not been clearly understood'.⁶²

and continues by claiming not only that the two levels of immediate experience and abstract principles have played a significant role in the whole history of philosophy but also by conjecturing along with F. S. C. Northrop that perhaps the major difference between the Eastern and Western tradition has been with abstract principles and their relation to common {28} sense experience, whilst that of the East has been with the fullness and immediacy of life experience known by all in the attitude of common sense experience. But, acknowledging the merely conjectural character of this suggestion he concludes that

"whatever may be true about East and West, however, one thing is certain - that there are these two approaches, immediate sense experience and conceptual structures."⁶³

Whilst one may agree with Frank with regard to the importance of the distinction to be drawn between common sense and abstract conceptual structures, I think that it is equally important to take care before characterising the former as 'immediate *sense* experience' (emphasis mine), if we are to understand by this the empiricist distinction between the immediacy of sense data over against the things which are thereby supposed to be represented to the mind by such sense data. If, as Frank earlier asserts⁶⁴ that the common sense mode of experiencing and thinking is the one that is shared by all mankind, then it would perhaps be important to listen to David Hume, when he writes that

'however philosophers may distinguish betwixt the objects and perceptions of the senses; which they suppose co-existent and resembling; yet this is a distinction which is not comprehended by the generality of mankind, who as they perceive only one being, can never assent to the opinion of a double existence and representation'.

And again

'indeed whatever convincing arguments philosophers may fancy they can produce to establish the belief of objects independent of the mind, 'tis obvious these arguments are known but to very few, and that 'tis not by them, that children, peasants, and the greatest part of mankind are induc'd to attribute objects to some impressions, and deny them to others. Accordingly we find that all the conclusions, which the vulgar form on this head, are directly contrary to those, which confirm'd by philosophy. For philosophy informs us, that every thing, which appears to the mind, is nothing but a perception, and is interrupted, and dependent on the mind; whereas the vulgar confound perceptions and objects, and attribute a distinct continued existence to the very things they feel or see.'⁶⁵

Although Frank's discussion of these matters is somewhat scanty, one is left with the impression that he tends to draw the distinction between common sense and abstract structures after the fashion of the Logical Empiricists whereby the former is deemed to have a sensory character, in such a way that, in Humean fashion, the sensory impressions are given the epistemological certitude of *observations* insofar as science is concerned, whilst the latter {29} is deemed to be the realm of *theoretical* terms and principles, in the sense that they are not directly related to the former. In regard to sense data or sense impressions forming the content of common sense experience, I can only concur with Popper when he writes that

'the quest for certainty leads to the singling out of data or elements, or sense impressions or immediate experiences, as a secure basis of all knowledge. But far from being this, these data or elements do not exist at all. They are the inventions of hopeful philosophers.'⁶⁶

The view of common sense experience to be taken in the sequel will not in the first instance be concerned with epistemological certitude with regard to the beliefs of common sense. It will be more concerned with what might be called *the attitude* toward experiencing the things and events of common sense reality as these are characteristic of all mankind. With this in mind, I would suggest that a better preliminary qualification of the common sense mode of experience is 'the immediate experience of things and events in the fullness of their environmental setting'.

3.3 Ernest Nagel: Common-sense Knowledge and Systematic and Responsibly Supported Explanations.

Nagel is less concerned than Frank to characterise common sense. His attention in regard to the latter is more with the contents of common sense knowledge and belief as a springboard for discussing the ways in which science differs from the general knowledge afforded from what I shall call the general attitude of common sense experience. For example, he begins with the following observation concerning the long and more-or-less reliable heritage of common sense knowledge

'Long before the beginnings of modern civilization, men acquired vast funds of information about their environment. They learned to recognise substances which nourished their bodies. They discovered the uses of fire and developed skills for transforming raw materials into shelters, clothing and utensils. They invented arts of tilling the soil, communicating, and governing themselves. Some of them discovered that objects are moved more easily when placed on carts with wheels, that the sizes of fields are more reliably compared when standard schemes of measurement are employed, and that the seasons of the year as well as many phenomena of the heavens succeed each other with a certain regularity..... The acquisition of reliable knowledge concerning many aspects of the world certainly did not wait upon the advent of modern science and the self-conscious use of its methods... If so much in the way of knowledge can be achieved by the shrewd exercise of native gifts and 'common sense' methods, what special excellence do the sciences possess, and what do their elaborate intellectual and physical tools contribute to the acquisition of knowledge?'⁶⁷ {30}

In his attempt to answer this question, Nagel seeks to discuss some of the ways in which 'pre-scientific' or 'common sense' knowledge differs from the intellectual products of modern science. He begins by discussing the point that although both common sense knowledge and scientific knowledge may be 'organised' or 'classified', it is the *kind* of organization or classification that distinguishes the one from the other.⁶⁸ He illustrates this by citing the example of a lecturer's notes on his travels in Africa. Whilst these may be very well organized for the purposes of communicating information interestingly and efficiently, they do not deserve the title 'scientific'. He then makes the point that information acquired in ordinary experience may be organized and accurate enough within certain limits, but it is seldom accompanied by *explanations* as to why the facts are as alleged.⁶⁹ He supports this view by citing as examples (a) that although the uses of the wheel have been known for centuries, they usually know nothing of the frictional forces that could explain why it was able to do the job required of it,⁷⁰ (b) that whilst many peoples have learned the advisability of manuring their agricultural fields, only a few concerned themselves with the reasons for so acting, and (c) that while the medicinal properties of herbs like the foxglove have been recognised for centuries, usually no account was given for their healing powers.

He goes on then to make the point that when common sense does attempt to give explanations for the facts of everyday experience the latter are frequently without critical tests as to their relevance to the facts they are supposed to explain.⁷¹

Other points concerning the differences between common sense, knowledge and scientific knowledge are also made. Though the former may be reasonably accurate within the usual demands made upon it, it is seldom aware of the limits within which its beliefs are valid or its practices successful. To this extent common sense knowledge is most adequate when the general factors relating to the situation to which it is applied remain more or less unchanged. This inadequacy of common sense knowledge may be partially assisted by science with its ability to 'introduce refinements into ordinary conceptions by the very process of exhibiting the systematic connections of propositions about matters of common knowledge'.⁷² {31}

Nagel notes the seeming ease with which those whom David Hume charmingly calls 'the vulgar' are able to entertain quite contrary beliefs in the attitude of common sense experience⁷³. Moreover he suggests that the reason why many common sense beliefs have survived for centuries whereas certain conclusions in various branches of modern science may have a very short life is largely because of the relative imprecision of the former as compared with the high degree of precision sought for in the latter⁷⁴,

Whilst common sense knowledge is largely concerned with the impact of events upon matters of special concern and interest to mankind, the quest for systematic explanations requires that inquiry be directed in a way that need not bear such features in mind. To this extent scientific formulations make use of highly abstract concepts whose pertinence to the familiar qualities which things manifest in their customary setting is by no means obvious, but is nonetheless relevant⁷⁵.

The final distinction between science and common sense made by Nagel relates to the

(supposedly) deliberate policy on the part of the former to expose its cognitive claims to the repeated challenge of criticism and testing to a degree that is not usually the case in respect to common sense knowledge^{76 77}. However, the validity of this point needs to be accepted with a word of caution. Examples of scientific and philosophical theories may readily be cited that have been held or withheld quite dogmatically, without due regard for critical argument. Moreover, it is not always the case that common sense beliefs are held uncritically. Perhaps a better way of stating Nagel's point would be to say that scientific theories always *ought* to be exposed to critical argument and test and that, as a matter of fact, common sense beliefs are frequently held without such a critical evaluation.

At the commencement of the second chapter of his 'Scientific Explanation', Nagel states by way of conclusion in respect to the matters that have been discussed above that 'the distinctive aim of the scientific enterprise is to provide systematic and responsibly supported explanations... such explanations may be offered for individual occurrences, for recurring processes, or for invariable as well as statistical regularities... to understand the requirements for, and the structure of, scientific explanations is therefore to understand a pervasive feature of the scientific enterprise'. {32}

In many respect these remarks are admirable in regard to their attempt to characterise the scientific enterprise. However, taken at face value the above could equally well apply to the task of solving a crime, whether by Enid Blyton's 'Famous Five', Kojak or any ordinary detective in the N. Z. Police Force! And, whilst no doubt we might be able to speak of the science of crime detection insofar as this is applied to the general principles and varied disciplines (forensic science) that may be brought to bear upon crime detection, a course in the latter would scarcely seem a prerequisite for 'The Famous Five' solve a crime or for Enid Blyton to be able to invent one!

In this respect, I would suggest that to gain a more adequate characterisation of science the above conclusion needs to be accompanied by another feature drawn out by Nagel in the earlier chapter of his book, viz:

"It is the desire for explanations which are at once systematic and controllable by factual evidence that generates science; and it is the organization and classification of knowledge on the basis of explanatory principles that is the distinctive goal of the sciences. More specifically, the sciences seek to discover and to formulate in general terms the conditions under which events of various sorts occur, the statements of such determining conditions being the explanations of the corresponding happenings, This goal can be achieved only by distinguishing or isolating certain properties in the subject matter studied and by ascertaining the respectable patterns of dependence in which these properties stand to one another." (emphasis mine).⁷⁸

3.4 *Max Wartofsky: Varieties of Common sense Knowledge, Tacit Knowing; Philosophy and Science as Criticism and Abstraction.*

In his 'Conceptual Foundations of Scientific Thought'⁷⁹, M. Wartofsky makes the following statement regarding the relationship between Science and Commonsense:

"The continuity between scientific knowledge and ordinary ways of knowing

could lead one to the erroneous conclusion that all knowing activity is scientific. The discontinuity between scientific and ordinary ways of knowing could lead one to the alternative conclusion, equally erroneous, that science has nothing to do with ordinary ways of knowing. The genesis of scientific thought in the intelligent human action which uses concepts, and in the rational human understanding which reflects on concepts, leads to a more qualified conclusion than either of these two. All science is knowledge by means of concepts, but not all knowledge by means of concepts is scientific... In considering the genesis of science we need to distinguish non-science from science. But beyond this, we need to show how certain ordinary ways of knowing form the distinctive matrix in which science could arise; how, in this sense, certain patterns and modes of thought are prescientific. In particular, we want to suggest how theoretical explanation and the formulation of laws derive from prescientific contexts".⁸⁰ {33}

In seeking to spell out the general character of the genesis of science from common sense in fulfillment of the aim just cited, Wartofsky proceeds by means of three steps. The first is to suggest a typology of pre-scientific knowledge in ways that are deemed relevant for the genesis of a scientific mode of thinking. Whilst the second is largely concerned with the kinds of distinctions between science and common sense that we have already discussed in regard to Nagel, Wartofsky does offer insights that we have not thus far considered in this regard. Finally he discusses the background and development of Greek Science and Philosophy making the point that the tradition of Western science and philosophy has an historical continuity with the cited beginnings made by the Greeks. I shall briefly summarise and discuss each of the three stages of his argument, with a view to going on to draw some general conclusions regarding the various points that have been made not only by Wartofsky, but also by Nagel and Frank in regard to the distinction between science and common sense.

(i) *The pre-scientific context.* In seeking to elucidate the pre-scientific context for the genesis of science, Wartofsky suggests that there are three types of such knowledge.

- a) that of explanation in terms of imaginary powers or beings involving 'mythopoeic' thought⁸¹ and 'animistic' explanation. Of its significance he suggests that it 'is not a... symptom of man's ignorance, but that it exemplified man's attempt at explanation, and at control over nature'⁸²
- b) generalizations from experience that may be expressed in proverbs and folk sayings e.g. 'better to lose with a wise man than to win with a fool'.⁸³
- c) practical knowledge or skill that enables us to drive a car, drive in a nail, ride a bike, build a bridge or a tunnel, or Inn a poultry farm.⁸⁴

Within the context of his argument Wartofsky is less concerned with what these pre-scientific or common sense ways of knowing may have in common than with trying to point out certain ways in which each of the above cited types of pre-scientific knowledge exhibit certain proto-scientific⁸⁵ features. Thus inherent in 'mythopoeic' and 'animistic' explanations, he suggests, lay the seeds of events {34} occurring for reasons or causes, and that there should be origins out of which the present state of affairs has arisen. In the, what I should like to term 'wisdom sayings' that result from generalizing reflections upon life experience in such a manner as to give guidance to live by, Wartofsky suggests that the main significance for the development of science is the occurrence of the general form of a universal law; namely; "Whenever.... then...."⁸⁶. On the other hand the significance of

practical knowledge and social rules, he suggests, are in regard to the belief that the 'right' way of doing things, being bound up with magic power, was in fact that 'sympathetic magic operates on things because they 'obey' the magic formula, and that they obey it because their very 'essence' or 'nature' is given in the formula. 'This notion, of the revelation of some essence of nature in a formula, though it is here reconstructed in its animistic and mystical form, plays a large role in the development of science and concepts of natural laws⁸⁷.

