

4 : A CONCLUSION AND A BEGINNING

4.1 THE BASIC PROBLEMS RE-EXAMINED

We began this study with four basic problems, the central problem of the role of the knowing subject and the three subsidiary problems:

What are acceptable tests of a fit between knowledge claims and the experiential universe?

What is the basis for the intersubjective universality of knowledge?

In what sense, if at all, can epistemology be isolated from metaphysics?

In reviewing these we begin with the subsidiary problems in order and conclude with the central problem. A fifth problem identified in the introduction, the problem of the cognitive status of science will be dealt with later.

4.1.1 The Evaluation of Knowledge Claims

An important point on which there is general agreement is that a test does not need to establish an absolute fit between knowledge claims and the experiential universe in order to be acceptable. A partial, provisional or approximate fit is acceptable and, indeed, is all that we can expect. In truth value terms the demand that knowledge should satisfy criteria of absolute truth has been generally abandoned.

This separates Popper from classical justificationists. Whereas the latter aimed for knowledge that, within limits, could be certified as an exact fit with reality, Popper has abandoned such a goal as unattainable. The changes in methodology go hand in hand with this change in goal. If an exact fit is required then it is essential to have tests that will tell us when such a fit is achieved. The quest for such a test led to the constant refining and tightening of the "correspondence rules" for the testing of theories in Logical Positivism. No

doubt the failure to devise such a test that could withstand critical scrutiny was a factor in the decline of the influence of Logical Positivism. However, if the requirement of an exact fit is replaced with a provisional or approximate fit the tests can be less rigorous. We may now be satisfied with something like Popper's falsifying tests that are designed to do no more than test for inadequacies in the fit without telling us how close it is to an exact fit.

This represents a major shift from the long centuries of Western thought during which, in spite of sporadic outbreaks of scepticism, it was generally assumed that the attainable goal of knowledge was an absolute or precise fit with a reality external to the knowing subject. We may perhaps never know that reality exhaustively but so far as we do know it there is, or at least can be, an exact fit between knowledge and a subject-independent reality, whether at the heart of material reality or transcending that reality in Platonic fashion. Today, by near universal agreement, that goal has been abandoned as unattainable. All we can and need to aim for is a partial, approximate or provisional fit.

There is not the same agreement either with regard to the ontological basis or with regard to the appropriate tests to be employed. On the ontological question Popper maintains the existence of absolute truth as a perfect correspondence of knowledge statements with the facts of reality but insists that this can only function as a regulative idea in epistemology on account of the conjectural character of all knowledge and the lack of any criterion of truth. The always approximate truth value of knowledge is due to the limitations of the knowing subject (Popper, 1983:24-27).

Piaget, on the other hand, maintains that knowledge must ever be incomplete and approximate, not because of the limitations of the subject but because of the transformational nature of reality that

always recedes from us as we approach it, developing new and more complex structures as we master its present structure. Knowledge can have only relative truth value since what is absolute in the now known is liable to relativisation as reality is transformed in the ongoing development of our knowledge (Piaget,1983:173).

Polanyi dissents from both. The relative character of all our knowledge is due neither to the limitations of the subject's ability to apprehend a reality of absolute rationality nor to the always changing nature of a reality which the subject approaches by means of universally valid rational mechanisms. The rationality and universality of reality as the impersonal pole of commitment is always correlative to the personal pole of commitment in a structure of commitment the validity of which is given only by the particular subject for the particular subject (Polanyi,1962:308-316).

Feyerabend takes this a step further by declaring a total absence of universal values either attaching to the activity of the knowing subject or to a reality external to the subject (Feyerabend,1975:23-53). Deutscher, moving in a different direction, identifies the limitation with the tendency of the subject to slip out of the objective attitude that alone secures genuine contact with the objects of reality (Deutscher,1983:28-44).

These ontological differences, of course, go hand in hand with anthropological differences. For Piaget man is a rationally constructing animal with rationality embedded in his very biological existence but lifted above the merely animal by the semiotic function that transforms him into a (possible) scientific man. Rationality, as a constructive, co-ordinating rationality allowing rational control of the environment is the most central human character.

Rationality is a more peripheral human quality for Popper, being limited to a critical rationality. Imaginative creativity held in

check by a critical rationality is more characteristic of the Popperian view of the human condition. Through his lingual ability this creative man creates the objects of the objective world of knowledge that transcends its human creator.

Polanyi's human is characterised neither by rationality nor by creativity, though possessing both as subsidiary qualities, but is characterised as an autonomous believer committing himself to what he believes in with no ground for this believing outside himself. Again the power of language raises man above the merely animal, though the basis for this superiority lies in inarticulate human faculties that produce language.

One striking similarity between all three of these is the role of language, or in Piaget's case the semiotic function, in distinguishing the human from the merely animal, though with differences in the exact nature of the role it is seen as having.

Feyerabend presents us with a picture of man as the autonomous individual decision-maker whose greatest enemy is supra-individual authority imposing arbitrary constraints on the exercise of autonomous individuality.

The new direction and limited scope represented by Deutscher's contribution makes it difficult to be confident about its anthropological implications but Deutscher appears to be heading in the direction of a view of the human as characteristically ethical, finding fulfilment and objectivity by acting according to right standards. However, further dialogue with Deutscher might modify this impression.

Together with the ontological differences, and directly related to them, there are wide differences in the nature of the tests to be used.

Piaget advocates deductive testing procedures that subject knowledge, in its construction, to rigorous logical and experimental con-

trols. Popper contends that the only tests possible and worth using are theoretical tests that enable us to eliminate unsatisfactory theories after their construction. For Polanyi the critical test is coherence with the subject's belief system.

Feyerabend, while proposing various tests from time to time, clearly does not want us to take these as standard or definitive tests. He pleads with us to regard all his proposals as those of a "flippant Dadaist and not as a serious anarchist" (Feyerabend, 1975:21n). We may choose whatever kind of test we deem appropriate, but none is to be taken too seriously. Deutscher, again taking us down a different road, abolishes all tests of knowledge claims proposing instead tests for identifying objectivity as a quality of the subject's activity. In one respect this places Deutscher with Piaget and apart from the others in that he wishes to test the subject's activity in the acquiring or formation of knowledge rather than propositions or theories. He differs from Piaget, however, in that the tests he proposes lack the basis in deductive logic of Piaget's tests.

Once again we encounter a widespread disagreement and a bewildering array of alternatives behind an important, but limited agreement in contemporary epistemology.

4.1.2 The Intersubjective Universality of Knowledge

As might be expected this diversity is directly reflected in diverse views as to the basis for intersubjective universality.

Piaget argues that intersubjective universality is based on a universal logical structure inherent in the organic base of the subject's activity as it interacts with a subject-independent structured reality. In support of this he advances extensive experimental research apparently unaware, or at least failing to note, that the compelling nature of this evidence depends in the first instance on his theory of verification.

Popper, having abandoned all hope of a rational basis for intersubjective universality in the formation of knowledge insists that the only basis for intersubjective universality is in the subject's critical rationality; "critical" not, of course, in the Kantian sense but in the Popperian sense of "destructive". The constructive functions of cognition (theory construction) are irrational; only the destructive function (theory refutation) is founded in universal rationality (see the discussion above in section 3.2.2).

Polanyi puts forward the structure of commitment as the purely formal basis for intersubjective universality. All knowing subjects operate within the same formal structure of commitment but, unlike the claims of rationalism, this gives no basis for intersubjective universality with regard to empirical content. In this respect the possibilities for what may count as valid knowledge are as diverse as the beliefs that people may set as standards for themselves by themselves. We are saved from the individualistic fragmentation of knowledge to which this would lead only by a consensus of commitment such as unites the scientific community.

So far as Feyerabend is concerned his interest in the question is confined to the pragmatic social problem of securing intersubjective agreement on fundamental issues of basic beliefs and education in order to secure social coherence. This can only be based on democratic vote if humanity is to be free and the rationality of knowledge is to increase. Deutscher's prescription calls for the engagement of the subject with the objects in a consistently objective manner the main features of which we can identify by rational reflection within a context of common sense realism.

And, amid the proliferation of competing theories a return to common sense realism as our starting point in relation to the problem of intersubjective universality has a great deal to commend it. We need

not commit ourselves to remaining there but the advantage of beginning there is that on the level of everyday experience, once we put on one side for the moment the intricacies of philosophical theorising, it is not difficult to obtain intersubjective agreement about matters of common knowledge with a quality of universality.

Place any human subjects whose senses are functioning in the ordinary way in the presence of another human and there will be immediate agreement in the knowledge that they experience the presence of a fellow human - provided, of course, they are able to communicate with one another. Similarly that clouds obscure the light of the sun, that the sun rises in the east and sets in the west or that roses severed from the bush and left to lie on the ground will shortly wither and die are readily recognised as matters of common and universally applicable knowledge on the level of everyday discourse. On this level of discourse it does not even raise any eyebrows to say that statements to this effect correspond to the facts; as any philosopher will know who has intruded his philosophical subtleties about truth theories into a group of people making such statements in the course of everyday discourse. And in the same context any suggestion that material objects under discussion are anything other than real is likely to be met with scorn.

The philosopher for whom nothing is philosophically interesting unless it is a problem requiring the skills of philosophical analysis for its solution may well dismiss these observations as trivial. And, of course, in and of themselves they do nothing to advance philosophical discourse. However, a careful analysis of what it is that secures such ready intersubjective agreement in such cases may do a great deal to advance our understanding of the basis of intersubjective universality of knowledge. With the current assaults on the universal authority of scientific knowledge it appears to be the only unproblematic

starting point left to us.

This, of course, is not likely to commend itself to Popper who argues that the way to approach epistemology is as the problem of scientific knowledge (Popper, 1980:18,19). There are, however, two good reasons for challenging Popper in this respect. In the first place his argument depends on a faulty either/or formulation of the problem; either we approach epistemology as the problem of common sense knowledge or we approach it as the problem of scientific knowledge. But, of course, there is no reason that we should not approach it as a problem to be tackled on both levels.

Secondly, his preference for the problem of scientific knowledge as easier to analyse than common sense knowledge (Popper, 1980:22) is based on his restrictive view of epistemology as the methodology of theories. That view has always been problematic, its authority resting on little more than a narrow philosophical orthodoxy intolerant of dissent; by now it has led epistemological discussion into so many impasses that it should be apparent that we have nothing to lose by trying a different approach.

4.1.3 The Metaphysical Problem

For Polanyi, Feyerabend and Deutscher the metaphysical problem does not exist since they make no attempt to isolate epistemology from metaphysics. In this respect they represent the fading of the Kantian shadow in contemporary epistemology. Piaget and Popper, however, both claim an epistemology that is independent of metaphysics, yet on quite different grounds.

Piaget makes his claim on the ground that his epistemology is a scientific discipline that proceeds to solve the problems of knowledge by step by step solutions of carefully delimited problems employing methods on which intersubjective agreement can be reached independently of all metaphysical, or philosophical, considerations. In this

way he expects to build a more and more extensively elaborated epistemology on strictly scientific grounds independently of all metaphysical questions.

Popper's position is, in certain respects, confusing. He clearly denies that epistemology is or can be a scientific discipline. It is a methodology that cannot be made into a science without falling into naturalism and, with it, inductivism, the ultimate heresy for Popper (Popper, 1980:50-53). It is therefore "a philosophical - a metaphysical - discipline" (Popper, 1983:xxv). In this respect the proposals of Piaget and Popper are contradictory.

So far the position seems clear. Popper's epistemology is a metaphysical, as distinct from a scientific, discipline. The situation becomes confusing when, elsewhere, Popper speaks of epistemology "in contradistinction to" metaphysics (Popper, 1983:74). In making this distinction he insists that his metaphysical views play no part within his epistemology in contrast to certain other philosophers who "use their metaphysical views to support their epistemologies" (Popper, 1983:81).

The confusion clears if we recognise two different senses, a broader and a narrower, in Popper's use of the terms "metaphysics" and "metaphysical". In the broader usage he uses it to distinguish all rational thought that is not and cannot be scientific because it cannot be subjected to the critical tests of empirical science. This closely parallels Piaget's distinction between philosophy and science, and is the sense in which Popper describes his epistemology as a metaphysical discipline.

In the narrower usage metaphysics is the equivalent of ontology, theories about the structure of the world, the nature of reality (Popper, 1983:73,74). It is in this sense that he wishes to exclude all metaphysical propositions from his epistemology. As the methodology of

science its validity is independent of all ontological considerations.

In the interests of clarity, therefore, the problem will be discussed as the problem of the relation between epistemology and ontology rather than epistemology and metaphysics. This distinguishes more clearly the problem as raised by Popper's epistemology and, although the problem raised by Piaget's distinction is broader in scope, the key issues can be elucidated satisfactorily within the scope of the epistemology/ontology problem.

It should be borne in mind that neither Piaget nor Popper wishes to take the positivist route of outlawing metaphysics. They do not even wish to argue that epistemology can be insulated against all metaphysical influence. Their claim is the more limited one that epistemology can be developed as a self-consistent system within which ontological questions play no part.

In the case of Piaget a substantial chink appears in his argument with his recognition of the decisive role of an epistemic framework in determining the kinds of problems that are admissible as scientific problems. There is no doubt of the role of ontological questions in the epistemic framework. The major feature of the change in epistemic framework that is said to have opened the way for the rise of modern science was an ontological change. In the medieval period concepts such as the principle of inertia were inconceivable because an Aristotelian ontology imposed on science a static conception of the world in which the "natural state" of all physical objects is one of rest with motion considered as an act of "violence" resulting from a force exerted on the object. A change in this ontology was essential for the rise of modern science (Piaget & Garcia, 1983:280-285).

Piagetian epistemology depends for its claim to an ontology-independent scientific epistemology on the step by step resolution of delimited problems identified as scientific as the proper epistemolo-

gical procedure. The whole development of such an epistemology depends on the selection of problems. But if an epistemic framework that incorporates an ontology determines the kinds of problems that are to be admitted as scientific it is apparent that ontological questions must have a decisive role in the selection of epistemological problems and consequently in the whole development of an epistemology. The epistemology is shaped by the nature of the problems which are determined, in part at least, by an ontology. Change the ontological assumptions of Piaget's epistemic framework and we might well open up a whole new range of now forbidden problems that would generate an epistemology as different from the Piagetian as 20th century physics is from Aristotelian physics.

But, quite apart from this consideration specific to Piagetian epistemology it seems to be impossible in principle to achieve the goal shared by Piaget and Popper of an epistemology independent of ontology. Every epistemology has inbuilt ontological values. Having developed the basic structure of an epistemology it is possible to operate within it, and to refine and further develop it without taking account of the ontological values that are built into it. But those ontological values nevertheless remain as intrinsic features of the system.

This may be demonstrated by a comparison of Piagetian and Popperian epistemologies at a point fundamental to each. Piagetian epistemology holds that the subject constructs cognitive structures in interaction with reality in a never-ending transformational spiral. Popperian epistemology holds that the subject makes cognitive conjectures about reality from which selection is made by critical testing. At first sight it may seem that with "subject" and "reality" as common terms the difference between the two formulas lies solely in the epistemic relation between them. On closer examination it becomes clear that the

terms "subject" and "reality" carry different correlative ontological values in the two accounts; a difference that is fundamental to the internal logic of the epistemologies.

The Piagetian formulation requires ontological values such that the subject is a rationally directed, constructive conqueror of a reality that is continually transformed and enriched by the subject's conquest. The Popperian formulation requires ontological values such that the subject is a creative guesser and rational critic of guesses about a reality whose structure remains wholly independent of the subject. If we were to swap these correlative ontological values of subject and reality so that the Piagetian subject and the Piagetian reality are placed within the Popperian epistemological formula and vice versa the now coherent internal logic of these epistemological formulas in each case would collapse into nonsense.

It will be noted that these ontological values imply corresponding anthropological values. The Piagetian formulation becomes nonsense if the human is not characterised, at the most fundamental level, by a constructive rationality while the Popperian formulation requires a human who is an imaginative creator held in check by a critical rationality.

The same analysis, I suggest, could be extended with similar results to other features of these and other epistemologies. There is simply no way to construct an epistemology without both intrinsic ontological and anthropological values and it is one of the more encouraging signs in current epistemological discussion that this is being more widely recognised.

This is not to say that epistemology is to be subsumed under, or subordinated to, either ontology or anthropology. It is saying only that they are inseparable correlates.

4.1.4 The Knowing Subject

Even though this is the central theme of this study, all that is needed at this stage is a quick summary since much of the relevant material has been dealt with already in the subsidiary problems.

All five of the views examined in this study concur in regarding the subject as an active agent formative of knowledge. In that respect the Kantian revolution has proven a lasting revolution. However, as on other points, they differ widely with regard to the nature of this formative activity.

Piaget presents us with a subject that constructs knowledge, and with it transforms reality, in a rational construction in accordance with a rationality inherent in organic life and expanded in its powers in human life by the semiotic function.

The Popperian subject, in sharp contrast, can construct nothing but guesses at the nature of reality and tries to get closer to the truth by critical elimination of guesses without any sure way of knowing how close he is getting if at all.

Polanyi's knowing subject is a believing subject functioning by self-set standards within the structure of personal commitment. The Feyerabendian subject is anything at all provided only it is free of all authority.

Finally, Deutscher offers us an involved subject who identifies the universal conditions of his or her objectivity, and rationality, in reflection on the multi-faceted character of that involvement, including the involvement of detachment (on the latter see Deutscher, 1983: 129).

Surveying this array of subjects, all claimed as the knowing subject, one is tempted to say: Will the real subject please stand up?

4.1.5 Some General Trends: A Summary-

A number of general trends emerge from this comparative survey. There is a trend away from the view of the subject as acquiring, apprehending or gathering knowledge toward the view of the subject as formative agent. There is a trend away from the notion of knowledge as absolute and immutable truth toward knowledge regarded as always relative, approximate and provisional.

There is also a strong trend away from the classical rationalism that held that it is at least possible to attain knowledge the objectivity of which is assured by a pure rationality excluding all extra-rational factors. The inevitable role of extra-rational factors is widely admitted, even by those who wish to retain some form of rationalism.

The emergence of irrationalist theories of knowledge as respectable alternatives has weakened the criteria of intersubjective universality in knowledge. Such theories replace intersubjective universality founded in an intellectually compelling rationality with a limited collective agreement or consensus of knowing subjects.

A further trend is the waning of scientific authority. There remain, of course, many who maintain the superior authority of scientific knowledge but there has been a significant emergence of influential voices that seriously question that authority. Feyerabend and Deutscher, with the striking differences in their approaches to the question, are but two representatives of this important trend.

Finally there has been, over the last quarter century or so, a startling fragmentation in Anglo-Saxon epistemology. On the one hand, this might be regarded as a healthy development in so far as it provides an intellectual climate favourable to creative thought and encouraging open interaction between alternatives. On the other hand, it might lead to a situation in which epistemologists become isolated

within competing "schools" each intent on strengthening its own arguments, and with them any errors, and noticing the others, if at all, only to launch an attack designed to destroy their credibility.

Since it seems to me that critical dialogue is an essential ingredient in intellectual development, it will be one of the aims of the remainder of this study to identify common ground on which such dialogue can take place between all with a serious desire to advance epistemological understanding. By "common ground" I do not have in mind something like a common cognitive core or foundation or an agreed absolute reference point for knowledge about which there will be no dispute. I have in mind rather the mapping of a common "territory" of discourse with some common reference points within which debate and disputation can take place as genuine dialogue, the sharing of partners each of which hopes to learn from and be enriched by the other.