Whilst all of this is in many ways highly conjectural, saying as much about Wartofsky as about the states of affairs to which he refers it does nonetheless serve to illustrate (a) the point that there are varieties of common sense knowledge (not necessarily viewing those itemised by Wartofsky as either accurate or exhaustive) and (b) the point that many of the conceptualizations of pre-scientific knowledge can be viewed as the precondition for, rather than necessarily hostile to, the development of science.

(ii) *The critical attitude toward common sense and abstract speculation.*

The second part of Wartofsky's argument⁸⁸ is largely concerned with making similar points to those made by Nagel with regard to the relationship to and the differences between science and common sense. In this respect, however, Wartofsky is mainly interested in the *genesis* of science from common sense knowledge. He attributes this both to an analytically critical appraisal of common sense concepts and to the critical evaluation of abstract and general theories, pointing out that in these respects Western philosophy and science have a common heritage. In regard to the development of a self-consciously critical attitude toward common sense concepts and beliefs, he writes that:

"The most important difference between science and common sense lies in the explicitness and the refutability of the 'scientific proposition and in the aim of science to be consciously and deliberately critical as a matter of course. The conditions of criticizability are, minimally, that the object of criticism must be articulated sharply, as an object of conscious reflection no longer tacit. But what is it that constitutes such an object of criticism, or what can be criticized in this way? It cannot be merely experience itself, for experiences are simply *had*. (emphasis his). To be critical *of* experience requires that it {35} be formulated in such a way that it can become an object of reflection... The public formulation in a language becomes the object of critical and public reflection, for now questions may be asked about the experience as it is described in overt linguistic form....

The concepts and judgments expressed in language thus become the subject of explication - of making explicit the largely tacit and unarticulated content of common 'sense knowledge and usage. This analysis of concepts and of the systematic frame-works in which concepts are related to each other is one source of philosophy. We may say that, in part, philosophy is that explication of common sense which makes it the object of sustained and systematic reflection and which forces us, therefore, to consider what it is we take ourselves to know and to mean and to believe in the ordinary way of common sense... Philosophy is the critical approach to the thought content of language, and to the way in which articulation in a linguistic form shapes and is shaped by this thought content. Thus it supersedes common sense, being about common sense rather than another form of

common sense knowledge itself. In this way it is detached from the immediate practical concerns of common sense, whose object is workaday decision and action itself, but it is the critique of the concepts which govern this practice, or of the beliefs which are embodied in it."⁸⁹

Philosophy in this sense, Wartofsky claims, is criticism. It involves an explication and analysis of what, in the attitude of common sense, remains tacit, intuitive, and bound to the actual experience of reality. However, he does not claim that this is the only source of philosophy but distinguishes the criticism of common sense knowledge from the critical evaluation of abstract theoretical issues in the following manner:

"We have seen that a large part of man's thought is concerned with more than common sense matters. Beyond the short term periphery of everyday activity there are speculative and theoretical questions concerning the why and wherefore of things. These too may be questions of human weal and woe, of practical consequence in the larger and long-term economy of human life. But they are questions of such great abstraction and vast generality as only language makes possible. The very formulation of questions of this scope has as its condition that conceptual abstraction which language affords. Thus, where common sense, orientated toward the specific and concrete, may ask, 'What is good or right in this instance, or in instances of this sort' or 'Where does this or that thing come from?' speculative inquiry generalizes in such a way that the questions are of a qualitatively different sort: 'What is *the good* or *the right* in human life? What, in general, makes anything good or any act right? or, 'Where does *everything* come from? What is the origin or the beginning of *all things*?' Once articulated, such questions themselves become objects of critical reflection: What does the question mean? What sort of answer does it call for? How would one go about deciding between true and false answers to such questions? {36}

Here, then, is another sort of subject matter for philosophical criticism, but for that criticism which has the dual task of explication and analysis, and of theoretical construction. For such questions do not admit of answers, derived from commonsense observation and practical knowledge. Rather, what is asked for is a hypothesis which transcends common experience and is yet bound by the constraints of what the common understanding finds plausible: something which reason applauds but which perception and common practice do not deny or find absurd."⁹⁰

Whilst one may debate all manner of features of that to which Wartofsky is trying to draw attention here, I think that he has very helpfully drawn attention to the way in which questions arising from diverse common sense contexts are given answers that abstract from and seek to explain various specific features of that experience. I will take up these matters at greater length in the sequel.

Whilst the development of abstract and speculative theorising affords considerably greater scope for the possibilities of understanding reality the relation between this mode of thought and common sense experience remains crucial for the healthy development of empirical science. Abstract theorising enables considerable scope for exploring the

consequences of hypotheses in a way that is partly detached from common sense experience. However, if theories abstracted from common sense experience are to be tested, then they have to be checked, not only for logical consistency, but also according to whether or not their claims and predictions are consistent with that experience. This implies the significance of observation and experimental testing to refute or confirm such hypotheses. It is these features, no doubt that Wartofsky has in mind, when he writes that:

"The tension between theoretical construction and common sense, between hypotheses framed to answer the questions of the speculative intellect and the plain facts of everyday know-how and observation thus gives rise to a criticism of a more complex sort. For our purposes, in examining the genesis of scientific thought, this is crucial. For it marks the radical transformation of a critical common sense into critical, rational scientific thought. It is not accidental that the earliest instances of philosophical speculation and criticism and the earliest instances of rational natural philosophy are one and the same. For science and philosophy have a common ancestry.⁹¹

iii) *The genesis of science and philosophy in Ancient Greece*

The beginnings of the common ancestry of science and philosophy are, of course attributed to the Ionian colony of Miletus in the sixth century BC. Of them Wartofsky writes

"That the most important methodological thesis of the 'physiologoi' (enquirers into nature) was that the variety and multiplicity of things was ordered by a unitary principle, or derived from some unitary stuff, so that this variety could be explained genetically as having evolved from this underlying material stuff or process. What was attempted, in short, was a unified theory of the universe - of its coming into existence, its structure, and its processes of change and transformation, on the basis of {37} of physical principles alone⁹².

These natural philosophers (sometimes called the pre-Socratics because their mode of thought dominated until Socrates introduced a radical departure in Greek philosophy) formulated a series of alternative cosmological hypotheses as reasoned speculations concerning the nature of things. But especially significant for our account is the fact that these were not simply alternative constructions. Rather, they developed in the course of criticism, each representing an attempt to overcome the inadequacies or inconsistencies of the preceding one'.⁹³

It may be said that two main things characterise the rational speculations of the beginnings of philosophy in Miletus during the sixth century B.C. The first was the nature and character of the questions asked and the hypotheses put forward to answer them. They had a level of generality and abstraction that marked them off from common sense thought. The second was the critical attitude that was adopted by the members of this tradition toward the results of their speculations. The latter were not viewed as the last word on the subject under discussion, but rather as a fallible attempt at answering a question. Any attempt at answering a question posed could and should be criticised by all - including the one who put it forward. Any attempt at the solution to a problem did not preclude other attempts being made to put forward alternative solutions to the same problem.

Sir Karl Popper has pointed out the significance of the genesis of the philosophical tradition with reference to the latter of the two features just mentioned⁹⁴. However, his view is one of assuming a continuity between common sense and science wherein the latter is a development from the former by virtue of the emergence of a critical attitude toward the contents of common sense concepts and beliefs.⁹⁵

In this respect it is instructive to consider the two sources of philosophy discussed by Wartofsky under the previous heading - namely analytical criticism of common sense concepts and beliefs, and the critical evaluation of general and abstract theories put forward in answer to general questions arising from common sense experience. The analysis and criticism of common sense begins not with Thales, but with Socrates. Of him Wartofsky writes that his impact on scientific thought is not ordinarily appreciated, because his concern seemed to be mainly with ethics and with the critique of common discourse and belief. His method of criticism is called 'dialectic' {38} which may be loosely translated as 'the art of argument'; but its connotations go deeper, and the method itself is exemplified in the so-called Socratic dialogues of Plato. The technique of dialectic consists in drawing one's opponent in argument into explicit recognition of the contradiction which his beliefs or his arguments entail. Such criticism cuts to the bone of the argument, by means of cross-questioning, which elicits the grounds or premises for stated conclusions, and by this explication makes the subject aware of the inconsistencies or the consequences of his belief, or makes him conscious of his ignorance. Thus the dialectician defends no favoured position, but objectively seeks to expose all positions to the same rigorous rational analysis. As such, this is the method of criticism per excellence, the origin of that self-conscious critical reflection on common sense which we discussed earlier⁹⁶. Socrates' method is thus the method of articulating meanings and knowledge claims for the sake of critical test, of sharpening and explicating formulations so that they stand in the bright glare of reason and become fit subjects for critical analysis'.⁹⁷

The tradition initiated by Thales and the other Ionians was, in the first instance, one of abstract, general speculation. This particular feature of the philosophical, scientific tradition has continued down to the present day and is characteristic of this tradition even when it is dogmatic rather than critical.

Moreover, the analytical criticism of common sense concepts and beliefs begin well *after* the tradition of abstract and general theorising had been established. It was not antecedent to the development of science and philosophy. Rather it had a beginning that was well after the more general and abstract concerns of the pre-Socratics had been well established. Indeed one could argue that the analytical criticism of common sense concepts initiated by Socrates required an ability for a certain logical distancing to be made between the common sense *conception* and its immediate contentful *experience* before such analysis and criticism could develop. Such logical distancing from common sense experience was indeed provided by the development of the cosmological theorizing of the pre-Socratic tradition.

If these historical conjectures have any validity then the view put forward by Popper concerning the genesis of science from common sense knowledge has some problems with it. His view is basically that common sense knowledge in the form of myths etc. was

placed under criticism by the Ionians, and that this together with the critical attitude that was also adopted by them toward their own solutions to the problems 'they posed saw the genesis of the tradition of open and critical discussion {39} including science and philosophy.⁹⁸ More crucial to the genesis of the philosophical tradition would appear to be the asking of why certain common sense facts were the case, together with a critical attitude toward the abstract and generalized answers that were offered to explain such facts. Once the tradition of general and abstract explanations of common sense fact had been established together with a critical attitude being adopted toward it, the ground was laid for Socrates, to adopt a critical and analytical attitude toward common sense concepts and beliefs.

3.5 *Summary*

At this stage of my argument I would like to draw together by way of summary some of the preliminary conclusions regarding the distinction between science and common sense that have been arrived at as the result of critically reviewing the views of P. Frank, R. Nagel and M. Wartofsky on the subject:

- i) The attitude and content of common sense concepts and beliefs is open to everyone. It requires certain learning and education, but demands no special grasp of theorising in the way that science and philosophy requires.
- ii) Science and Philosophy both develop from a background of common sense knowledge, and should relate back to that common sense background.
- iii) Common sense knowledge is related to the daily concerns of life in a way that does not know the logical distancing of its concepts and beliefs from the full common sense awareness (whether real, dreamed or imagined) of life experience.
- iv) Science is concerned with explanations; explanations that employ *a* degree of generalization or abstraction, so that their range of application is far wider than the specific events that may have prompted the question as to why they have occurred.
- v) Both science and philosophy should be characterised by critical analytical discussion, wherein their claims are exposed to the tests of logical consistency and empirical fact. In respect to the latter, scientific and philosophical theorizing make predictions about common sense experience. However, they do not order or organize our perceptual experience of the things of common sense in the basic way claimed by the Post-Kantian epistemologies.
- vi) Both science and philosophy in the sense discussed here have a continuity with the tradition beginning with Thales and the Greeks that followed him. This is not intended to imply that science and philosophy are exclusively Western, as many contributions to its various branches have been developed by and incorporated into the Western tradition from other sources. Nonetheless it is to this tradition rather than to any other that we look for the continuous development of science and philosophy. {40}

4 The Character of Common sense Experience and the Sharpening of the Distinction between Science and Common sense.⁹⁹

4.1 Introduction

Consider the following situation. A certain lady has the tasks of preparing meals and looking after young children. From her experience in cooking she is familiar with the fact that butter softens when heated. She is concerned with the problem of softening some plasticine and some clay for her children to play with. On the basis of her experience with butter, she heats the plasticine with good success and heats the clay with somewhat less success!