4.2 THE NEGLECTED QUESTION: WHAT IS KNOWLEDGE?

Amid the plethora of contemporary epistemological ideas there is a notable absence of discussion of the fundamental question: What is knowledge? Piaget and Popper both explicitly state the view that any attempt to deal with this question is epistemologically undesirable. Others just pass it by without notice.

It seems to me a strange, and intellectually hazardous, procedure to talk for hour after hour about something without any attempt to make clear what it is we are talking about. If an attempt to answer the question were to commit us to a search for a Platonic Idea or an Aristotelian essence or some other kind of immutable conceptual entity I could understand, and share, the hesitation. But it does not do anything of the sort. It does no more, unless we wish it to, than commit us to clarifying what we are talking about. No doubt, if we go about it seriously, it will lead us to a definition of some sort but we need not regard this "definition" as definitive; we may regard it,

and I suggest that we should regard it, as a working hypothesis for epistemological analysis.

The failure to address this question appears to me intellectually hazardous because every epistemology implicitly assumes an answer of some sort and by refusing to address the question explicitly we refuse to examine critically, or allow others to examine critically, a fundamental assumption of our theorising. And to insulate our ideas against critical scrutiny seems to me always intellectually hazardous. Even Popper, with his aversion to definitions, recognises the importance of making clear distinctions (Popper, 1972:402) and it is just the need to do this that makes it important to address the question: What is knowledge?

In order to avoid confusion in dealing with questions about the conditions and growth of knowledge we need to distinguish knowledge from the rest of our experience. Especially we need to distinguish it from those other features of our experience, such as sensation and belief, with which it has commonly been closely associated; even if it should prove that no distinctions can be identified other than a difference in words it can only add clarity to our discussion to establish this. If we take the view of Piaget and Popper that the key epistemological problem is the growth of knowledge it can only assist our investigations to clarify what it is the growth of which is our concern. If we want to study the growth of pine trees it can only help us in solving the problem if we clearly distinguish pine trees - i.e. have an answer to the question: What is a pine tree? If we do not we may well find ourselves studying the growth of eucalypts thinking we are studying the growth of pines!

The analogy of the pine tree is not facetious, though I do not wish to imply that knowledge is an entity of the same kind as a pine tree. I do suggest, however, that the procedure required for clarifying the

relevant distinction is the same in each case. In order to clarify the distinction involved in the description "pine tree" we need to enquire, as widely as possible, as to the common distinctive features of the objects so designated that warrant the common designation. Similarly, to clarify the distinction involved in "knowledge" we need to enquire, as widely as possible, as to the common distinctive features of whatever is so designated that warrant the common designation.

The qualification "as widely as possible" is important. It will not do, for example, to limit ourselves to scientific knowledge. To do so is to run the risk of a too restrictive definition that obscures the commonness between science and other forms of knowledge. Only by examining as wide a range as possible can we distinguish the distinctive features common to all from those peculiar to a particular form of knowledge.

It is always possible, of course, that we will not find any distinctive features common to all objects designated by a common word or word combination. This in itself would lead to significant increase in clarity by enabling us to identify distinctions that had previously been obscured by an ambiguity of language. However, we can safely do this only after we have made exhaustive enquiry for common distinctives that warrant the common designation.

Following this procedure the first thing we note about knowledge as human knowledge is that it is a human activity as distinct from a material object or relationship or passive affection. Activity is used here in the broadest sense as opposed to passivity and not in the narrower sense of a concrete physical act.

It is true that some theories of knowledge have severely limited the cognitive activity of the human subject but even the most severe forms of empiricism have not reduced knowledge to nothing but a stream of impressions registered on a passive subject. However unambiguous the

passively registered sensory data has been held to be there has remained a need for the active processing of this data by the subject in order for it to count as knowledge even if it must be accepted that the processed result lacks the clarity of the initial sensible impressions. At the very least the subject must filter the stream of impressions in order to distinguish between genuine cognitive data and illusory impressions.

It may be objected that "knowledge" has been used to encompass more than human knowledge. On the one hand there is animal knowledge and, on the other hand, there are those who speak of a supra-human knowledge, whether as divine knowledge or as the Popperian World 3 of objective knowledge. This is conceded and, so far as these views are accepted, appropriate qualifications would need to be added for any complete definition of knowledge.

For the present purpose, however, I leave these questions to one side to concentrate on knowledge as human knowledge which, it seems to me, is the central issue of epistemology.

The introduction of animal knowledge into epistemological discussion does not displace the human but is for the sake of establishing the continuity, and more especially the discontinuity, between the human and the merely animal. And the introduction of a supra-human knowledge has always been for the sake of providing an objective anchorage or standard for the activity of human knowledge.

As a working hypothesis that can serve as a starting point for epistemological analysis, therefore, we may say that knowledge is a human activity. We may then later, if we wish, add an understanding of animal and/or supra-human knowledge. But then, as it is apparent that not all human activity is cognitive activity, how are we to distinguish the cognitive from other kinds of human activity. I suggest that knowing is typically qualified as correlated distinguishing.

To say that I know John Brown is to assert that I distinguish John Brown from other objects of my experience. It makes no sense to say that I know John Brown if I am unable to distinguish John Brown. If I know him only slightly I may not be able to distinguish him in every circumstance but if I cannot distinguish him under any circumstance at all then clearly I do not know him. To say that I know that the grass is green is to assert that the distinguishable property "green" attaches to the object "grass" that I distinguish from all other objects of perception. To assert that I know that common salt is a chemical compound of sodium and chlorine is to assert that what I distinguish as "common salt" is a distinct kind of compound of the distinct elements "sodium" and "chlorine". Indeed the whole of science, whatever else we may say about it, is an endeavour to make increasingly refined distinctions within a systematic correlation.

Every statement of knowing is an assertion of one or more distinctions in a way that, for example, a statement of believing is not. To say that I believe that the grass is green, or that common salt is a compound of sodium and chlorine, implies the distinctions involved in the corresponding knowledge statements but it does not assert them. Similarly, to say that I believe John Smith, while it implies that John Smith exists, does not assert his existence in the way that "I know John Smith" does. The assertion of a belief is an assertion about the subject in relation to an object whereas an assertion of knowledge is an assertion about an object as distinguished by the subject.

Anything like a complete treatment of the nature of belief, of course, would need to discuss in some detail various analyses that differ in various ways from the one offered here and that raise important issues that I pass by without discussion in the present analysis. I think for example of those offered by Moore (1953), Griffiths (1967), Armstrong (1973) and Quine & Ullian (1978). I resist the

temptation to explore the issues raised by these analyses so far as they differ from my analysis at this time in the interest of keeping the present study within some kind of reasonable limits. The reading and reflection on these analyses, however, has been significant in the development of my own analysis presented here in outline only.

But knowing is more than simple distinguishing, except perhaps at the most primitive level. It may be that knowing begins by simply distinguishing one object from the total perceptual field but it cannot grow without an increasingly complex correlation of the distinctions giving rise to epistemic categories such as classes and relations. The impossibility of any one person mastering the whole field of knowledge today is due not only to the immense number of distinctions that would need to be mastered but even more to the complex network of correlations.

I propose, then, as a working hypothesis, that knowledge be distinguished as the human activity typically qualified as correlated distinguishing. This, of course, places the emphasis on the activity of the subject but it does not rule out the consideration of knowledge as also a product that becomes independent of the subject in the manner of Popper's World 3 or as in some other sense independent of the knower; neither does it forbid a consideration of the claim of a subject-independent knowledge that is not a human product but is apprehended or actualised in human knowledge. It says no more than that we shall begin our analysis with knowledge as a human activity and, from that point, consider what else may be said about knowledge. Questions of this sort will be considered in the next section when considering the outline of a theory of knowledge.

The examples given so far have been examples of "knowing persons" or of "knowing that" but the working hypothesis equally suits cases of "knowing how". In this case the correlative nature of the distinguish-

ing is indispensable since every case of knowing how is a matter of correlating distinctions of objects and their properties with one another and with typically distinct actions. Knowing how to carve a piece of wood, for example, requires the correlation of distinct properties of the wood with those of the carving tools and the subject's skills and typical carving actions.

In this connection it is important to distinguish skill from "knowing how". Skill always needs to be directed by a "knowing how" but there can be "knowing how" in the absence of the correlate skill. A woodcarver who has become a paraplegic as a result of an accident will still know how to carve wood but will lack the skill to do so. A surgeon may know how to perform an operation but due to lack of practice may not have the skill for doing so.

A skill is a competence in the use of instruments, either natural or fabricated instruments, whereas "knowing how" provides the correlated distinctions necessary for effective exercise of the skill. So, for example, a person may have well developed skill as a woodcarver but be unable to exercise that skill effectively on a piece of wood with unknown and unfamiliar properties. He may well acquire the necessary know-how, of course, by applying his skill to the piece of wood but it will be a trial and error process different from the effective exercise of his skill on a known piece of wood.

By calling the above definition of knowledge a working hypothesis I am not implying that it is to be regarded as having the status of a Popperian guess. It is the result of a careful analysis of knowledge as a common feature of human experience. It is a working hypothesis only in the sense that it provides the basis for further analysis that should always remain open to modification as a result of that analysis.

4.3 THE KNOWING SUBJECT WITHIN A MODEST THEORY OF KNOWLEDGE

While none of the approaches to epistemological problems that have been surveyed in this study appears to me to be completely satisfactory, each of them, to a greater or lesser extent, has something of value to offer to current epistemological discussion. Since I have no wish to advocate eclecticism as an epistemological principle, an alternative epistemology is required as the framework for this positive evaluation and as the basis for an alternative solution to the basic problems in those areas where the existent theories are inadequate.

In drawing this study to a conclusion, therefore, I propose to develop the outline of an alternative epistemology as the context of a concluding evaluation. Since it is obvious that no more can be attempted at this stage than to present the alternative in the boldest of outlines, leaving a great deal of detail to be filled in, this constitutes a beginning for further development as well as a conclusion.