She learns from the exercise that heating things does not always make them softer. In particular, butter and plasticine are made softer through heating, whilst clay is made harder. As far as she is concerned these are common sense facts that have to do with things in general, and with butter, plasticine and clay in particular. She would no doubt be able to utilise this common sense knowledge in a whole variety of ways in regard to cooking, cleaning and helping make up things for her children to play and do. None of this would be science.

If, on the other hand, someone were to ask why some things become softer when heated whilst other things became harder when subjected to similar treatment, they would be seeking to explain certain common sense facts with reference to certain properties exhibited by the things concerned. Any such explanation would have to be applicable to the common sense facts concerning butter; plasticine and clay observed by our hardworking lady in the home. These common sense facts can indeed function in scientific discourse.

There is therefore an undoubted plane upon which common sense thinking on the one hand, and scientific and philosophical thinking, on the other, meet. However, to conclude from this that there is no sharp and clear distinction between science and common sense I believe to be mistaken. {41}

One of the main reasons why the distinction between common sense thinking and scientific and philosophical thinking may fail to be appreciated is because of the way in which attention is usually focussed upon the *products* of the respective modes of thought. When this is done it is readily understood, for example, that common sense thinking may be said to name, classify, make inferences and draw analogies, but that scientific thinking, whilst doing all of those things, simply adds such elements as the formation of concepts which are more abstract and precise, involving the construction of explanatory theories and the development of methods and techniques for testing them.

There are indeed many ways in which I would not wish to take issue with such a description. I have already said, above, that it is most important to recognise that science and philosophy take their starting point from common sense experience, and that common sense fact and scientific explanation have a plane upon which they meet. To continue the spatial analogy, my claim would be that the plane of science and philosophy is not simply an extension of the plane of common sense thinking. Rather, if science and philosophy were to be represented by a box, and common sense by a box, then there is a plane of

intersection upon which the two meet, having full continuity with one another. Or, to change dimensions, the plane of common sense experience intersects the plane of scientific and philosophic thought in a line, a line which has full continuity with each plane.

If we concentrate upon the *products* of science and common sense, then we do not, in many ways, go far from the line of continuity in the two respective planes, and are inclined to miss the sharpness of the distinction which may and should be drawn between the two modes of thought. However, if we direct our attention less to analyzing the products of the respective modes of thought and move toward an analysis of the way in which our conceptual procedure actually operates in relation to common sense experience to produce these respective products, then I would suggest that a sharp distinction between common sense concepts and scientific and philosophic concepts can be drawn, and that, moreover, such a distinction proves very fruitful in philosophy.

4.2 *The Common sense Character of Objects of Consciousness*

Our awareness or consciousness always has an object. Whether such objects be self, a tree, a dog, the Government, a centaur, Santa Claus, or dreams, hallucinations, illusions or memories of the same, we do not have an awareness except that it has a content. The contents of our consciousness are of diverse kinds, and may include real things such as the table I'm {42} writing on or the book beside me, as well as imagined objects such as unicorns and hobbits, and memories, dreams and hallucinations, of both real and imagined things.

In common sense experience we all manage to classify the objects of our awareness as real things, as dreams, as hallucinations, as illusions, as memories, or as things we don't quite understand or can't quite place, without undue problem or difficulty. We are able to recognise that certain of the contents of our awareness are correlated with things whose existence is independent of us, that others of them (dreams, hallucinations) are 'only in our minds' and that still others (mirages, illusions) are counterfeit appearances. However, the history of philosophy knows of large numbers of views and theories that have tried to call into question some or all of these common sense beliefs. These theories have generally maintained that the data of consciousness are of a certain kind or character, and have sought to account for all the data of consciousness in a way that accords with the views put forward. During the period since the 17th century, for example, Locke claimed that the data of consciousness were internal, mental copies of a real physical world outside the mind, and that certain properties of the former did not belong to the latter. Berkeley, on the other hand, claimed that although the immediate contents of our experience were sensory sights, tastes, touches, smells and sounds, he also denied that these were copies of anything else, for, in his view there was in fact no reality 'external' to the 'mind' whose contents were represented by the mind. Kant suggested that the contents of consciousness are composites of an external raw sensual material together with an unconscious operation of our minds which imposes all sorts of order on the raw material so as to create even those objects we are apt to regard as existing independently of our consciousness. Then again there have been the common sense realists such as Thomas Reid and Dugald Stewart who have tried to defend 'the beliefs of common sense' as natural instincts with which we have all been fitted to get along in the world.

Debates have also been carried on with regard to the subject side of the awareness of the objects of consciousness. Some theories have held that the subject experience is 'a mind' which receives input from 'a body'; others have maintained that the hypothesis of a non-physical mind is entirely superfluous since this experience can just as well be accounted for in terms of the physical operations of brains, that is in terms of bodies without minds; still others have maintained that 'mind' properties and 'body' properties are both aspects of the same {43} 'body-mind' identity.¹⁰⁰

In seeking to reflect upon the character of common sense experience, I want initially to set aside these problems as they have been generally considered by philosophy. The main reason for this is simply that these discussions concerning the data of consciousness tend to *mask* the basic point at issue; namely that the data of consciousness have a certain givenness, a certain 'common sense' character, a certain neutrality that is in danger of being surrendered if it is too hastily construed into a certain philosophical or scientific mould. I wish to start from the *fact* that with regard to the cited diversity of the data of consciousness with which we are all familiar, we generally have little difficulty in managing to distinguish between them. We are certainly not readily able to explain the why and the how of the diversity of the objects of consciousness; there are times when we all wonder whether we have correctly identified an object of our awareness; and some people do indeed suffer from problems in respect to their ability to distinguish between actual things and illusions / hallucinations. These problems do not detract from the validity of the thesis that the contents of consciousness are 'a given' in our common sense experience. They are not 'a given' in the sense that enables us to make irrefutable assertions about them after the fashion of the common sense realists. They are 'a given' in the sense that they constitute the empirical content of our immediate experience, and, although it may be true that this 'givenness' requires a measure of interpretation on our part, the extent of this interpretation is not of a character that can fairly deny a neutrality or givenness to the objects of awareness referred to.

Thus, in discussing common sense experience, I am seeking to refer to the full diversity of the contents of consciousness in a way that

- i) takes account of the relative ease with which we are all able to distinguish real things from memories, hallucinations, illusions, etc., albeit that there are times when all of us have difficulty in doing so, and that there are a few of us who, for one reason or another, would seem to have great difficulty doing so at all. In the latter case, for example, 'common sense tells us' that something is wrong with people who labour under such delusions; indeed such cases are usually treated as 'mental illness'. {44}
- ii) recognises that the various objects of consciousness constitute a neutral datum that are 'a given' of our experience, albeit that this datum requires a response and an interpretation from us. In speaking of common sense experience, therefore, it should be noted that in using terms like 'things' 'event', 'mind', 'consciousness' etc., they are employed in ways that seek to recognise this interpretative neutrality of the objects of consciousness. At the same time, it will be claimed (in section 4.2 below) that the objects 'of consciousness are 'objects' in the sense of things (or memories of things, illusions of things, dreams of things etc.) having a continuing, if changing,

- wholeness that is exemplified in a coherence in a diversity of properties and relations.
- iii) asserts that 'common sense knowledge and belief' arise from an interaction with and a response to our common sense experience of the objects of consciousness, and that such interaction and response involves a measure of interpretation of the contents of common sense experience.¹⁰¹

The basic thesis to be developed in the present section of this essay is that common sense concepts and beliefs arise from an *attitude* of our consciousness toward its contents that differs in certain important respects from the attitude toward those contents that leads to the development of scientific concepts and theories.

In what follows I shall first give attention to the matter of the character of the objects of consciousness (Section 4.3), and subsequently attempt to describe the major features that characterise the common sense attitude toward the contents of consciousness (Sections 4.4 and 4.5) and follow that up with an attempt to describe the major features that characterise the theoretical attitude toward the contents of consciousness. (Sections 4.6 and 4.7).

4.3 *The Objects of Consciousness as 'Things-in-Coherence-with-their Properties and Relations'*

In everyday experience we are directly aware of a whole variety of things in their various relationships to a whole variety of events. The 'things' and 'events' of everyday experience are characterised by a 'concrete wholeness'. We do not see 'colours', hear 'sounds', taste 'tastes', feel 'shapes', smell 'odours' etc., except that the colours, sounds shapes and tastes together with a whole range of other properties are linked with the actual entities that are presented to us as the objects of consciousness. {45}

In asserting this feature of the data of consciousness, I am not wishing to assert anything with respect to 'a substance' that may or may not be the bearer of the properties and relations of the things in question, for such would go beyond the asserted 'neutrality' of the objects of consciousness presented to us in common sense experience.

I am seeking simply to suggest that the things, the dreams of things, the illusions of things, the memories of things etc., as they are presented to our consciousness, have the character of a continuing, if changing wholeness that exhibit a coherence of a diversity of properties and relations, the similarities and dissimilarities with which readily enable us all to recognise and clarify such things as 'trees', 'people', 'houses', 'mountains', 'rivers', 'water', 'cats', 'dogs', 'flowers', etc. The latter are not put together by us by sensations of colour, taste, smell and sound etc. They are presented to us as 'concrete wholes' in which the objects are identified as continuing, if changing things whose properties and relations have a coherence which is characteristic of the various things in question. We may have to learn how to recognise the typical coherence of properties and relations when we identify a 'table' or a 'tree', but it is the thing in the coherence of its properties and relations that is presented to us as the objects of our consciousness in the attitude of commonsense experience.

4.4 *A Characterisation of the Commonsense Attitude Toward the Contents of Consciousness*

Whilst, the objects of consciousness may have the character of 'wholes comprising a unity and diversity of properties and relations', our consciousness is not at any given moment equally aware, or aware with equal clarity, of all the possible objects within its field. Indeed we sometimes have great difficulty in correctly identifying certain objects of consciousness. In this respect, we are all aware of the way our consciousness is able to range freely over the field of its contents in a fashion that pays specific attention to certain features of its contents in a way that places the remainder in the background.

Concentrating on, noticing, paying attention to, listening to, watching, observing are just some of the ways in which we focus attention upon certain of the contents of our consciousness whilst leaving the remainder to the periphery of its awareness. Consider the following examples. While I am listening to a recording of Beethoven's Ninth Symphony in my living room, the focal awareness of my consciousness is toward the stylistic features of the sound of the music in a way that places the general decor of the room, papers on philosophy that lie all over the table, the mess created on the floor by the children etc. into the background (at least for the moment!) Whilst I am driving the car the main attention of my consciousness is (or should be) upon the matters that have to do with the immediate purpose of controlling {46} the passage of the car from A to B in a way that is safe for the car, its occupants, other cars and bystanders. Other matters within the field of my consciousness, such as the breathtaking scenery, the stimulating conversation of the other occupants, together with the memory of the tasty meal that we have just eaten, are (or should be) less central to the focus of my consciousness.

As illustrated in these examples, I shall use the terms 'focal awareness' and 'subsidiary awareness' to refer to the way our consciousness is able to single out certain objects or features of objects for attention, whilst leaving the remaining contents in a more peripheral or 'less conscious' relation. The objects or features singled out for attention will be said to be in 'focal awareness' whilst the objects or features of objects in the more peripheral relation to consciousness will be said to be in 'subsidiary awareness'¹⁰²,

Accordingly I shall use the distinction between 'focal awareness' and 'subsidiary awareness' in this essay to assist in the description of the difference in the attitude of consciousness toward its objects in common sense experience on the one hand and of scientific and philosophical theorising on the other. Following on from that I shall draw a sharp distinction between 'common sense concepts' and 'theoretical concepts'. In the attitude of consciousness toward its objects in common sense experience, our focal awareness is directed toward the fullness of the concrete entities presented to it in such a way that (a) any concept formation involved is subsidiary to some other purpose with respect to the object/objects concerned, and (b) our familiarity with the objects and events concerned is focussed toward 'the wholeness' of such things so as to be vague with regard to their detailed properties. {47}

In the case of playing a piano, for example, our focal awareness in regard to the piano is angled toward utilizing the aesthetic qualities of the instrument so as to realize a certain piece of music. The properties of snap size and weight of the instrument, together with those which commend it as a valued or inferior piece of furniture assume a subsidiary position in our awareness. Moreover, we are only subsidiarily aware of the many details

with regard to the positioning of the fingers, hands and feet in the execution of the notes and phrases designated by the composer on the score. Again, insofar as any concept formation takes place in the course of the whole exercise, it is generally integrally but nonetheless subsidiarily - related to the focal purpose involved.

If the following day we are assisted by one or two other people in moving the piano up or down a flight of stairs, then our focal awareness is upon the object in a way that places its aesthetic properties and potentialities into a subsidiary position. The immediate focus upon the object now is such as to be angled toward its properties of size, weight and shape as these present problems for moving it up/down the stairs. Any concepts formed in relation to the shift, such as analyzing who is to put their weight where and when, or whether the object should be tipped up or down or rested on a step to make way for a subsequent maneuver, are formed as an integral part of a whole exercise that has a focal purpose to which this concept formation is subsidiary.

However, whether we are aware of our piano as 'item of furniture' or as 'a musical instrument' or as 'a thing to be moved up/down the stairs', we are aware that it is the same thing, and that it is a *whole* - an object in coherence with a diversity of properties and relations. Moreover our varying focal awareness of it is the means whereby we become aware of its diverse properties, and to that extent become familiar with it. Ordinarily we make little or no distinction between becoming familiar with something and distinguishing its properties; our attention is at once directed toward the entity and to its properties, or, we may, say to the entity-incoherence-with-its-properties. Conversely, in noticing the properties of an entity we do not experience them in isolation from the entity, but as properties-of-the-entity. We grasp the entity as a Gestalt in the continuity of its features.

We often have great difficulty describing or defining things even though we are very familiar with them. If we are asked to give directions for a route that we've travelled along many times, and have no difficulty whatever negotiating ourselves it may nonetheless present all kinds of difficulties. Giving a description of someone that we would not fail to recognise ourselves is another case in point. We may be able to drive a car, or be able to type, but have great difficulty in describing how we do it. Again people are often surprised at the difficulty of giving a definition of a chair that would adequately differentiate it from other sorts of furniture used for seating. Our first impulse is usually to mention its usefulness for sitting - features that are obviously insufficient to distinguish a chair from a sofa or a bench. Yet we have no difficulty in recognizing a chair and distinguishing it from a bench or a sofa. These examples may be extended to many others. Whether we consider such common-sense activities as riding a bike, mending a puncture, driving a car, plowing a field, listening to the birds, making furniture, eating a meal or building a house; or consider the problems of trying to describe or define aspects of such activities and the various objects with which we may be involved with in them, in each case the attitude of consciousness toward its objects is such that (a) the formation of concepts is integrally but subsidiarily related to some other focal purpose, and (b) our familiarity with respect to the object/objects concerned is of 'the entities-incoherence-with-their-properties' in such a way as to be clear about the object as a whole, but to be vague about its specific properties.

Common sense experience therefore arrives at a knowledge of the contents of its objects of consciousness that is first of all *tacit* and *inarticulate*. It arises from an interaction with objects of consciousness that display a wide variety of ends and purposes that variously form the focal awareness of consciousness. However, because of the way in which concept formation is always integrally but subsidiarily related to these focal ends, common sense knowledge and belief is in the first instance *tacit* and *inarticulate*. People generally know more than they can tell, as Polanyi has put it¹⁰³. However, such commonsense knowledge rarely remains tacit and inarticulate. People need to have some understanding of what they are doing, and need to share it with others. Articulate common sense knowledge is the content of tacit common sense knowledge as this is formulated, in part, at least from common sense experience. As such it is fallible. Moreover, it is in part influenced by the beliefs and views of reality that are embodied in a world and life view- As there are a diversity of purposes and activities encompassed in the common sense attitude of consciousness, so there are a variety of strands to common sense knowledge and belief¹⁰⁴. {49}

Certain features of such articulate common sense knowledge and belief very often become part of a cultural tradition that is passed on from one generation to another, either critically or dogmatically.

To summarise: In common sense experience our attitude of consciousness is characterised by a general awareness of 'wholes' slanted toward a focal awareness that knows of many and diverse purposes. However, despite this diversity, two features may be said to characterise the attitude of consciousness in common sense experience: (a) that concept formation is an integral but subsidiary part of the attitude of consciousness in common sense experience; and (b) that our familiarity with the object/objects of consciousness is one that may be described as being clearer with respect to the gestalt, 'the-entities-in-coherence-with-their-properties' than with respect to their specific and individual properties.

Knowledge that results from common sense experience is in the first instance tacit or intuitive. As such it may be tutored and taught through the guidance of others. However, common sense knowledge does not remain tacit, but becomes articulate in the form of statements that embody concept formations that are developed as part of common sense experience. The content of such articulate common sense knowledge and belief is fallible, in part influenced by a world and life view, and generally identified by philosophers as 'common sense knowledge'. It is 'objective' in the sense discussed by Popper in 'Objective Knowledge'.¹⁰⁵

4.5 *Common sense Concept Formation*

Now, as we have already noted, the process of distinguishing properties is at least a major part of forming a concept of an object of consciousness. The concept of a thing thus involves thinking together in a logical unity-in-diversity of the salient properties of the thing. Now, in the attitude of common sense, this process of distinguishing and combining properties into concepts is usually done vaguely because of the two features that we have suggested characterise common-sense experience. Whilst common sense concept formation is therefore clearer about the combination, the gestalt, of the properties rather than yielding a sharply distinguished conception of the individual properties, there are

always some properties of such objects which are noticed distinctly in the attitude of common sense; viz those properties that are sometimes taken as the defining characteristics of a thing or an event. These properties are the basis for the ordinary, but important, practices of naming and classifying the objects of consciousness, albeit that some of them may take place only tacitly. To illustrate the latter, let us return to the example of defining a chair. Whilst many of us may {50} have difficulty doing this in a way that adequately distinguishes it from a sofa or a bench, we would have little difficulty making the distinction in practice or in correctly using the word 'chair'. The reason is that we have made our distinctions in a way that is vague with respect to detail, but adequate in relation to the gestalt and its salient or defining features. Whilst the latter are contained within the common sense concept 'chair' and are known in the sense of being able to be recognised when present or absent in a particular object of consciousness, they are too indistinctly noticed to be properly distinguished or reported - at least without further reflection, reflection that begins to focus upon an analysis of the meaning of the concept in a way that begins to be detached from the concrete experience of chair. (i.e. departs from the attitude of consciousness that is characteristic of common sense experience).

Hence, though what are sometimes taken as defining characteristics or properties of things are often explicit in common sense experience, and thus form the basis for the application of common nouns and classification terms, sometimes there are other properties included in these concepts which are only vaguely identified; indeed this can be true of the defining characteristics themselves.

Thus the common sense concept is clearer with regard to the gestalt, the arrangement and relations of the component properties included in the concept than with its specific components singly. Common sense concepts, then, grasp the unity, the whole of things and events in a way that helps us to name, classify and deal with the everyday practical affairs of life.

As has already been observed in the discussions of the views of Nagel and Wartofsky,¹⁰⁶ articulate common sense knowledge is apt to be vague, but does, nonetheless have a certain accuracy about it that stands the test of time. Indeed common sense knowledge has little by way of a history.¹⁰⁷ I would suggest that the attitude of consciousness giving rise to such articulate common sense knowledge and belief discussed above goes some way toward explaining this state of affairs. Common sense knowing on the one hand is generally accurate enough for the purposes of everyday practical affairs that give rise to it. On the other hand, because of the subsidiary position of concept formation, of precise explanation, and of the observation of detail that such purposes generally entail, common sense knowledge is vague with respect to detail. There is one more important point to be made about the noted vagueness of common sense concepts and of the articulate knowledge they seek to embody. The extent of the vagueness is directly related to the focus of interest toward the objects of consciousness concerned in common sense experience. {51}

Thus the precision of measurement for a carpenter involved in the construction of a house is considerably greater than that of a person estimating the distance covered in an afternoon stroll. On the other hand the level of precision in the measurements for cabinet making is generally greater than it is for carpentry. Furthermore, the ability to be able to

be precise to the desired level depends not only upon the purpose in view, but also upon the existence and skill in the use of the appropriate instruments.

My point is this. The vagueness of common sense knowledge is not simply an *inherent* feature of the common sense attitude of consciousness. It is a matter that is dependent upon the more specific focus of attention in regard to this attitude toward the contents of the objects of consciousness. When the purpose at hand demands it, and both the technical instruments and skill in handling them are available, common sense knowledge can be accurate with respect to detail. This issue is of considerable importance when we come to discuss the relation between common sense knowledge and the testing of theories in the form of observations and experiment.¹⁰⁸

4.6 *A Characterization of the Attitude of Consciousness toward its Contents that is involved in Theorising.*

Articulate common sense knowledge has yielded us a wide variety of information. We know that water will generally put out fire; that whereas most fruit and berries are good to eat for food, others poison birds, animals and human beings; that sitting in a bath of water causes the level of the water to rise; that wood generally floats in water, and does so even better when it is hollowed out. Not only do we have a fairly reliable common sense knowledge of such things, we are also well able to utilise such knowledge toward the attainment of a whole variety of ends. We have developed poisoned arrows for killing birds, beasts and humans; we have learned the art of making dugout canoes and more elaborate vessels to sail in. Such features of day to day practical life remain part of the attitude of common sense knowing. However, once we begin to ask questions as to why such common sense facts are the case, then implicitly or explicitly we are on the road toward theorising, and toward an attitude of consciousness toward its contents having a different focal awareness from that involved in common sense experience. Rather than being focussed upon 'the gestalt' as we have described 'the-thing-incoherence-with-its-properties', in a way that places concept formation in a subsidiary position to some other focus, the theoretical attitude is characterised by a focus upon certain properties of things in a way that brings concept formation and attempts at logical explanation of the properties concerned into the centre of attention. {52}

Thus we (or the ancient Egyptians and Babylonians) might discover that a certain rectangular field having sides of length three units and four units has a diagonal of length five units, and that these numbers are related according to $3^2 + 4^2 = 5^2$. Moreover we might discover that in other cases of rectangular fields the sums of the squares of the lengths on the sides was equal to the square on the diagonal. We might then go on to conjecture that this property held for all rectangular fields, and indeed all rectangular objects, and on that basis we might even be able to develop a means of calculating the length of the diagonal given the lengths of the sides.¹⁰⁹

If we were to go on to ask the question as to why the sums of the squares of the lengths on the sides of not only our fields but also of other rectangularly shaped objects were equal to the square of the length of the diagonal, then two things are apparent with respect to the focal awareness of our consciousness:

- a) that we are focussing attention upon certain properties (in this case the lengths)

- of these objects to the exclusion of others (in the case of the fields, for example, we neglect the properties as to how they are fenced and irrigated, the type of soil, the crops and/or animals supported etc.) and
- b) that we are simultaneously focussing attention upon the properties of length in respect of *all* rectangularly shaped things, whether actual or merely possible.