4.3.1 Why "modest"?

I describe the theory that I offer in outline as "modest" for two reasons. In the first place I do not offer it as the definitive theory of knowledge. Too often, it seems to me, philosophers have suffered from delusions of grandeur in thinking that they have offered the world the final, definitive solution to philosophical problems. Neither philosophy nor any other branch of human endeavour will ever arrive at the definitive solution of any problem. I therefore offer my theory as no more than a contribution, I hope a credible and stimulating contribution, to the ongoing development of epistemology. I am aware, of course, that this in itself says something about my view of knowledge.

Secondly, I speak of a "modest" theory because it makes only modest claims for human knowledge. I make no attempt to establish an absolute

truth value for any human knowledge claim. I resist the notion that any kind of knowledge claim in any sphere of human life is an end to all possible argument. I reject the notion of any kind of superior knowledge with the right to dominion over human life. Knowledge is not the key to life's meaning. It's role is more modest.

The theory I offer is "modest", therefore, in the double sense that I make for it only modest claims and allow within it only a modest role for knowledge in human affairs. My reasons for this will emerge in the course of developing the outline of the theory.

It should be noted that the denial of absolute truth value to knowledge and the rejection of authoritarian claims for knowledge in relation to human affairs does not entail the denial of the existence of any absolute value or the rejection of all authoritative guidance in human affairs. It speaks only of the limitations of knowledge as a human activity, or, if we prefer, a human possession. That through knowledge we may be as the gods is an age-old human aspiration. I am saying that the vision of this aspiration is an illusion that had best be abandoned so that we can get on with living in the real world.

4.3.2 Knowing as the Rationally Qualified, Multi-faceted Activity of a Multi-faceted, Integral Subject

In describing knowing as rationally qualified I register dissent from both rationalism and irrationalism. I dissent from irrationalism in that I maintain that rationality is the primary distinguishing quality of knowing and not a merely subsidiary quality. I dissent from rationalism in that I deny that rationality has any autonomous or self-authenticating character. Human knowledge is as finite and fallible and dependent as all else that is human.

However, words like "rational" and "rationality" are notoriously ambiguous [see e.g. the discussions by Williams (1967) and Warnock (1967).] In order to sharpen the notion of knowing as "rationally

qualified" I propose to extend in two important ways the analysis of the nature of knowledge begun in section 4.2.

Firstly, "rationally qualified" means that the correlated distinguishing that is constitutive of knowledge is characterised by logical coherence. I am not proposing a coherence theory of truth but say only that logical coherence is a necessary quality of the correlated distinctions that constitute knowledge such that the discovery of incoherence in knowledge claims raises serious doubts about the cognitive status of one or more of the items involved in the incoherence. As a simple example, to say at one and the same time "I know that p" and "I know that not-p" raises serious doubts about one or both statements; they can each be accepted as knowledge statements only if it can be shown that the logical contradiction is, for some reason, only apparent.

In specifying logical coherence as a necessary characteristic of knowledge, however, I stress that this does not mean that knowledge must conform to a specified system of formal logic. Formal logical systems can be useful tools for checking logical coherence but they are not the source of the logical normativity of knowledge. Formal systems do not prescribe logical norms but formalise, and then always partially, the logic inherent in the knowing activity.

In this respect the work of Piaget and his colleagues is valuable in tracing a logic inherent in the subject's activity prior to formalisation. However, the existence of such a logic can be checked in other ways. It does not require any knowledge of formal logic to recognise the absurdity of saying at one and the same time "I know that p" and "I know that not-p". It is not the formal logical rule of non-contradiction that establishes the absurdity but a universal human experience that is formalised in the logical rule.

While it is inconceivable in the world as we know it that the law of

non-contradiction should not be valid, the possibility of quite another kind of world in which the law does not apply is not inconceivable as an imaginative conjecture about other "possible worlds". We sustain the law within our formal logical systems because it conforms to universal human experience in the world as we experience it. Similarly with other rules for formal systems of logic.

Of course, once a formal logical law is established on the basis of experience it serves as a check on further experience. We suspect, rightly so, that we are mistaken if we have an experience that violates some well-established logical rule. However, we should never lose sight of the fact that all logical rules are, in the last analysis, founded in the formalisation of the logic inherent in experience and are valid only so far as they conform to experience. For this reason, a formal system that is valid within a limited range of experience may need to be supplemented or modified if the range of experience is extended.

Secondly, knowing is "rationally qualified" in that its correlated distinguishing, with its quality of logical coherence, is not a projection of our subjectivity but is responsive to the subject-independent structure of reality. Having said this, two careful qualifications need to be noted. It is the structure that is subject independent and not the reality and this structure is as much object-independent as it is subject-independent.

It is not questioned that there exist objects independently of the knowing subject and that in our knowing we gain knowledge of these objects in their objectivity. However we do not, and cannot, know these objects by detaching ourselves from the reality to which they belong since we are ourselves immersed in that reality as components of it. We can know these objects in no other way than through our engagement or involvement with them within a specific relational

field.

By relational field I refer to the situation that our observations always occur within specific limited fields with a finite range of objects related to one another and to the observing subject in specific ways. I never experience anything other than in the context of such a field. I can minimise the number of related factors within a relational field but I can never know any object in total isolation. To know shape and colour I need to observe it in relation to a source of light; to know weight an object must be related to another object, be it air or water or a sophisticated weighing device. I can know whether an object is in motion or at rest only in relation to a field of motional variables. For example, we can never observe the motion around the earth's axis of ourselves and the objects of our everyday experience because the whole relational field is equally in motion; we can observe the motion involved only in relation to motional variables outside this moving field. Similarly, our knowledge of the movement of a vehicle within which we are enclosed depends on the observation of objects external to the vehicle that are moving at a different speed, or not visibly moving at all, or the feeling of movements of the vehicle in relation to the ground as swaying or bumping.

We might go on indefinitely. Getting to know an object is not a matter of isolating it from the relational field in order to apprehend its inner structure - the illusion of essentialism. Such isolation is in any case an impossibility. We can stabilise the relational field so that we can concentrate on the constant properties exhibited by the object within this stabilised field - the objective of experimental techniques in science. But we are still engaged with the object within this stabilised relational field. The relational field controls, and limits, the observations we make of the object.

The stabilised field of scientific experiment aids our knowing by

controlling our observations within comparable relational fields within which we are able to repeatedly observe comparable properties of objects. However, it also limits our observations to what can be observed within that specific kind of relational field.

The stabilising of the relational field by experimental techniques is one way of facilitating our knowledge of objects. But if our knowledge is not to become narrow and restrictive we need also to vary the relational fields in every possible way. The wider the range of relational fields within which we can experience any object the more complete our knowledge of that object is likely to be. We will not know the "fire" of a precious stone unless we view it under a variety of light conditions, but no amount of changing light conditions will enable us to know the hardness of a diamond; for this we must bring it into relation with another material to which the properties "soft" and "hard" apply. Those who have experienced the coffee bean only as prepared for beverage use will find their knowledge of it enriched in surprising ways if they experience it growing on a coffee bush; the two are not immediately recognisable as the same object. The water buoyancy of any object will never be known unless it is brought into relation with either water or an already known standard of water buoyancy.

The list could go on indefinitely. What is or can be known about any object is dependent on the relational field within which we experience it, so that varying the relational fields is essential if we are to know objects comprehensively in their full objectivity. While we can and do know the thing in itself we cannot know the thing by itself.

For this reason it is a mistake to suppose that the constancy of observation gained - among other factors - by the stabilisation of the relational field by scientific experiment ensures that we come to know the most fundamental structure of the objects of investigation; that,

for example, the physical structure identified by physical science is the fundamental structure of material reality. The experimental controls that facilitate our knowing of the objects by stabilising the relational field simultaneously impose severe limits on our knowing of these objects by restricting us to the experience of them within this specific relational field. There is no reason, other than a dogmatic faith in science, to suppose that the experience of the objects within this particular relational field gives us access to the fundamental structure of the objects any more than any other.

I have sympathy with Popper's distrust of essentialism, though on somewhat different grounds, and maintain that reality has a dynamically variable character. Knowing objects in their objectivity is always to know them within variable relational fields. Any identification of a determinant essence of an object can only be the arbitrary imposition of our own subjectivity.

This does not mean, however, that reality is an indeterminate, infinite variable after the manner of the Heraclitan flux. There is a lawful structure to reality but it is not the structure of independently determined entities related by determinant laws of invariant relations. It is a structure that incorporates variability and change within a dynamic relational field; it is a structure that, in its completeness, encompasses the whole of reality, which is, for practical purposes at least, infinite, in a dynamic relational field. To know any object exhaustively we would need to have what we do not, and it seems, cannot have, exhaustive knowledge of the structure of reality that makes it the object it is. As our knowledge of this structure is partial and limited, confined to those parts of which we have had experience, so our knowledge of the objects occurring within the limited relational fields of our experience is partial and limited.

This structure gives knowledge its open-ended character. The expan-

sion of our knowledge is not due only, or even mainly, to the discovery of new objects. It is due above all else to the experience of reality within new relational fields that expands our knowledge of the lawful structure of reality; as a result not only does our knowledge expand by the incorporation of whatever new objects may occur in these new relational fields but, even more important, our knowledge of the old, familiar objects expands as we place them within our enlarged understanding of the structure of reality.

It is the mistake of classical rationalism to suppose that the structure of reality is such that its universal ordering principles can be replicated in human thought and language. This depends on two doubtful assumptions: The assumption that the structure such as we experience it - using experience in the widest possible sense - is the universal structure of reality and the assumption that the universal ordering principles are such as can be replicated in human thought and language. The doubtfulness of these assumptions has led to a retreat from rationalism so that even those who wish to retain a rationalist position, such as Piaget and Popper, do so in a more or less modified form.