This process involves a focussing of attention upon *common or similar properties of diverse things* rather than upon *a thing with diverse properties*. The various things in which these properties are instantiated are relegated to a 'subsidiary position of our consciousness. Indeed, insofar as we focus attention upon the property of length to the extent that we try to isolate it from the other properties that the various things might have, we may be said to be *abstracting* the property of length with a view to forming an accurate concept of it for the purpose of further analyzing it into its constituents properties, and also for formulating the relations that might hold between various lengths, not only of rectangles, but also of other figures. Finally, we are concerned to explain why the sum of the squares of lengths of the sides of a rectangle might be related to the square of the length of the diagonal.

This example is taken to be illustrative of the attitude of consciousness toward its objects that is involved in theorising. The focal awareness is upon certain properties to the intentional exclusion of others, with the object of enhancing the ability to form precise conceptions of these properties as they may be instantiated in a wide variety of actual or {53} possible objects, and, as such to form part of explanatory theories.

To the extent that in the theoretical attitude of consciousness concepts are formed of properties in partial isolation from the actual things in which they are instantiated, we may say that theorising involves a process of *abstraction*.¹¹⁰

In the attitude of common-sense-experience things, parts of things and quantities of things may all be distinguished more or less explicitly; but always without losing the focus upon concrete things. To abstract is to intensify the level of the focus of attention to the point where some quality is not simply distinguished, but is extracted and isolated by the focus of attention to the point that we are able to deal with it in a way that requires only a possible or potential realization in the properties and relations of concrete things¹¹¹.

In abstract thinking, therefore, we do not have at the centre of attention a 'concrete-thing-together-with-its-properties', but instead one or more properties that have been temporarily isolated from the wider matrix of these properties as exhibited in concrete things. In this way the wholeness the 'gestalt' of things, is broken by theoretical abstraction in the sense that some specific property (or properties) is analyzed out, intentionally pulled from the interconnectedness with other properties exhibited by things and events, and thought of apart from them. The attempt at abstraction is made for the purpose of forming a concept of the property itself, for further analyzing it into its constituent parts, and for formulating relations and explanations which are taken to hold between it and other properties. {54}

To take another example. If we were shown a car by a friend who had just purchased it, then our common sense awareness and focus of attention with respect to it would be such

as to distinguish more and more of the car's individual properties as we spent time looking it over. We would become aware of its size, its shape, its colour, its style, its weight and the general condition of its parts. We might be interested in its value as this related to its condition, the prices people have been paying for similar items, and what our friend paid for it. Again we might be interested in the suitability of the car as a family vehicle, a 'hot rod' or as a commuting car around town. In our common sense experience all these properties remain *properties of the car*. However, if we were to focus attention upon one (or more) of these properties in such a way that the said properties were viewed (i) less in relation to this particular car and more in relation to any object in which they might be instantiated, and (ii) in such a way as to form precise concepts involving relations and explanations between these and other properties, then our attitude of consciousness towards its objects is that of theorising, utilising abstractions. For example, it would be part of our common sense conception of the car that it was heavy. In the attitude of common sense this property is observed and contained in many conceptions regarding the car. It is also contained in many conceptions of other things. In the attitude of common sense the property of 'being heavy' is not itself the focus of attention. But this is precisely what happens in the theoretical attitude of consciousness. In so doing the theoretical enterprise may subsequently formulate and reformulate the relations between heaviness and such properties as weight, gravity, mass, acceleration, force etc., in an effort to gain accuracy and explanatory power with regard to the properties under investigation. The purpose of abstract concepts is to discover as much as possible about the specific constituent properties of both concrete objects and complex properties, and to formulate the relations that hold between them so as to allow the construction of theories that explain the various properties of the things and events presented to us in common sense experience.¹¹²

As a further example, consider the case of an artist sketching a model's face. For this purpose he/she restricts his/her attention not only to the face of the model rather than to any other bodily part, but also to the shape of the face rather than to any other property of it. In doing so, the artist consciously restricts his/her attention to this particular property and, in the common sense sense, has conceptualized it. However this conception of the shape of the face is not theoretical because it was not directed toward explaining either the shape in terms of its constituent properties or its relations to other shapes; nor was the shape conceptualized *qua* shape, but as *shape of that face*. This implies that the artist seeks to produce a shape in which 'the gestalt' of the person is angled toward the shape of the face. Both accuracy with respect to the shape and a certain liberty allowing 'the character to be portrayed' are necessary for this. The activity of the artist therefore contrasts with that of the geometer who deals with shapes in abstract. In his/her theoretical conceptions, shapes are of necessity abstracted from the sensory, physical and other properties of things, and, in particular it is impossible to draw an abstract shape, for to do so would, of necessity, mean a drawing or something similar - in other words a concrete thing that demonstrates *all* of these properties.

Finally, take the case of a man who discovers the fact that when the water in his well drops below a certain level his pump is ineffectual. He may also develop a good eye for sighting the critical level. All this is genuine knowledge, though of the commonsense variety. It is only when this state of affairs is explained by way of abstracted properties of *pressure* (of the air on the water surface) and *weight* (of the water) that we may be said to

have any theoretical knowledge of the fact the well owner knows, but can't explain. {56}

To summarise

The attitude of consciousness toward its contents involved in theorising involves a focussing of attention upon common or similar properties of diverse things in a way that seeks to abstract the said property or properties, so as to form an accurate and precise concept to include a related set of concepts for explanatory purposes.

4.7 *The Distinction between Common sense and Theoretical Concepts*

Most people, in particular most scientists and philosophers, generally recognise that both science and philosophy are concerned with attempts to develop precise concepts and theories from a background of less well-defined and imprecise conceptions. Rudolph Carnap, for example, describes 'the procedure of transforming an inexact, prescientific concept into a new exact concept' as *explication*.¹¹³

Now it is my thesis that the process of abstraction from common sense experience discussed in section 4.6 accounts for most of the salient features of theory-making in relation to the more imprecise common sense conceptions of everyday experience. The process of isolating properties followed by the careful self-conscious way in which they are combined in concepts, explains the greater precision of an abstract concept. Moreover, since we are then clearer about just what is or is not included in such a concept, we find it easier to be clear about what is entailed or denied by it. At the same time this characteristic of abstractly formed concepts shows why their contents are easier to state in definitions. Moreover, it gives a good account of the greater manipulative control we may exercise in the formation of abstract concepts, for, having once isolated certain properties we may combine them into concepts in ways we have never experienced in common sense experience. Thus we may be inventive of concepts which do not correspond to any entity and we may postulate the existence of entities (such as atoms and electrons) that are not open to direct common sense experience. This greater conceptual freedom of not being bound to conformity with concrete data, is a characteristic that has long been recognized as distinctive of theoretical thinking.

With regard to the process of *explication*, as defined by Rudolf Carnap, he states that the objective is 'to *replace* the given inexact concept (the explicandum) by the exact concept (the explicatum)'.¹¹⁴ In our distinction between common sense concepts and theoretical concepts, it is not intended or proposed that the latter *replace* the former. To be, sure common sense may be deepened and corrected in all manner of ways as the result of the progress of science and philosophy. However, this does not affect the difference between the focus of common sense {57} experience and that of theorising. The latter gains its precision partly as the result of abstracting certain properties from the things of common sense experience to the specific exclusion of others. As such these conceptions are not generally fitted to replace those of common sense, for they lack the *integral*, if vague on detail character of the latter.

In discussing the activity of theorising as involving the formation of abstract concepts from an attitude of consciousness toward its objects that focusses upon common or similar properties in a way that places the things in which these properties are instantiated into subsidiary awareness, we have spoken of properties being included or excluded from a

concept, and of an abstract concept as the product of an act of thought which brings about the logical integration of the major features of whatever is being conceptualized: Whilst most philosophers would concede that we in fact have *some* theoretical concepts which arise from the abstraction and recombination of properties referred to here, it would probably be true to say that many would deny that this can be an adequate account of all theoretical concepts. Whilst I am in no position to refute every possible objection that may be put forward against such a thesis, I think that it is important in putting it forward to deal with some misunderstandings that may arise in respect to exactly what it is that is being asserted.

For example, it might be asserted that because a perfect circle is an entity or property that is not instantiated in any actual thing of common-sense experience, it cannot be a conception that is obtained by abstraction from the things of common sense. As far as the common sense notion is concerned, it is sufficient to point out that we encounter things which have the property of being round. This is generally enough for us to form the concept of circularity as a common sense notion describing the shape of the moon, of a wheel etc. The abstract concept of a perfect circle, however, involves on the one hand a neglect of all sensory and physical properties and on the other involves precise quantitative and geometric properties in respect to the point which is described as the centre, the length of the radius, and the continuous curve which is the circumference. Each of these may be individually related to the properties of things of common sense experience, albeit that they do not correspond exactly to the common sense conception of circularity. However, by excluding the sensory and physical properties of the latter, and including the properties of a point as centre and a quantitatively exact distance as radius we are able to account for the concept of 'an enclosed plane figure being at every point along its circumference equidistant from its centre' as a perfect circle. This concept is abstracted from the things of common sense {58} experience, and, whilst it may not correspond exactly to any such particular common sense object, is nonetheless applicable to them with varying degrees of approximation.

To consider another example. How is the concept of 12,038,468 derived from experience? Most of us have never seen that many things, and probably wouldn't know it if we had. How then do we get this particular number concept by abstraction? To answer this question we shall begin with a quote from John Hospers:

"Arithmetic, we might say, studies the quantitative aspects of things; when we consider the sum of two and three, we don't care whether its three applies to three boats or three bales of hay. The concept of three (or threeness) is formed through abstraction from many cases. What three apples, three boats and three bales of hay have in common is their numerical quantity; that there are three of them is relevant to mathematics, not what it is three *of*. The concepts of arithmetic are all quantitative... that is what defines them as arithmetical; and they are abstracted from experience, from our experience of quantities of things we would have no arithmetical concepts.'¹¹⁵

Thus whilst Hospers is willing to grant an abstractionist account of some number concepts, it soon becomes apparent that he is unwilling for all number concepts to be accounted for in this way. He goes on to say:

'So far so good. The problem comes when we realise that we have a concept of 12,038,468 just as much as we have one of 3. Yet we have never *seen* or *observed* exactly that number of things, and would not know it if we did. What, we can ask, is the relation between that number and our sense-experiences?'¹¹⁶

The main question to be asked here is why Hospers views the chief issue as that of relating the number 12,038,468 to sensory properties? Surely an abstractionist account of number concepts can, beginning from such common sense conceptions as two things are one more than one thing, then proceed to abstract the number one as the unit quantity and follow this up by generating a sequence of natural numbers with each succeeding number holding a place in the sequence with a quantity value increasing one over its predecessor equal to the first unit one. In this way we may arrive at concepts of very large numbers (including 12,038,468) without having sensorily perceived that many things and without having needed to have realized it if we did. Moreover, the conceptions of large numbers obtained in this way still apply to and relate to the things of common sense experience. {59}

The main reason why Hooper raises a problem regarding an abstractionist account of the number 12,038,468 would appear to be his giving a certain pride of place to *sensory* properties of things, and, as a consequence any abstraction from the things of experience is deemed by him to imply an abstraction via sensory properties. To this the answer has to be that whilst the objects of consciousness would indeed appear to have sensory properties (or, at least those corresponding to actual, concrete things do), they also seem to display a wide variety of other properties. It is precisely at such points as these that the neutrality of common sense experience with reference to theories purporting to provide the true, essential or real character of the objects of consciousness needs to be insisted upon. Premature decisions of this kind have all too often prejudiced the whole discussion with regard to the character of human knowledge from the outset. For example, John Locke's account of human knowledge would appear to have taken for granted that the objects of human consciousness arose from external objects whose 'primary' qualities of a physical and spatial character caused impressions to be made upon us which were subsequently 'copied' with the extraneous 'secondary' qualities being added by 'the mind'. If Locke gave a primacy to the physical and spatial properties of things, then Berkeley, in taking what was 'really immediate to our experience', namely Locke's 'copies of impressions' was able to suggest with some cogency that we didn't need the originals at all, because we didn't really know them anyway. In fact Berkeley took the primacy of sensory properties for granted, as did Hume, with the latter claiming that our ideas were copies of the latter. In view of the history of such discussions it is important to point out that, at least in the first instance, there is a *prima facie* case for the objects of consciousness displaying a wide variety of properties, but also a diversity of property kinds. Our common sense experience of rocks, trees, spiders, cats, politicians and philosophers would appear to disclose not only properties of length, spatial extension, weight, change and heat, but also properties that distinguish the living from the non-living, the conscious from the unconscious and the human from the non-human.