In reaction to the deficiencies of rationalism, modern irrationalism, on the other hand, makes the mistake of denying all rational controls that would enable us to check intersubjectively the connection between knowledge claims and empirical reality. In Polanyi's terms, I may believe passionately in a connection between my knowledge and a rational reality external to my knowledge but there is no way to check this connection outside my own belief. For all the rational language in which it is commonly clothed, irrationalism leaves us without intersubjective means of checking whether there is any relation at all between our knowledge and a subject-independent reality.

If rationalism has failed by claiming too much for rationality,

irrationalism allows too little. We escape both mistakes if we recognise that knowing is a logically coherent, correlated distinguishing by subjects in response to the lawful structure of reality as that structure is experienced within the limits of the relational fields of reality accessible to those subjects. In this way we avoid claiming too much, first of all by recognising that our knowledge neither replicates nor corresponds to the structure of reality but is responsive to that structure and secondly by claiming no more for our knowledge than a relationship with the structure of reality within the limits of our experience without any universalising extrapolation beyond those limits. By the first of these limitations we avoid the reduction of the structure of reality to a lingual or conceptual structure while by the second limitation we recognise the provisional, open-ended character of our knowledge.

At the same time we do not leave ourselves on a shoreless sea of subjectivity by abolishing intersubjective rational controls. Since our knowledge is responsive to a subject-independent structure of reality experienced by the human subject within the limits of a relational field, any knowledge claim may be checked intersubjectively against that structure of reality within those limits.

There is, for reasons that will be discussed later (in section 4.3.6), no absolute rational proof of the rationality of knowledge. By its claims that rationality rests on some kind of absolute rational proof it is rationalism, rather than irrationalism, that has discredited the notion of the universal rationality of knowledge. By claiming too much rationalism has lost everything. Yet without a trans-subjective rationality the rational arguments and appeals to empirical evidence that abound in the literature of irrationalism lose their point.

To Feyerabend's claim (1975:32,33) that his appeal to rationality is

nothing but playing a game by the nonsense rule of rationality in order to make fun of the nonsense claims of the rational there is, of course, no answer since it is not an argument but an assertion that there are no arguments; any response is, by definition, not a counter-argument (arguments having been abolished by definition), but only a counter-assertion with no rules by which to judge between the assertions. For the Feyerabendian to demand that dissenters should take their arguments seriously by making serious replies, therefore, would be to deny their own case. A few lines of flippant nonsense is, on his own grounds, as suitable and adequate a response to a "flippant Dadaist" as a whole volume of reasoned argument; indeed, it seems to be the only response that meets his terms.

Whether or not an anarchist would appreciate such a response on the level of philosophical discourse, we may ask whether in his daily living he lives by the terms of his epistemological anarchism. Hume's observations (1978:180-217) about the difficulties in living by consistent sceptical principles appear equally applicable to anarchism. The issue here is not whether we allow a place in our lives for the nonsensical and absurd; that is merely to allow that the rational is not everything. The issue is whether we are prepared to live as though there is no distinction between the absurd and the rational; as though the expectation that if I jump naked from the top of a 60 storey building I will float gently to the ground has the same status as the expectation that I will plummet to my death or that to plunge my arm in boiling water is as satisfactory a way of cleaning the arm as washing it in warm soapy water. According to Feyerabend (1975:221,222) something along this line was advanced by Lakatos. The anarchist may say that his choice of one kind of action in preference to another has no rational basis - as Feyerabend does in response to Lakatos - but others of us are entitled to observe that, so far as he consistently

makes the one choice and persistently refuses to make the other, in practice his life is ordered by a core of what we call rational principles.

In short, while there is no absolute proof of a rational basis for knowledge, something suspiciously like rationality persistently impinges on our experience, in spite of all the efforts to abolish it.

I have not attempted to give an exhaustive analysis of rationality, a task that would require a major study in itself. Worthwhile discussion of some other facets is offered by Hart et al. (1983). What I have attempted here is simply to give some basic features of the understanding of rationality that I have in mind when I speak of knowing as a rationally qualified activity of the subject in order to give some clarity to my use of the terms "rational" and "rationality" in the present discussion.

As important as is the recognition of the rational qualification it is equally important to recognise that knowing is the activity of a multi-faceted yet integral subject. It is not the activity of Reason, or Intellect, or of some autonomous core of rationality under any other name. In this respect, Piaget's identification of an epistemic subject distinct from the individual and psychological subjects is dubious, to say the least, if it means, as seems to be intended, a rational core that functions cognitively in autonomous independence of the other features of subjectivity.

The knowing subject in human cognition is none other than the human subject in whom the full range of subjectivity is operative. The designation "knowing" subject refers to no more than the subject as engaged in a specific kind of activity. That elusive quality we call "objectivity" in knowledge is secured, not by immobilising the extra-rational in the subject but by its subjection to rational controls. In this respect it seems to me that Deutscher is on the right track in

seeing objectivity as a form of our subjectivity, a being engaged with the objects.

It is neither desirable nor possible to exclude from the knowing activity all extra-rational features of our subjectivity in order to make it an exercise in pure rationality. Any attempt to do so, so far as it may succeed at all, can only displace knowing with logical games. Knowing requires the engagement of the full subjectivity of the subject.

Once we recognise this there is no difficulty in acknowledging the cognitive role of the various extra-rational factors that have been put forward in recent epistemological discussion as having a key role in cognition. The only question is whether they have the dominant role assigned to them.

So Popper's creative guesses undoubtedly have a role in the growth of knowledge. Creative imagination is a part of our multi-faceted subjectivity and its suppression can only impoverish the knowing process. But it may be doubted whether all progress and all theoretical advance is nothing but creative guesses. And, as cognitive creativity the employment of creative imagination is, I suggest, more rational than Popper admits. Indeed, Popper's own requirements of falsifiability and corroboration require his cognitive guesses to be rationally qualified guesses - logically coherent and responsive to the experience of the structure of reality, even though only in a negative sense. I suggest that, so far as knowledge does proceed by the use of creative imagination the creative conjectures by which it advances are rationally qualified also in a positive sense in that they are made within an existent network of correlated distinctions. A logical correlation with this network distinguishes the cognitive conjecture from other acts of creative imagination such as fantasy.

Similarly, Polanyi's unsubstantiated beliefs play a part. The scien-

tist who never ventures on the basis of an unsubstantiated belief, like the one who never ventures a creative guess, is never likely to be other than a competent technician operating the established system. The expansion of knowledge demands, on occasions, that we dare to act on a belief for which we can cite no supporting evidence. Yet, like the creative guess, the role of unsubstantiated belief is subsidiary to the search for a logically coherent account that is responsive to the experience of the lawful structure of reality.

Similarly knowing involves such extra-rational factors as trust in other subjects, the constraints of communal interaction, and passionate personal commitments. Whatever belongs to our subjectivity plays a part in cognition. The rationality of knowledge is not secured by the exclusion of extra-rational factors but by their subordination to the rational qualification of the subject's activity that distinguishes cognition.

Evaluating Piagetian epistemology in the light of this analysis of the nature of knowledge, the notion that the rationality of knowledge is founded not in the logic of formal systems but in a logic inherent in the interaction of subject and object commends itself as sound. On the other hand the internalisation of the structuring principles of reality within the subject leads to a typical rationalist reduction of the universal ordering principle of reality to a dimension of the subject's experience of that reality, in this case the logical-mathematical dimension. The result is that knowledge is distorted by the limiting of its objectivity to one dimension of our subjective experience within a restricted relational field; a dimension of our experience of reality that is known for what it is only in its relativity to the structure of reality as a whole is arbitrarily made definitive of reality.

Piaget is right in linking the rationality of our knowledge with the

interaction of subject and object prior to all formalisation. However he introduces a fundamental distortion when he identifies this rationality with a logic internal to the subject that is formalised subsequently in logico-mathematical systems. As a result he gives too restrictive an account of the rationality of knowledge by reducing it to a logico-mathematical ordering of experience. For Piaget it is logic developed in mathematics that provides the ordering principle of knowledge at its higher levels, and even at the more primitive levels it displays a primitive mathematical character. A major difficulty, then, in the development of human and life sciences is the development of adequate mathematical structures applicable to them in view of the absence of "units of measure" (Piaget, 1970:67-80).

The success of mathematical instruments in the conquest of reality in the physical sciences makes it tempting to attempt to extend their use as the key cognitive instruments for every area of knowledge. However, to yield to this temptation would result, I suggest, in the distortion that results when a multi-faceted experience is reduced to one of its facets. The structure of reality to which we respond in our knowing has many facets that are not reducible to the mathematical.

The rationality - and logic - of our knowledge is not founded in the structure of the subject or the structure of detached objects or the relation between them but in the lawfulness of the structure of reality in which subject is linked with object, and object with object, within a complex and dynamic network of relationships. The structure of reality is not a determinant structure fixing reality immutably within a rigidly determining framework but is a lawful structure fixing boundaries and conditions for a dynamically variable, in some sense even unpredictable, reality. Our knowledge is our account of the correlated distinctions of this reality as we experience it; the rationality of our knowledge is secured by a logical coherence in a

responsiveness to the subject-independent structure of reality as experienced while the distinctively human quality is due to the multifaceted subjectivity of the human subject. Human knowledge is richer than animal knowledge insofar as human subjectivity is richer than animal subjectivity.

4.3.3 The Two Modes of Knowing

The need for a further elaboration of our analysis of knowledge is suggested by Piaget's identification of stages in cognitive development. Leaving aside the specifically psychological questions involved in the concept of stages of development and the various intermediate stages identified in the development of Piagetian theory, it seems clear that we can distinguish two distinct modes of human knowing. We can distinguish a primary mode, which I call the concrete mode, and a secondary mode which I call the theoretical.

The distinction, as such, does not emerge for the first time from Piaget's work, of course, but that work does provide us with useful material for clarifying our understanding of the nature of the distinction.

Piaget tells us not only that children pass through a stage of concrete operations before they are able to think in terms of formal operations but that concrete operational thinking continues to play a significant part in the life of the adult, including those adults with the most highly developed ability for formal operational thought.