In asserting that theoretical concepts arise from an attitude of consciousness toward its contents that focusses upon properties of things with a view to forming precise concepts

of the same, we reject any premature judgment that would prejudice the discussion by insisting that the things of common sense experience are essentially 'this' or 'that' kind of property.

In particular if a case is to be made for 'materialism' or 'phenomalism' then it has to be argued for in a way that seeks to account for the diversity of properties and property-kinds that are presented to us in the things {60} of common sense experience.¹¹⁷

Further, we assert not only that such concepts as the number 12,038,468, the perfect circle, weight, mass, charge and temperature arise as abstractions from common sense experience, but also that such concepts as market, style, and democracy, as these are treated by theoreticians who seek to define and use them in a way that moves from the vagueness of common sense to the precision of theory, are developed in a similar way.

Again, to dispel any simplistic or false views of what might be being asserted concerning abstraction from common sense experience, consider one further example. How is the principle of inertia derived from experience? In common-sense-experience we are all aware of some of the properties of things in motion. Most things fall to the ground when dropped; some things rise up from the earth when released. Some things move when pushed; other things are exceedingly difficult to move in this way. The sun appears to move across the sky, as does the moon, and some other bodies in the heavens.

Various attempts have been made over the centuries to formulate principle, as to how and why things move. These attempts have involved a focussing upon those properties of things that were related to their motion in such a way that other properties were neglected. To put it another way, it was the properties and causes of motion as these were instantiated in things¹¹⁸ that were of principle interest.

Greek theory as put forward by Plato and Aristotle hypothesised that rest was the normal state of affairs, and that to disturb this state, a force was necessary. This together with the geocentric theory of the universe led to the hypothesis whereby the heavenly bodies were deemed to move eternally in uniform circles whereas earthly bodies moved toward their 'natural place' except when 'forced' to do otherwise. These principles were utilised in such a way as to seek to explain why the various bodies moved as they did. As such the explanations had many problems, and these should have caused greater doubt upon the explanatory principles earlier and upon a scale earlier than they did. However, the authority and epistemology of Aristotle were not easily overcome. {61}

Galileo was the chief architect in changing all that. Not only did he make great advances in an accurate, abstract dynamical theory of terrestrial motion, but he also suggested the idea that all bodies were in motion, and continued so to be unless acted upon by a force. Although his formulation of the latter principle required further adjustment, it was an important step forward, for it implied that what needed explanation was the *change* in motion rather than motion itself.

In this whole development common sense experience forms the background of the facts to be explained. In the effort to explain why various things moved in the way they do, attention was focussed less upon the particular things that moved, and more upon the

properties of motion as they related to particular groups of things (e.g. celestial motion/earthly motion) in an effort to explain why and how they moved. In the effort to explain the motions of particular things, certain properties were abstracted and brought together conceptually in ways that, at face value, sometimes *seemed* to contradict common sense beliefs (e.g. the earth's rotation; all things continued in motion unless acted upon by a force etc.) Nonetheless, working on the general, abstract theories of motion resulted in being able to explain more and more of the common sense facts, as well as predicting and explaining others that were not yet known. In the light of such advances, such common sense beliefs as were contrary to these more abstract principles had to be modified.

The principle of inertia, then, is not related to common sense in a simple way. It is decidedly not a simple matter of abstracting from common sense beliefs. It required a great deal of labour over the centuries to be able to abstract and bring together the properties of motion which individually may be related to common sense into conceptions which were capable of explaining the properties with which we are already familiar, albeit that we cannot explain.

The distinction between common sense concepts and theoretical concepts developed here is one which reflects the difference of attitude toward the objects of consciousness in common sense experience and in theorising. As such it is somewhat different to the distinction that is usually drawn between 'observed' and 'theoretical' concepts. This latter distinction has been drawn under the dominant influence of the Logical Empiricist train of thought and, whilst the Post-Kantian trend has blurred it, it has not abolished it. Indeed, one of the central theses of the latter is that theories and theoretical terms influence all 'observed' entities. It is therefore important that I discuss the common sense/theoretical distinction put forward in this essay with reference to the more well-know distinction between observed/theoretical conceptions. {62}

The term 'theoretical' as used by Logical Empiricists is almost universally reserved for those concepts which are associated with postulated entities (such as atoms and electrons), over against the supposed immediacy of 'observed dense impressions'.¹¹⁹ Moreover, in both Post-Humean and Post-Kantian strains of thought 'theoretical' entities are generally viewed as arising from a free reign of speculation that, in science, should organize and explain the phenomena presented to us in sense-experience.

With these comments in mind I shall summarise the distinctions I have been attempting to draw between common sense and theoretical concepts attempting at the same time to show how science and common sense have a continuity with one another, and in this light make some comments about observations.

Let me first summarise the major theses that I have been seeking to argue in section 4 of the current essay:

1. The things and events of our experience are coherent wholes that exist in a matrix of properties and relations that they share with other things in varying degrees and ways.
2. In common sense experience the focus of our attention is upon the wholes, the gestalt of the things of our experience in such a way as to often be vague about the details. The degree of this vagueness depends very much upon just what the

- immediate purposes in relation to the things happen to be. In particular concept formation in relation to common sense experience is subsidiary to whatever other purposes might be in view.
3. *A common sense concept* is therefore generally accurate with respect to the gestalt, the whole, of the things and events of our experience, but is apt to be vague on detail.
 4. Theorizing arises from an attitude toward the things of common sense experience that is characterised (a) by a concern to *explain* why things exhibit the properties and relations they do and (b) in the effort to do this, the major effort is put into carefully defining the concepts through a process of abstracting what are deemed the relevant properties from the matrix of common sense experience.
 5. The efforts to explain the facts involved in theorizing are therefore considerably free-er and more general than is the case in commonsense experience. This activity may indeed involve postulating the existence of such entities as electrons, but the latter would be better described as hypothesised entities rather than theoretical ones. A *charge*, for example, is a theoretical concept. It refers to a property of a thing that may, for theoretical purposes, be considered in abstraction. An *electron*, on the other hand, is considered to be a concrete entity bearing a charge. In addition to having the property of charge it is my claim is that we observe *things* that have sensory as well as usually considered to have size, mass etc. Thus it is an hypothesised entity in the sense that certain properties are ascribed to it, albeit that we have no common sense experience of these or any other properties they may have.
 6. *A theoretical concept*, therefore, is one that arises from a focal awareness of properties-that-may-be-instantiated-in-things and that has been precisely formulated in terms of its content. Whilst it is possible to formulate different concepts of very similar properties (e.g. Aristotelean, Newtonian, Einsteinian 'mass', 'gravitation', 'force' etc.), these different theoretical conceptions are all related to the same common sense matrix of human experience, and to that extent have a common observational basis.

In section 4.1 of the present essay I asserted that the relationship of science to common sense could be likened to two planes intersecting in a line. The line of intersection is fully continuous with each plane so that there is therefore a real continuity between science and common sense. However, there is equally a sharp distinction between them. Let me interpret this geometrical analogy in terms of the above theses concerning common sense and theoretical concepts. The line of continuity as the intersection of the two planes corresponds to the concrete things and events as they are presented to us as the objects of our consciousness. Common sense conceptions, and the beliefs and knowledge associated thereto, correspond to one of the planes, the plane in which our knowledge of the things and world of our experience is primarily focussed upon the wholeness of these things, being accurate enough for most common sense purposes, but apt to be rather vague in detail. Theoretical conceptions, scientific and philosophical theories constitute the other plane. In this plane there is a focus upon the conception of the properties that may be instantiated in the things with an endeavour to formulate such conceptions with great precision, in an effort to develop theories with high explanatory power.

Observations take place on the line of intersection of common sense with theory.

Observation is a common sense activity, albeit one that has a definitive purpose. The free-ranging activity afforded by the possibilities of abstracting from common sense experience indeed acts as a searchlight, yielding predictions as to the outcome of certain events, whether or not they be under controlled conditions. Observations are directed toward the details of such predictions, and the precision of such detail is frequently dictated more by theoretical considerations than by mere observational interest. However, because experiments and observations take place within the full matrix of common sense experience, they are not simply the result of an overall organization of our experience by our mindset. In making observations we observe {64} common sense properties of things which are related to our theoretical conceptions via processes of abstraction and refinement. As such they have the potential to be able to confirm or refute our formulations.

5. Appendix: A Critical Discussion of Polanyi's Distinction Between "Focal Awareness" and "Subsidiary Awareness".

In the course of developing the notions of common sense experience, common sense knowing, common sense concepts, the attitude of theorising and theoretical concepts, I have utilised a distinction between 'focal awareness' and 'subsidiary awareness'. Although the terms are borrowed from Polanyi¹²⁰ my usage has not necessarily followed his. I have sought to use the distinction exclusively in relation to the way in which our consciousness is able to focus attention upon certain objects or features of objects within its field. In particular I have endeavoured to avoid a usage of these terms that would (a) confuse our consciousness with its objects, (b) seek to develop the relationship between focal and subsidiary awareness as a quasi-inductive leap so as to function as a scientific methodology and (c) fail to recognise that all formulations of our knowledge of things and their properties and relations have a measure of fallibility about them, albeit that they are founded in a tacit grasp of the objects of consciousness that functions as the ground of intuition.

In all three of the aforementioned respects, Polanyi's usage of the terms 'focal' and 'subsidiary awareness' tends to contribute toward an epistemology that possessed the 'Post-Kantian' weaknesses discussed in section 2 of the present essay.

Thus, Polanyi 'widens the distinction between subsidiary awareness and focal awareness by identifying it with another commonly known and universally accepted distinction, namely that which we feel between parts of our own body and things that are external to it'.¹²¹ Also, with reference to his description of using a hammer to drive in a nail, describing our attention to the nail as focal and the attention to the hammer as subsidiary, with similar comments with respect to a dentist's probe for examining the interior of a cavity, he writes that

"our subsidiary awareness of tools and probes can be regarded now as the act of making them form a part of our own body. The way we use a hammer or a blind man uses a stick, shows in both cases we shift outwards the points at which we make contact with the things that we observe as objects outside ourselves. While we rely on a tool or a probe, these are not handled as external objects'.¹²² {66}

Such remarks, I suggest, tend to obscure the distinction to be made between consciousness and its objects.

Polanyi's basic scientific epistemology had already been developed and proposed without the usage of the terms 'focal awareness' and 'subsidiary awareness'. In his early publication 'Science, Faith and Society'¹²³, for example, he describes his view of the way in which scientists discover new things about reality in the following terms:

"The vast growth of science in the last 300 years proves massively that new aspects of reality are constantly being added to those known before. Whence can we guess the presence of a real relationship between observed data, if its existence has never before been known? We must go back to the process by which we usually first establish the reality of certain things around us. Our principal clue to

the reality of an object is its possession of a coherent outline. It was the merit of Gestalt psychology to make us aware of the remarkable performance involved in perceiving shapes. Take, for example, a ball or an egg: we can see their shapes at a glance. Yet supposed that instead of the impression made on our eye by an aggregate of white points forming the surface of an egg, we were presented with another, logically equivalent, presentation of these points as given by a list of their spatial co-ordinate values. It would take years of labour to discover the shape inherent in this aggregate of figures - provided it could be guessed at all. The perception of the egg from the list of co-ordinate values would, in fact, be a feat rather similar in nature and measure of intellectual achievement to the discovery of the Copernican system. *We can say, therefore, that the capacity of scientists to guess the presence of shapes as tokens of reality differs from the capacity of our ordinary perception, only by the fact that it can integrate shapes presented to it in terms which the perception of ordinary people cannot readily handle.* The scientist's intuition can integrate widely dispersed data, camouflaged by sundry irrelevant connexions, and indeed seek out such data by experiments guided by a dim foreknowledge of the possibilities which lie ahead. These perceptions may be erroneous; just as the shape of a camouflaged body may be erroneously perceived in everyday life. I am concerned here only with showing that some of the characteristic features of the propositions of science exclude the possibility of deriving those by definite operations applied to primary observations; and to demonstrate that the process of their discovery must involve an intuitive perception of the real structure of natural phenomena' (emphasis mine)¹²⁴ {67}

In this passage we have a clear statement as to the parallel between ordinary perception and Polanyi's view of scientific discovery. We also have a clear reference to the way the views of Gestalt psychology have contributed to Polanyi's view according to which 'wholes' are recognised in terms of grasping a variety of particular properties. Thus, whilst there is no reference to the terms 'focal awareness' or 'subsidiary awareness' the basic ideas of Polanyi's scientific methodology are clearly stated.