It has sometimes been thought, quite mistakenly, that by concrete operational thought Piaget meant something like pre-logical thought while by formal operational thought he meant something like logical thought. The distinction he was making is quite different, even though it is true that formal operational thought extends our logical powers. The distinctive character of concrete operational knowing is not the absence of logic but that the subject relates the relevant distinc-

tions and co-ordinations directly and only to concrete situations either as immediately experienced or as remembered in images. In formal operations the subject deals with formalised abstractions.

So, for example, arithemetical operations as concrete operations are always operations carried out on concrete objects and their relationships either directly or as images of the subject's memory. In formal operations these same arithemetical operations are carried out without concrete reference. In other words, knowing in the concrete operational mode must always have specific empirical content, whereas in the formal operational mode it can proceed without empirical content. While the disciplines of pure logic and pure mathematics are exclusively matters of formal operations all academic disciplines depend on formal operations to a greater or lesser extent.

While we can articulate something of what we know in the concrete mode it always has an inarticulate, or, at least, unarticulated, component; it is not language dependent though it is facilitated by language. I know the difference between two adjoining timber panels on the wall in front of me so that, if they were removed I would have no difficulty in putting them back each in the place it now occupies but I could give no more than a rough description of these distinctions. My knowledge enabling me to distinguish the two panels quite decisively is based on distinct variations in colour and in the natural grain of the wood and other features that I perceive, and that I could point out to another observer, but that cannot be stated precisely in the available language.

Similarly, I know when the consistency of dough is right for making bread with a precision that seldom errs though I am unable to specify this consistency condition precisely in words. In this case I can share my knowledge only by having another person feel the dough under the appropriate conditions of variation. Any attempt to articulate

the knowledge can only be a partial articulation.

I may even know in the concrete mode without being aware that I know. A master craftsman will make a thousand decisions, unerringly selecting materials and tools and bringing them together in various ways, without being aware of the intricate web of knowledge on which this unerring selection rests. In a similar way an experienced chef makes countless decisions in the course of preparing a meal or a gardener in laying out a garden without ever articulating even for themselves the knowledge involved. This presumes, of course, that each has learned by concrete experience without theoretical training.

Each of them, of course, will be able to articulate by careful reflection the knowledge involved in their creative activity if required but such articulation will always fall short of the full and precise knowledge embodied in their actions.

To this extent Polanyi is right in saying that we know more than we can say. It is doubtful, however, that the difference between animal and human intelligence rests as heavily on language as he claims. The creative powers in which human activity transcends the animal, as exemplified in the craftsman, the chef, the gardener, depend on an intricate web of knowledge that is neither dependent on language nor able to be completely and precisely articulated in language. The superiority of human knowledge rests on the enhanced subjectivity of the human as compared to the animal subject. It is an enhancement that is reflected in the unique creativity of the human subject of which language is but one product; a creativity that explores the infinite potential of reality for development far beyond the requirements of animal adaptations.

While knowing in the concrete mode at the inarticulate level is not the result of reflective thought, neither is it purely intuitive; it occurs only within the context of correlated distinctions responsive

to the lawful structure of reality.

Piagetian research tells us that, at a later stage in the child's cognitive development, the ability for formal operational thinking develops. Briefly, formal operational thinking is characterised by the ability to operate with abstract symbols and propositions. I do not wish to enter the debate over the timing of this development in the child - a matter on which Piaget himself showed considerable flexibility - but it does seem to me clear that Piaget's stage of formal operations represents a distinct, secondary mode of knowing. It is a secondary mode both because it develops later than the concrete mode, dependent on the acquisition of language and because, when it is developed, it remains always dependent on the concrete.

I prefer to refer to this secondary mode as the theoretical mode of knowing, rather than the formal, but, in the end, it is the distinction that matters rather than the language in which we refer to it.

It needs to be stressed that this distinction of concrete and theoretical modes of knowing is not based on a distinction internal to the subject's logical functioning. In this respect it seems to me that Piaget is mistaken in seeing the theoretical, or formal, mode as representing a higher level cognitive development resulting from a higher level development of the subject's logical functioning. It is certainly an extension of the subject's cognitive powers, including logical functioning, but a lateral rather than higher level extension and an extension that is made possible by the construction of lingual - including symbolic - instruments that constitute an addition to and not merely a further development of logical functioning.

There are three fundamental characteristics that distinguish the theoretical mode from the concrete. First, it is concerned with reality in its universality rather than its concrete particularity. The subject engaged in the theoretical mode with the objects of a concrete

relational field sets to one side the unique particularities of the objects and their relationships in order to isolate the common and recurrent, since it is only these that can be formalised in theoretical abstractions. Everything is stripped away from the experience of reality that cannot be represented in terms of an intersubjective universality. It is only by means of the second characteristic of the theoretical mode that we are able to achieve this universality. While we remain in the immediate relation to the concrete field of experience that is characteristic of the concrete mode we can speak of no more than inductive generalisations based on recurrent features of particularity.

In its second characteristic, the theoretical mode of knowing is a knowing of properties and relations not as distinguishable within the concrete relational field but as abstracted from that field; an abstraction that implies a prior distinguishing. In the concrete mode of knowing we distinguish properties, relations and classes of objects as well as concrete objects but in the concrete mode they remain thinkable only as properties, relations and classes immediately associated with concrete objects within the range of our experience. We can think beyond our experience only as an extension of that experience in its concrete particularity. In the theoretical mode these properties, relations and classes that we distinguish in the concrete relational field are abstracted from that field as conceptual entities that become instruments of thought independently of all concrete associations.

This gives the theoretical mode both its peculiar power and its peculiar danger. Its peculiar power is given in that these abstracted conceptual instruments can be used to construct universal theories and models that enable us to explore possibilities that go beyond the limits of our immediate concrete experience. Its peculiar danger is

that we will mistake the epistemological independence of these conceptual instruments for an ontic independence, taking them, as a result, to be constitutive of the universal structure of reality. It is this mistake that, from the time of the ancient Greeks, has fed the notion that the theoretical is the superior mode of knowledge.

Yet, despite its prevalence it is, I suggest, based on a fundamental mistake. The conceptual abstractions of the theoretical mode of thought do not represent the fundamental constituents of the universal structure of reality. There is no reason to suppose that this structure is conceptual or concept-like in character. The abstract concepts and conceptual relations that are the instruments of the theoretical mode of knowing are the products of human cognitive activity founded in an abstraction from the concrete relational field of human experience; as such they are responsive to and not constitutive of the structure of reality.

Further, the structure of reality is not reducible to the universals with which the theoretical mode of knowing deals. The particular is not a mere instance of the universal nor are its unique qualities mere "accidents" added to a fundamental structure of universality. The unique qualities of particularity that the theoretical mode of knowing necessarily discards as irrelevant for its purpose are intrinsic qualities of the structure of reality.

It will be apparent that I am using the term "universal" in a different sense to that adopted by Hart (1984:37-83) in his recent detailed treatment of the problem of universals. Since the ontological correlate of the theory of knowledge I am outlining here has strong affinities with the ontology expounded by Hart, a brief discussion of this difference is in order here.

Hart applies the terms "universal" and "universality" to what he calls "conditions" that, in my terminology, secure the lawfulness of

the structure of reality. I use the terms "universal" and "universality" to distinguish those features of our experience of the structure of reality that can be formulated as universal concepts and laws from those features of the same structure of reality that being uniquely particular are not capable of being formulated in universal laws and concepts. In other words, I use the terms to indicate a distinction within what Hart calls "subjectivity".

It should be made clear that in my use of the terms "universal" and "universality" the ontological correlate of the epistemological universal is not an ontic universal but persistent regularities in the structure of reality within a relational field. The universality is only a universality within the limits of the relational field within which we experience the persistent regularities.

Since I attribute these persistent regularities to the lawful - or in Hart's terms "conditioned" - character of the structure of reality it may seem that the difference between us is purely terminological. To some extent that is no doubt true but behind this terminological difference there appear to be more fundamental differences.

Hart (1984:40-71) maintains that we have experience of the conditions such that we "uncover" and "intellectually grasp" the conditions in concepts. While he is careful to distinguish these concepts from the conditions that they conceptualise he nevertheless holds that it is the conditions, the laws that govern reality, that we first "uncover" and then "grasp" in concepts.

I maintain, on the contrary, that it is the conditioned and not the conditions that we conceptualise as universal concepts and laws. The examples Hart gives as an uncovering of conditions, and any others I can think of, are, it seems to me, no more than experiences of persistent regularities in the conditioned, that is to say, in my terminology, in the structure of reality as lawfully structured.

This by no means requires that we merge the conditions with the conditioned. On the contrary it seems to me to be an objection to Hart's approach that it tends, not in its intention but in its practice, to blur the distinction between condition and conditioned. It is not at all clear, and I fail to see how it could be made clear, how we distinguish between the analysis and conceptualisation of regularities in the conditioned and the analysis and conceptualisation of the uncovered conditions; what is the difference between the conceptualisation of regular patterns experienced in the conditioned and the conceptualisation of the uncovered conditions? In spite of Hart's disclaimer in relation to realism (1984:63-65) it seems to me that his position entails a realism of an Aristotelian type in which the conditions are realities "uncovered" in some way by human intellectual activity. Yet just what this "uncovering" means is not clear, at least to me.

In saying that all conceptual universals are conceptualisations of our experience of the conditioned and not of the conditions I do not deny that our experience of the conditioned is such as to require the recognition that there are conditions distinct from the conditioned, to which the conditioned is responsive. Indeed, I insist on it. Neither do I suggest that our conceptual universals have no relation of any kind to universal conditions. They relate to the conditions as revealed in the regularities of the conditioned, providing us with insight into the conditions. However, as regards the theoretical analysis that results in universal concepts this is, I maintain, an analysis of the conditioned, not the conditions, and that consequently these concepts are to be seen as conceptualising persistent regularities in the conditioned, not the conditions as such.

There is a further, and I think not unrelated, difference in that Hart appears to regard theoretical (scientific) analysis as the means

by which we understand the conditioned order, or structure, of reality (Hart, 1984:37-39, 72-78). He asserts (1984:37): "The nature of things, the system of the universe, or the order of the world is particularly the domain of scientific investigation".

I maintain, on the contrary, that theoretical analysis is able to give us an understanding of some features only of the lawful structure of reality, "the order of the world", namely of those features that can be conceptualised in universal laws and concepts. This appears to involve a somewhat different conception of the structure of reality. For Hart (1984:450) it seems to be synonymous with "pattern" and "regularity", with what can be "grasped" in universal concepts. I acknowledge that this is a conception of structure that has the sanction of a long philosophical tradition. Nevertheless it seems to me to be a mistaken conception. In my view an adequate account of the structure of reality that takes account of its full riches requires a conception that incorporates in the notion of structure those unique qualities of particularity that are not represented by the universal categories of theoretical analysis

In using the term "structure of reality", I use it to mean no more than "the way in which reality fits together" without implying that this can be reduced to universal patterns or regularity. In further qualifying this as a "lawful structure" I indicate that reality fits together in such a way as to exhibit the character of being subject to law. The patterns and regularities that are articulated in universal concepts or laws by theoretical analysis, therefore, represent significant features of this structure, its "universal" features, but do not give an exhaustive analysis of the structure; they do not tell us all the important things about the way reality fits together in its subjection to law.

To illustrate this consider a work of art. Such an object is, I

suggest, an individual structure within the lawful structure of reality. We might fruitfully engage in theoretical analysis of this work of art, employing a number of theoretical disciplines, including theoretical aesthetics. Such an analysis would certainly tell us a great deal about the structure of the work of art but, when we had exhausted all our theoretical analysis, I suggest there would remain "something" about the work of art, something that is no mere "accident" accompanying the structure but that is an indispensable constituent of the structure, that was not "uncovered" in our theoretical analysis. This "something" gives this object its unique individuality that makes it this particular structure as a work of art. It is an indispensable constituent of the structure that we can refer to but that cannot be captured in conceptual categories.

This "extra" in the structure of a work of art that defies theoretical analysis is not, I suggest, merely the product of the creative freedom of the artist. That there is such creative freedom and that its exercise is a necessary factor in artistic activity, as in many other areas of human activity, including science, I do not doubt. However this creative freedom can be productive of a work of art only as it is exercised with an insight into what Hart calls "nomic conditions" that are not reducible to those universal conditions of which we gain insight by theoretical analysis. It is insight that is gained only by a knowledge of the conditioned - the structures of reality - of a kind that is beyond the universalising scope of theoretical analysis.

Or we might compare an object constructed out of wood by a master craftsman with another similar object constructed of wood in an automated factory. In the latter case the wood is dealt with in terms of universal properties that have been identified by theoretical analysis. Any other properties are ignored. The master craftsman, however,

can take each piece of wood individually, note the unique properties of each - as well as its "universal" properties - and take account of these in his construction. What the master craftsman has taken into account that the theoretical analysis missed is not to be treated, it seems to me, as "accidental" properties of individuality added to the structure but as intrinsic features of the structure of the piece of wood. They are features of the structure that are necessarily missed by theoretical analysis because they are lost in the abstraction of theoretical analysis and can be identified only in the experience of the structure of reality in its concrete particularity.

This distinction is equally significant in the knowledge of "natural objects" involving no act of human forming. The structure of a tree, for example, as a concrete particular includes more than can be identified by the universal categories of a theoretical analysis. Theoretical analysis will give us knowledge of so much of the structure of the tree as it has in common with other trees, with other living organisms and with all physical reality - what I call the universal properties of the tree. It will not give us knowledge of those features of its structure that are unique to this particular tree.

Hart recognises (1984:76-78) that particulars have this a individuality that cannot be reduced to universal categories and, commendably, extends this recognition to all particulars, not confining it to the human. However it seems to me that his universalising of conditions prevents him from doing full justice to the conditioned character of this unique individuality.

I stress again that the recognition that the structure of reality as lawful or conditioned structure includes the uniquely individual as well as the universal does not destroy freedom and creativity by enclosing human action in a determined order. The nature of the conditioning law ensures freedom and creativity.

For these reasons, then, I deny that the "nature of things, the system of the universe, or the order of the world is particularly the domain of scientific investigation". Science is concerned with these things but only in so far as they are capable of being brought within the universalising categories of science.

The question of universals, to which Hart has made a stimulating and valuable contribution, involves complexities with which I cannot deal at the moment. Any complete discussion of the subject would need to take account of features of the current debate that, for the present purpose, I have ignored - e.g. the recent articles by Armstrong (1986), Lewis (1986) and Williams (1986). I trust, however, that I have said enough to give some clarity to the use I make of the terms "universal" and "universality" and my reasons for using them in this way.

The third characteristic of the theoretical mode, that follows from its abstractive character, is its dependence on language. While language is useful for extending the scope of the concrete mode of knowing but not essential, it is indispensable to the theoretical. In the concrete mode language serves the purpose of enabling us to go beyond the immediate experience and remembered images of past experiences in order to correlate a wider range of experiences, including those of other subjects. This is undoubtedly extremely valuable in extending the range of our knowledge but the basic elements of knowledge in the concrete mode are obtainable without the aid of language. Language, on the other hand, is indispensable to the conceptual abstractions that are characteristic of the theoretical mode.

It is possible, of course, to postulate abstract concepts as mental entities prior to their linguistic formulation. There is, however, no ground in our experience for such a postulate. We can think concrete objects, classes, properties and relations if need be as images or

series of images, but we can think abstract concepts only as linguistic formulations. The postulation of concepts as language-independent mental entities is neither required nor supported by anything in our human experience, but, so far as I can see, is based on a doubtful ontological speculation. It is, I suggest, best dispensed with.

This does not require us to adopt a nominalist position with regard to abstract concepts. They are linguistic formulations that refer to features of reality. It simply frees us of the rationalist demand for the replication of the structure of reality in human thought. It frees us to recognise abstract concepts as linguistic formulations responsive to and referring to the lawful structure of reality that is not reducible to or replicated in the conceptual.

However, even if we accept the postulate of concepts as non-linguistic mental entities, the linguistic formulation of these entities remains essential if they are to function as objects of cognition. Whatever is internal to the subject's thought could be an object of thought only as it is distinguished from that thought by its objectification in some way. The only way to objectify an abstract concept is in a linguistic formulation. However we look at it the theoretical mode of knowing is language dependent.

While the theoretical mode of knowing is founded in abstractions from the concrete field of experience, the subject operating in this mode develops theoretical constructions that go beyond the limits of the concrete experience from which the initial abstractions were made. By this means the subject generates theories about empirical reality that require testing in the concrete field of experience if they are to count as knowledge.

I have spoken of concrete and theoretical modes of knowing rather than concrete and theoretical knowing in order to emphasise the continuity of knowing as a single rationally qualified type of human acti-

vity. In both cases the subject is engaged in making logically coherent, correlated distinctions in response to the lawful structure of reality as experienced within limited relational fields. The distinction between the concrete and theoretical lies not in the nature of the cognitive activity but in the manner of the subject's engagement with reality in this activity. In the concrete mode the subject is engaged directly with the objects, properties, classes and relations of the concrete field of experience whereas in the theoretical mode the subject is engaged with the same concrete reality by means of theoretical instruments founded in conceptual abstracting from the concrete field and developed as theoretical constructions that go beyond that field. Yet these theoretical constructions do not count as knowledge till they have been tested (empirically) in the field of concrete experience.

It is a major flaw in both Popper's and Polanyi's epistemologies that they miss, or underplay, the discontinuity of the two modes of knowing. For them knowing at the theoretical level is distinguished from the most primitive levels of animal knowledge only by the heightened cognitive powers of the subject. So Popper, for example, takes scientific theories to be nothing but more sophisticated versions of primitive animal dispositions. The fundamental change in the manner of the subject's engagement with the objects is missed.

If the distinction between the concrete and theoretical modes is blurred in Popper and Polanyi it is lost altogether in Feyerabend and Deutscher. In the reaction to the overweening claims of scientific knowledge a fundamental distinction has been lost.

The distinction of the concrete and theoretical modes of knowing underlies the traditional identification of the academic disciplines as sciences. Academic disciplines from theology to physics and mathematics, and including philosophy, share a common theoretical character

that distinguishes them from knowing in the concrete - or "common sense" - mode. That distinction remains unchanged by all the developments of modern science and justifies the continued recognition of the academic disciplines as a single cognitive domain differentiated in a variety of disciplines and groups of disciplines but all alike characterised by the theoretical cognitive mode.

This is not to say that the theoretical cognitive mode is sufficient in itself to characterise scientific activity. Science is a complex communal enterprise the complete analysis of which lies beyond the scope of the present study.

However, while an attempt at a complete analysis of science would take us too far afield from the theme of the present study one aspect requires some notice. The various emphases on method and methodology in the epistemological approaches discussed earlier - Popper's reduction of epistemology to methodology of science, Feyerabend's methodological anarchism and Piaget's criticisms of Popper et al. for their preoccupation with methodology to the neglect of the "real" epistemological problem - calls for some brief comment on the role of method in science.

One matter on which Popper and Piaget are agreed is that there is no such thing as the scientific method (see section 2.2 above and Popper, 1983:5-8). Beyond this, however, they differ. Piaget argues, what Popper would deny, that science progresses only by the development of systematic methods suited to the problems and that these methods share common characteristics that distinguish them as scientific methods.

It seems to me that, in this respect, Piaget is right both in his agreement and differences with Popper. There is no universal scientific method such as positivism thought to identify but a variety of methods suited to the various disciplines and types of problems. For this reason the tendency that can still be observed of attempting to

establish the scientific credentials of a discipline by developing methods modelled on those of the physical sciences is, in my view, an undesirable tendency that hinders the growth of science.