With reference both to what he considers to be the contribution and the shortcomings of Gestalt psychology to his epistemology, Polanyi writes that

'we owe to Gestalt psychology much of the available evidence showing that perception is a comprehension of clues in terms of a whole. But perception usually operates automatically, and gestalt psychologists have tended to collect preferentially examples of the type in which perception goes on without any deliberate effort on the part of the perceiver and is not even corrigible by his subsequent reconsideration of the result. Optical illusions are then classed with true perceptions, both being described as the equilibration of simultaneous stimuli to a comprehensive whole. *Such an interpretation leaves no place for any intentional effort which prompts our perception to explore and assess in the quest of knowledge the clues offered to our senses.* I believe this is a mistake (emphasis mine).¹²⁵

In other words, whilst Polanyi accepts what has been brought to light by Gestalt psychology concerning the fact that perception is a comprehension of clues in terms of a

whole, he disputes the supposed bias with respect to the examples its representatives have cited. In Polanyi's view 'the active principle' or 'intentional effort' has an important part to play. My point would be that it is precisely at this point that the Post-Kantian tendencies of Polanyi's epistemology show themselves, particularly with reference to his views on scientific discovery.

For example, in a later essay, "The Logic of Tacit Inference"¹²⁶ Polanyi claims that 'scientific discovery cannot be achieved by explicit inference, nor can its true claims be explicitly stated'. Rather, 'discovery must be arrived at by the tacit powers of the mind, and, its content, so far as it is indeterminate, can only be tacitly known'.^{127 128} In order to find a logic by which such tacit powers may be enabled to achieve and uphold true conclusions, he turns once again to the parallels with perception, suggesting that gestalt psychology has demonstrated that tacit operations establish coherences of everyday objects in nature, and that similarly 'scientific knowing consists in discerning gestalten' that indicate a true coherence in nature'. {68}

From an elaboration and development of these ideas, Polanyi develops his views of scientific discovery as a quasi-inductive methodology.

I would like to make two comments with respect to these views. The first relates to the question of recognising 'a gestalt' in ordinary perception. Whilst I agree there is a movement from recognising certain particular properties to the identification of 'a whole', it sometimes happens that 'the whole' identified is mistaken. Cases of mistaken identity illustrate the point, but there are many other examples. Thus, even in ordinary perception our recognition of wholes is fallible. Mistakes are recognised precisely because the process of focal awareness does not move in one direction only, a point that I will take up more deliberately in a moment. We also move from an hypothesised whole to the properties it ought to have. Once these are recognised as lacking in the object of consciousness supposedly identified, then we recognise our mistake and need to re-identify 'the whole'.

The second relates to the activity of scientific theorising. The focal attention with regard to the objects of consciousness that preoccupy a theoretician presumes a subsidiary awareness of common sense realities. This, together with the familiarity that he or she may have with regard to the subject matter they are seeking to understand or explain indeed forms a complicated background of tacit knowledge or intuition that has an important, if for the most part, unspecifiable, role in theoretical work. Moreover, following the intuitive grasp that such tacit knowing offers, the theoretician may indeed 'see' a new gestalt in terms of which many details suddenly fall into place. However this flash of insight is akin to 'the hypothesised whole' of ordinary sense perception mentioned above, and, in a similar fashion it needs to be explicitly stated in the form of a theory that may be scrutinised and tested. In further developing his theory, Polanyi uses the terms 'focal awareness' and 'subsidiary awareness' in a fashion that shifts our attention from the latter to the former in such a manner that from/to and parts/whole relationship is to be established between them, giving also the appearance of an 'inductive' leap, which he describes as 'the act of integration'. Thus, he writes that

"We may say that a scientific discovery reduces our focal awareness of

observations into a subsidiary awareness of them, by shifting our attention from them to their theoretical coherence.

This act of integration, which we can identify both in the visual perception of objects and in the discovery of scientific theories is the tacit power we have been looking for. I shall call it *tacit knowing*.

It will facilitate my discussion of tacit knowing if I speak of the clues or parts that are subsidiarily known as the *proximal term* of tacit knowing and of that which is focally known as the *distal term* of tacit knowing. In the case of perception we are attending to an object separated from {69} most of the clues which we integrate into its appearance, the proximal and the distal terms are then largely different objects, joined together by tacit knowing. This is not so when we know a whole by integrating its parts into their joint appearance, or when the discovery of a theory integrates observations into their theoretical appearance. In this case the proximal term consists of things seen in isolation, and the distal term consists of the same things seen as a coherent entity.

But tacit knowing does exercise in both cases its characteristic powers of integration, merging the subsidiary into the focal, the proximal into the distal. We may say then that in tacit knowing we always attend *from* the proximal to the distal term.

In subordinating the subsidiary to the focal, tacit knowing *is directed from the first to the second*. I call this the functional aspect of tacit knowing. Since this functional relation is set up between two kinds of awareness, its directedness is necessarily conscious. Such directedness coincides then with the kind of intentionality which Franz Brentano has claimed to be characteristic of all manner of consciousness. This vectorial quality of tacit knowing will prove important'.¹²⁹

This supposed 'vectorial quality' in the relationship between 'focal awareness' and 'subsidiary awareness' in Polanyi's view would seem to be somewhat confusing. I would simply point out that it is quite possible for our consciousness to shift its attention from an object (for example a car), to a focus upon *part* of the same object (a wheel of the car, for example). Moreover, it is equally possible for our attention to move from a focus upon the whole object as 'a gestalt', to a focus upon certain of its properties or relations. In the case of a car, for example, we may focus upon its shape, its size, its weight, its colour, its economic value, or any other of its many properties and relations.

To this extent it would seem quite acceptable to speak of a focal awareness of part of an object, with a subsidiary awareness of the whole, or of a focal awareness of certain of its properties, with the other properties and relations in subsidiary awareness. Why then does Polanyi wish to maintain that 'tacit knowing' has this supposed vectorial quality?

On the one hand, many of Polanyi's examples refer to activities such as riding a bike, playing the piano or driving in a nail. In these respects he correctly points out that for those respective activities to be sustained, it is necessary for the relationship between the features {70} of which we are focally aware to those of which we are subsidiarily aware

to be maintained in a certain way. Otherwise we are likely to fall off the bike, lose the thread and rhythm of the music we are playing or bang our finger rather than the nail. However, if we are unfortunate enough to have a puncture whilst riding our bike, then our focus of attention with respect to the latter object has to change. Indeed, rather than be focally aware of the bike as a thing which helps us travel more quickly from A to B if we keep pedalling, balanced and steer correctly, we dismount, take off the wheel and give our undivided attention to patching the hole in the tube! Again, if tomorrow we have to move the piano into another room, then the focus of our attention to the piano will be less toward the stylistic features of the sound we can get from it, or toward its general decor as a piece of furniture. Our focal awareness will be taken up with its properties of size and weight as we seek to carry it from one place to the other. However, that the aforementioned aesthetic features remain in subsidiary awareness, and are not lost sight of entirely is evident in the care with which the piano is treated in transit, by comparison with a log of wood, for example.

With respect to such examples, there is indeed a structure to the 'focal-awareness; subsidiary-awareness' relation. However, the structure of this relation is determined less by parts/wholes, than by the character of the activity that is being conducted with the objects under consideration: If the character of a given activity is to be sustained, then a necessary feature of this is a certain structure to the 'focal-subsidary awareness of consciousness in relation to its objects'.

On the other hand, Polanyi's concern to develop his distinction between 'focal awareness' and 'subsidiary awareness' in relation to tacit knowing both in perception and in scientific discovery would seem to involve a preoccupation with *perceptively recognising or identifying an object of consciousness* on the one hand, or with *formulating an hypothesis from a set of observations* on the other. From this standpoint he wishes to claim that the viewing of the relationship of the whole to its parts is very different if one begins from a focus upon the parts prior to recognising 'the whole' of which they form a part than in the care in which one moves in the reverse direction. Doubtless there is some truth in this: the familiar 'mystery sound' or 'mystery picture', wherein we hear or see part of the whole, and try to use the Information gained to identify the whole, not to mention the many variations on {71} the theme of duck-rabbits¹³⁰ all bear this out. In the case of the 'mystery sound' and the 'mystery picture', the thing to be identified has a whole range of properties, and our consciousness is not able to range over sufficient of them to recognise the object as easily as it would if more of the object were disclosed. The result is that our imagination has to generate possible ways in which what we are presented with might be able to fit into a larger picture, and then to eliminate the more unlikely possibilities, and finally to hazard a guess, and await the fuller view. In the case of the duck-rabbit, it is important to realise that we are presented with a picture that has an intentional ambiguity built into it. Indeed to recognise it as 'a duck' or 'a rabbit' would both be incorrect, precisely because of this fact. Given our wealth of experience in recognizing objects of consciousness unambiguously as 'a this' or 'a that' predisposes us to focus on the whole as if it were the familiar duck or the familiar rabbit, depending how we imaginatively fill out the properties missing in the sketch. However, the correct way to identify the picture would be 'as-one-that-has-been-drawn-to-be-able-to-be-recognised-as-a-duck-or-as-a-rabbit, - depending upon the way in which we focus upon the properties sketched in the picture'.

I am inclined to the view that the problem of *identifying* an object of consciousness involves both a moving from a focus on particulars/parts/properties of a thing to the whole-thing as a gestalt together with a moving from a hypothesised whole or gestalt to the properties/ parts that such a thing would have. Such a two-way operation of our consciousness in relation to an object would do justice both to the clues offered by the properties/parts in identifying it and to the checking of our conclusions. Thus, even in respect to the matter of recognizing or identifying an object of consciousness, I am not persuaded that the relation between 'focal' and 'subsidiary' awareness has the vectorial structure claimed by Polanyi. More than this, simply to be able to recognise an object is, on his terms, only part of what should count in respect to 'tacit knowledge' of the same. The 'tacit knowledge' involved in being able to ride a bike involves both an ability to focus upon a certain activity and a sufficient mastery of certain skills that enables the focal aim of consciousness to be realised in relation to the object under consideration.