At the same time there are common characteristics shared by all scientific methods, though I believe Piaget took a wrong turn in making mathematical analysis one of these common characteristics. Some of the characteristics that, it seems to me, are common to all scientific disciplines are the isolation of theoretical problems and the direction of research toward theoretical goals, the development and use of specialised instruments suited to these problems, systematic procedures and analysis, and the limitation of the field of investigation to a stabilised relational field such as to facilitate a focusing on aspects of the experiential field relevant to the specific problems and goals of the scientific investigations. Much more could be said but this must suffice for the present. Some worthwhile further discussion of this question is provided by Stoker (1965) and van der Merwe (1983).

An important, but undesirable, practical consequence of the lack of a clear view of this distinction between the two cognitive modes, combined with the lingering estimation of theoretical knowledge as superior knowledge is the mushrooming of "academic" disciplines with a pseudo-theoretical character - that is, the application to non-theoretical problems of universalising techniques borrowed from theoretical disciplines - in order to provide "academic" qualifications in fields in which thorough training in the concrete mode is a more appropriate preparation. In the end this tendency can only lead, on the one hand, to poorly qualified practitioners through the diminution in value of the concrete cognitive mode that results from imprisoning it in a pseudo-theoretical mould and, on the other hand, the loss of the penetrating insights that can come only from a disciplined attention

to problems within the theoretical cognitive mode, a loss that must follow when the distinctive character of this mode is lost in the merging of all knowledge in one undifferentiated domain.

It should be observed that it is not necessary to abolish the concrete/theoretical distinction in order to abolish the overweening authority of scientific knowledge. It is necessary only to gain a clear view of the distinction in order to recognise that the theoretical mode is secondary, not only in the sense that it develops after the concrete, but also in that it remains always dependent on the concrete.

Although it has an internal autonomy in the sense that the rules of theoretical construction cannot be prescribed other than within the theoretical cognitive mode, the theoretical remains dependent on the concrete from which it has its beginnings and to which it must always return for the testing of its theories. The relation between the concrete and theoretical cognitive modes is not that of inferior and superior but of a correlation in a constant mutual interaction of primary and secondary in which neither has overriding authority.

In this connection it is important to note the reciprocal action of the theoretical mode on the concrete. The use of the terms "primary" and "secondary" is not to be taken as implying a subordination of the theoretical to the concrete any more than the reverse. The relation is one of entirely mutual correlation. Theoretical distinctions modify our concrete perceptions while the immediacy of the concrete acts as a check on theoretical speculation.

The concrete knowing of a mid-20th century university graduate will differ from that of a New Guinea highlander in direct relation to the differences in their theoretical knowledge, though also for other related reasons. The university graduate who rightly values the concrete mode of knowing will be alert for ways in which the New

Guinea highlander's knowledge, drawing on a different field of experience, can both enlarge and correct his own knowledge while at the same time the highlander can benefit from the graduate's theoretical enrichment.

The distinction of concrete and theoretical modes of knowing is not to be made into a distinction between autonomous cognitive domains. Knowledge forms a single unified field to which both concrete and theoretical modes may contribute with equal, but complementary, authority. It is even doubtful whether we should speak of the activity of knowing as a purely concrete or a purely theoretical activity except in those cases where the theoretical mode has not yet been activated. Certainly scientific knowledge is not a purely theoretical matter and, once the theoretical mode is developed, everyday, or common sense knowing does not take place except in the context of theoretically developed distinctions and correlations.

The practice that has now become widespread of distinguishing between "science" and other theoretical disciplines regarded as non-scientific tends to obscure the fundamental unity of academic disciplines due, among other things, to their common theoretical character. Rather than trying to resist the now widely accepted nomenclature by insisting on the scientific character of all academic disciplines, however, it seems to me better to stress the unity by recognising that they have in common the character of theoretical disciplines.

At the same time there are legitimate distinctions that need to be made among these theoretical disciplines and that also tend to be obscured by the current use of the term "science". "Science" may perhaps be useful as the designation of a group of disciplines within the theoretical disciplines but only on the basis of a careful analysis of the nature of the discipline concerned and not by the acceptance of a mere convention that may well have developed for doubtful

reasons and with blurred distinctions. Both because I have not been able to engage in such an analysis in other than a preliminary way, and because the discussion of even this preliminary analysis would take us too far afield from the theme of the present study I shall not attempt at this time to suggest the way in which such distinctions among the theoretical disciplines might be made. I stress, however, the urgency of developing such distinctions based on careful analysis if the present mushrooming development of academic disciplines is not to head into confusion.

While others blur or abolish the distinction between the concrete and theoretical modes, Piaget makes the distinction but, lacking a sufficiently penetrating analysis of the nature of knowledge, he draws the lines in the wrong place. Bypassing any attempt to analyse the nature of knowledge as a universal feature of human experience, he simply assumes that modern science is the paradigm of science in its most developed form and begins his analysis from that point. In consequence he takes the theoretical instruments characteristic of modern science as the basis for distinguishing the theoretical mode from the concrete.

The application of this criterion leads him to divide the academic disciplines between the nomothetic disciplines, including "natural" and "human" sciences, that constitute sciences in the strict sense as the highest levels of knowledge and the historical, juridical and philosophical disciplines with an ambiguous cognitive status and designated "sciences" only by a dubious linguistic convention (Piaget, 1970:13-28; 1970b:154-187). What separates the nomothetic, scientific disciplines from the non-scientific is the employment of procedures and, above all, theoretical instruments of a logico-mathematical character modelled on those employed in the physical sciences. The further development of the human sciences as epistemic enterprises depends on

the further refinement of theoretical instruments of a logico-mathematical character together with experimental procedures adapted to the problems of those sciences.

In harmony with this view, Piagetian research elucidating the development of the theoretical, or formal, mode of thought directs its attention exclusively to the development of logico-mathematical theoretical instruments. All possibility of theoretical instruments of other kinds is ignored.

In this respect Piagetian epistemology is in accord with a widespread tendency of contemporary academic practice that regards the scientific status of a discipline as dependent on the adoption in that discipline of procedures and theoretical instruments of a logico-mathematical character in the image of those employed in the physical sciences. Yet it rests, in the end, on the arbitrary and doubtful assumption that the physical sciences furnish the universal paradigm for all knowing, or at least for the highest levels of knowing. It is indeed tempting, in view of the spectacular successes of the modern physical sciences, to suppose that the application of their experimental procedures and logico-mathematical instruments to other fields, with appropriate adaptation, is the key to a parallel expansion of knowledge in those fields. It is, however, a proposition put in serious doubt by a closer examination in the light of the above analysis of the nature of knowledge.

The rationality of knowledge requires a responsiveness to the lawful structure of reality as that structure is experienced in all the many-sidedness and relational complexity of a variety of relational fields. Physical science gains its strength by a selective focussing within this many-sided complexity of the total experience; it focusses selectively on the physical properties and relationships, setting the rest to one side as irrelevant to its purpose.

When, therefore, as in all theoretical knowing, physical scientists abstract from the concrete experiential field and develop their theoretical constructions from these abstractions they are responding not to the structure of reality as a whole but to those features of it that come within the selective focus of their discipline. The conceptual instruments they construct are those adapted to these selected features of reality. To take these selectively focussed abstractions and the specialised cognitive instruments developed for them as the universal model for all theoretical knowing is to guarantee the distortion of our knowing by reducing the multi-dimensional complexity of the structure of reality to one of its many dimensions.

Theoretical instruments of a logico-mathematical character are effective instruments for the physical sciences because, having been developed in interaction with those features of reality in which these sciences selectively focus, they are appropriate to the field of theoretical knowing in question. A similar effectiveness in other fields of theoretical knowing will not be achieved by using the same theoretical instruments, with or without adaptation, but only by developing instruments appropriate to these fields in interaction with those features of reality on which they selectively focus. The mere extension of the procedures and conceptual instruments of the physical sciences to other fields, however they may be adapted, will only hinder the development of our knowledge in these fields.

Once we recognise the need for a diversity of theoretical instruments and procedures we are able to recognise the unity of the academic disciplines as theoretical knowing with common characteristics while acknowledging the diversity within this unity that enables us to distinguish particular disciplines and groups of disciplines.

In this respect both Piaget and Popper are mistaken in regarding the distinctions of academic disciplines as merely conventional. There is

undoubtedly an element of convention in the way in which the distinctions are drawn in academic practice which should be always open to challenge on the ground of the arbitrariness or inadequacy of its distinctions, but there is a basis for the distinctions in the structure of reality. And it is on the basis of an analysis of this structure than any challenge to existing or proposed academic practice should be based.

4.3.4 The Multiple Foci of Knowing

This leads to a consideration of the question of variety within both modes of knowing. Doug Blomberg, a close and respected colleague, has proposed a theory of multiple ways of knowing to deal with this problem (Blomberg, 1978:146-234). Because, on the one hand, the work he has done in this area has had a significant influence in the development of my own thinking and because, on the other hand, I find his theory unsatisfactory at certain points it is appropriate to discuss this theory before presenting my own alternative.

Taking the basic structure of Herman Dooyeweerd's epistemology as his starting point Blomberg aims to make good what he regards as deficiencies in Dooyeweerd's theory. These he sees in the restriction of knowing, other than religious knowing, to theoretical knowing and undifferentiated naive experience. Blomberg argues that there is a need to make room for differentiated non-theoretical knowing. His proposal for making good this deficiency is to add eight further ways of knowing that, together with theoretical knowing, make up nine ways of "distantial knowing" distinct from the knowing of naive experience and religious experience.

Dooyeweerd's modal theory has such a fundamental role in Blomberg's theory of ways of knowing that it is important, at this point, to give at least a summary description of the basics of this theory. Dooyeweerd maintained that an analysis of empirical reality reveals