Footnotes

- 1 Using the terminology of H. I. Brown in his 'Perception, Theory and Commitment'. Chicago (1977).
- 2 op. cit. p.149
- 3 his 'Nature of the Physical World', Dent, London (1935) contains the Gifford Lectures delivered in the University of Edinburgh in 1927.
- 4 ? {footnote unknown}
- 5 op. cit. p. 8
- 6 op. cit. pp. 8-9
- 7 op. cit. p. 9
- 8 op. cit. pp. 267 ff.
- 9 'Logic of Scientific Discovery' Hutchinson, London. (1959).
- 10 op. cit. Chapter 3, entitled "Theoretical Terms' pp.37-48
- 11 {unknown}
- 12 'Perception, Theory and Commitment'. p.49
- 13 Routledge and Kegan Paul, London (1958)
- 14 Minnesota Studies III. ed. Feigl and Maxwell, 1962.
- 15 C.U.P. (1958).
- 16 International Encyclopedia of Unified Science, Chicago (1962)
- 17 "Personal Knowledge", pp. 3-4.
- 18 'Against Method'. Verso edition (1979) p. 30
- 19 'Perception, Theory and Commitment'. p. 127
- 20 Ibid. p. 149
- 21 Such Post-Kantian epistemologies in science may obviously be related to those in more general endeavour. For example to Whorf's thesis in respect to the way language shapes a world and life view and to Levi Strauss's 'Structuralism' in Cultural Anthropology. In the version current in the philosophers of science under discussion, it is scientific theories which are deemed to have the role of ordering our experience. Quite obviously other hypotheses may be deemed to play the same role.
- 22 "Explanation, Reduction and Empiricism", Minnesota Studies III p.29
- 23 For evidence of these views, refer, in the case of Feyerabend to the note (18) from "Against Method" already cited in this essay, and, in the case of Polanyi to the following: 'To say that the discovery of objective truth in science consists in the apprehension of a rationality which commands our respect and arouses our contemplative admiration; that such discovery, while using the experience of our senses as clues, transcends this experience by embracing the vision of a reality beyond the impressions of our senses, a vision which speaks for itself in guiding us to an even deeper understanding of reality-such an account of scientific procedure would be generally shrugged aside as out-dated Platonism: a piece of mystery-mongering unworthy of an enlightened age'. 'Personal Knowledge' pp. 6-7
- 24 Refer, for example to "The Open Society and its Enemies' Vol. II pp. 213-223, Routledge and Regan Paul (1966 revised edition), in which Popper discusses 'historicism' (i.e. relativism) in a Post Kantian (in this case Hegelian) sociology of knowledge.
- 25 Oxford, London (1972).
- 26 op. cit. p. 22
- 27 op. cit. p. 22
- 28 op. cit. p. 18
- 29 op. cit. p. 18 p. 22
- 30 op. cit. p.18, p.22
- 31 op. cit. pp.18-19
- 32 'Objective Knowledge' pp. 33-34
- 33 Ibid. p. 37
- 34 Ibid. p. 36
- 35 Ibid. p. 34
- 36 Ibid. p. 119, p. 243 etc.

- 37 Ibid. pp. 347-348
- 38 Ibid. pp. 65-74, pp. 343-344
- 39 Ibid. esp. in "Two Faces of Common Sense", "Epistemology Without a Knowing Subject", 'On the Theory of Objective Mind' and 'Evolution and the Tree of Knowledge'.
- 40 Ibid. footnote p.68
- 41 Ibid. pp. 63-64
- 42 Ibid pp. 328-329
- 43 Refer to section 2.5
- 44 Ibid p.34.
- 45 These have already been discussed in section 2.3 above.
- 46 'Objective Knowledge' p. 341
- 47 'Objective Knowledge', pp. 341-342.
- 48 'Objective Knowledge'. p. 346
- 49 'Objective Knowledge'. p. 346
- 50 'Objective Knowledge'. p.360
- 51 Ibid. footnote p.68
- 52 'Logic of Scientific Discovery', footnote p. 59.
- 53 'Objective Knowledge' footnote p.68
- 54 Section 2.4 of the present essay
- 55 'Logic of Scientific Discovery' pp. 98-111
- 56 'Logic of Scientific Discovery', p.99
- 57 'Logic of Scientific Discovery'. p. 109
- 58 Ibid. p.111
- 59 'Perception, Theory and Commitment'. p. 67
- 60 A fuller and more representative discussion of the subject should include the following: A. Whitehead 'Essays in Science and Philosophy', Philosophical Library. N.Y. 1949 pp. 95-96. C. Hempel "Fundamentals of Concept Formation in Empirical Science". Univ. of Chicago Press, 1952, pp. 20-21. P. Frank 'Philosophy of Science' Prentice Hall N. J. 1957 pp. 1-20. W. P. Montague 'The Ways of Knowing' Macmillan Co., N.Y. 1958 pp. 73-78. J. Kemeny "A Philosopher looks at Science" Van Nostrand Reinhold Co. N.Y. 1959 pp. 172 ff. E. Nagel "The Structure of Science", Harcourt, Brace & World Inc. N.Y., 1961 pp 1-15. Danto & Morgenbesser 'Philosophy of Science' World Publ. Co. N.Y. 1961 pp. 15-26. I. Scheffler 'The Anatomy of Inquiry'. A. Knopf N.Y. 1963 pp.56-76. M. Wartofsky 'Conceptual Foundations of Scientific Thought' MacMillan, London 1968 p. 6-9, 43ff. N. Reschner "Scientific Explanation" Free Press. N.Y. 1970. pp. 6-10. The cited authors have been chosen as the more representative and insightful on the topic.
- 61 P. Frank 'Philosophy of Science' Prentice Hall N.J. 1957. pp. 1-2.
- 62 Ibid p. 9
- 63 Ibid pp. 9-10
- 64 refer to the quote mentioned in footnote 61.
- 65 D. Hume "A Treatise of Human Nature" Bk. I Part IV Section II. p. 202, p. 193 in the edition of L. A. Selby-Bigge, Oxford 1968.
- 66 K. Popper 'Objective Knowledge'. p. 63
- 67 E. Nagel "The Structure of Science" Harcourt, Brace & World, 1961. pp. 1-2
- 68 Ibid p.3
- 69 Ibid pp. 3-4
- 70 The point here might be made more effectively if it were framed along the lines of the following two namely 'although the uses of the wheel have been known for centuries, few concerned themselves with seeking to explain the reasons for its effectiveness'. This way of making the point shows less of a bias toward the possible implication that post-Newtonian mechanics is the only mechanics deserving the title 'scientific'.
- 71 Ibid. p. 4.

72 {unknown}

73 Ibid p.6

74 Ibid pp.7-8

75 Ibid pp.10-11

76 Ibid pp.12-14

77 {text reference unknown} Ibid p.15

78 Ibid p. 4

79 MacMillan, London, 1968

80 Ibid pp. 43-44

81 Refer to 'Before Philosophy' by Henri Frankfort, et al. Penguin, 1949. pp.11-36.

82 Wartofsky op. cit. p. 44

83 Ibid p.45

84 Ibid p.45

85 {footnote unknown}

86 Ibid p. 57

87 Ibid p.61

88 Ibid p.63-68

89 Ibid pp. 66-67

90 Ibid pp.67-68

91 Ibid p.68

92 It would be a mistake to interpret this statement in terms of modern materialism. Thales, for example, is on record as having said that he thought that 'all things were full of gods'. (Aristotle De Anima 411a7) What is more likely in this respect is that the view of 'nature' under the influence of the fates or Nature Gods of the Greeks but a certain character to Ionian speculation that differentiates it from modern materialist' thought. The Greek nature gods, it should be remembered, were never considered to be the creators of matter. They themselves were part of it! and even Plato's Demiurge only gave form to this pre-existing matter.

93 Wartofsky op. cit. p. 71.

94 'Conjectures & Refutations', Routledge and Kegan, Paul 1965, pp. 136-165 and 'Objective Knowledge' op. cit. pp. 347-348.

95 'Objective Knowledge' pp.32-105

96 refer section (ii) above entitled 'the critical attitude toward common sense and abstract speculation'

97 Wartofsky op. cit. p. 83.

98 'Objective Knowledge' pp. 32-34; pp. 347-348 and "Back to the Presocratics' in 'Conjectures and Refutations' pp. 136-165, Routledge & Kegan Paul, 1965

99 In developing the views of this section I am much indebted to the first chapter of a thesis on the philosophy of Herman Dooyeweerd entitled 'The Structure of Theoretical Thought'. The thesis itself is entitled 'Transcendental Critique, Ontological Reduction and Religious Belief in the Philosophy of H. Dooyeweerd' and was written by Roy Clouser in 1972, and submitted in completion of the requirements for a Ph.D. degree in philosophy at Trenton State University, U.S.A.

100 For a recent discussion of the ways in which these issue have. been taken up, refer to "The Self and its Brain; an argument for Interactionism' by K. Popper and J. C. Eccles. Springer-Verlag, 1977)

101 The character of this interpretation insofar as it depends upon what I shall term a world and life view will be taken up in another essay.

102 Although the terms 'focal awareness' and 'subsidiary awareness' are borrowed from Polanyi (refer, for example, to 'Personal Knowledge', op. cit. pp. 55-65 and to 'Knowing and Being', Routledge and Kegan Paul, London (1969), pp. 138-180), my usage of them will not necessarily follow his. I shall use the distinction exclusively in relation to the cited way in which our consciousness is able to focus attention upon certain objects or features of objects within its field. In particular I shall do this in a manner that (a) does not confuse our consciousness with its objects, (b) does not seek to develop the relation between focal and subsidiary awareness as a quasi. inductive leap in such a way as to provide a

scientific methodology and (c) recognises that all formulations of our knowledge about things and their properties and relations have a measure of fallibility, albeit that they are founded in a tacit grasp of an awareness of the objects of consciousness. These matters are taken up further in an appendix to the current section of this essay.

103 Chapter 1. "The Tacit Dimension", London (1966).

104 Refer, for example, to the description of such strands by Wartofsky in his 'Conceptual Foundations of Scientific Thought' pp. 43-62

105 e.g. in his comparisons between 'I know' and 'knowledge', p. 110

106 refer pp. 30-40 of this essay

107 Nagel 'The Structure of Science' pp. 5-9

108 Further remarks made on this question are on page 64-65

109 Refer O. Neugebauer 'The Exact Sciences of Antiquity', Dover, New York (1969) pp.36-44

110 It will not be claimed that all concepts in theorising are abstract. What will be claimed is that theorising of necessity involves a degree of abstraction in at least some of its concepts.

111 This is using the term 'abstract' in more or less its literal or original meaning, which is to separate something out of something else; or to extract something from something else. Compare Donald Williams' statement in 'Mind as a Matter of Fact', Review of Metaphysics, December, 1959, p/221: '...the designation "abstract" derives "from the way an aspect or accident of a thing, while partially and positionally it stays embedded in its matrix, becomes also, as the rest of the matrix does not, an element in the distinctive unity of consciousness".

112 Although the above process of relating the familiar properties of heaviness and weight of a car to the precise abstract formulations of the properties of 'mass', 'inertia', 'gravity', 'force', 'acceleration' and 'velocity' of Aristotelean, Newtonian or Einsteinian mechanics is relatively simple to state, the actual intellectual labour in being able to develop precise abstract conceptions of the various properties concerned has so far taken hundreds, even thousands of years. This point is in no way underestimated. The point I am trying to make is simply that the process of concept formation in respect to scientific theorising takes its starting point from an abstraction of certain properties of things given to us in common sense experience. The ongoing task of scientific theorising is to test refine and criticise these conceptions. In principle this gives a different slant to the relationship between science and common sense than those offered by Post-Humean and Post-Kantian philosophies of science.

113 'Logical Foundations of Probability'. Univ. of Chicago Press, Chicago and London (1962) pp. 1-18

114 Ibid p. 3 emphasis mine.

115 p.111 John Hovers 'An Introduction to Philosophical Analysis' (New Edition) Prentice-Hall, Englewood Cliffs, 1967.

116 Ibid p.11 emphasis mine.

117 It should also be noted that the abstractionist account of theoretical concepts put forward in this essay seeks, for similar reasons to those just stated, to remain neutral in the first instance to such disputes as the realism/nominalism controversy concerning universals. The term 'property' as used here is not being used in a way that is biased against the nominalist. Both parties to this dispute have to account for the similarities or resemblances in the various properties of the things of our experience.

118 the fact that these things were described as 'bodies' is perhaps indicative of the fact that the 'primary' qualities had been abstracted as of constituting the main interest, with the 'secondary' qualities put aside (or more especially deemed to be contributed by 'the mind' of human subjects).

119 My claim is that we observe *things* that have sensory as well as {remainder of footnote unknown}

120 'Personal Knowledge' op. cit. pp. 55-65, 'Knowing and Being'. op. cit. pp.138-180.

121 'Personal Knowledge' p. 58.

122 'Personal Knowledge'. p. 59

123 O.U.P. (London), 1946

124 Ibid pp. 24-25

125 Personal Knowledge' pp. 97-98

126 'Being and Knowing' pp. 138-158

127 Ibid p.138

128 {reference unknown} Ibid p.138

129 Ibid pp. 140-141

130 Refer, for example, to 'Patterns of Discovery', N. R. Hanson op. cit. pp. 4-30; 'Perception, Theory and Commitment", H. I. Brown op. cit. pp. 81-94