

Chapter 9: THE DESCRIPTION OF EMPIRICAL METHOD

§1 Accounts of Dialectic

Socratic dialectic:

Having suggested that Andersen's conception of logic is a form of dialectic (or a method of critical inquiry), it will be necessary to give a more detailed account of it, and the best way of doing that is to review the traditional conception of dialectic. In fact, the term is used in a variety of senses [Speake, 1979, p.88]; it is said by Sparkes to be "appallingly ambiguous" and opposed to *eristic*: argument aimed at persuading [Sparkes, 1991, p.216]. Despite widespread recognition of this method, thoroughgoing analytical descriptions of it are extremely rare. What we are concerned with here is that form of dialectic practised by Socrates in the Platonic dialogues. We are not concerned here with the Kantian, Hegelian or Marxist conceptions of dialectic which, despite the similarity of name, are fundamentally different from the Greek form under consideration. There is broad agreement that Socrates employed a distinctive method of inquiry: a question and answer method of discourse which brought together several distinct techniques practised by some of his predecessors. It is almost certain that Parmenides, Zeno, Protagoras and other pre-Socratic philosophers and sophists contributed to the development of this Greek dialectic [see Gulley, 1968, Ch.1, and SIEP, p.53, cited p.189f, above]. It is probable that Plato is primarily responsible for the method of division which appears only in the later dialogues, notably the *Sophist* and *Statesman*. However, in order to avoid dispute about, or inquiry into, the originators of these various techniques, the term *Socratic dialectic* is used here to broadly identify a reasonably distinctive method of inquiry represented in Plato's dialogues.

Burnet points out that Aristotle credits Zeno with being the inventor of dialectic [Burnet, 1959, p.134], and states: "Dialectic is literally the art of conversation or discussion, and its procedure is governed by strict rules. The "answerer" ... is required to reply to the questioner ... in the fewest possible words, and to answer the question exactly as it is put. He is not allowed to ask other questions or to boggle at the form of those put to him" [Ibid, p.134-5].

Gulley points out that Socrates' dialectic was principally, if not always, used in the pursuit of ethical truths or definitions [op. cit, p.13], and that

he believed "that problems in ethics are unlike arithmetical problems or problems where there is an accepted standard of measurement, e.g., problems of size and weight (Euthyphro 7b-c)" [Ibid, p.42].

Plato's conception of dialectic was different from the method employed by Socrates. It aspired to attain a first principle: knowledge of the form of the good [Burnet, op.cit., p.229-30; see also Speake, 1979, p.88]. According to Gulley, Plato believed dialectic had two essential aims: "Firstly, its aim is to discover the truth, most especially the truth expressed in the form of definition. Secondly, it aims to educate others to discover the truth. It is considered by Plato to be the best possible method for achieving these aims" [op.cit, p.33]. For Plato, then, dialectic was a method of discovering higher truths in both philosophy and science and had the additional function of educating others.

Plato regarded Socrates' method as dialectical, and distinguished it from *eristic* [Gulley, Ibid, p.32-33]. Dialectic is often contrasted with eristic by way of their respective aims. Eristic, it is said, aims to persuade without really establishing its case by sound argument: aiming to persuade or to win, not to prove the case. By contrast, dialectic is not concerned with winning, or persuading (by any means); it aims to establish a case by sound argument, based on premises which are agreed by the participants (to be 'true') [c.f. Sparkes, op.cit., pp.215-6]. But this way of putting the matter suggests we can always recognise the aims or motives of those participating in discussion. This would be extremely difficult, if not impossible, to establish except on formal grounds. We have ways of testing propositions and arguments: of recognising false assumptions and invalid arguments, and these may be taken as evidence of insincerity in argument, or of eristic. But can we establish a person's aims, motives or sincerity in argument in any other way? So the question must be raised about the order of discovery of eristic and dialectic. Do we discover that a person is engaging in eristic or dialectic by firstly discovering their aims or motives, or do we firstly discover that their methods are inappropriate (perhaps that their premises are false or their arguments invalid, or they are inconsistent) and then determine that their aims or motives are other than truth-seeking? It is suggested, on this basis, that formal analysis must come first. That raises questions about Plato's characterisation of dialectic by its aims: as aiming to discover the truth; but it also means we must be able to recognise the character of dialectic and distinguish it from that of eristic.

Socrates' question-and-answer technique is obviously something different from asking for specific information, such as: "How much are those apples you are selling?" or "What is the shortest way to the station from here?". Asking questions such as these has an immediate and "practical" purpose, and does not aim to serve inquiry alone. If we continued to probe in cases such as these, casting doubt on the truth of the answers or the veracity of the answerer, we would run into serious trouble. Socrates' kind of questioning is of a much more critical, demanding kind than these. Like them, it may be employed to find out something the questioner does not know, or does not understand, but it does not have any immediate "practical" purpose: it only serves the purpose of understanding: of understanding one "proposition" in relation to a much wider context, or in relation to a range of "propositions" believed.

Certain characteristics of Socrates' method, or this dialectic, are generally recognised, in particular (a) the question and answer technique, (b) the use of inductive arguments, (c) the *elenchus*, (d) the use of hypothesis, and (e) the quest for (ethical) definitions. The question-and-answer aspect is often associated with rules. In *Plato's Earlier Dialectic*, Robinson divides his discussion into two parts: Part I, *Elenchus*, and Part II, *Dialectic*; and in the second part, mainly, discusses hypothesis. This division suggests that the method of Socrates' *elenchus* is quite different from the method of hypothesis. There can be no doubt that *elenchus* and hypothesis are quite distinct: the first is a method of testing some thesis, the second is the function a proposition plays in discourse. But the method of hypothesis and the (method of) *elenchus* are, obviously comparable as methods. The *elenchus* is sometimes taken as a destructive method, aiming to show that some proposition is false, but this is not necessarily so. Robinson recognises that "'Elenchus' in the wider sense means examining a person with regard to a statement he has made, by putting to him questions calling for further statements, in the hope that they will determine the meaning and the truth-value of his first statement. Most often the truth-value expected is falsehood; and so 'elenchus' in the narrower sense is a form of cross-examination or refutation" [1953, p.7].

Robinson's distinction between the wider and narrower sense of *elenchus* is of considerable importance. We can represent either of the methods of hypothesis or *elenchus* in terms of *people* engaged in discourse, or in terms of propositions being tested. Thus the method of hypothesis may be the investigation of a *person's* provisional thesis, or the critical testing of a

proposition, just as the *elenchus* may be the "cross-examination of a person" or the testing of a "statement" believed. Once the emphasis is removed from the persons involved, and placed upon the proposition or statement under examination, we see that both the *elenchus* and the method of hypothesis are methods of critically testing propositions. And the question must be raised: "What is the difference, if any, between these two methods?". There can be no doubt that there is a difference between: (a) someone's provisionally accepting for the purpose of discussion an hypothesis (which they do not believe), and (b) someone's believing a proposition. These are the first steps in a particular inquiry, or the first steps in a specific dialectical process. Once we distinguish clearly between the steps in these processes we see that:

- (i) the first step is the recognition of a problem about a specific proposition, either --
 - (a) one person doubts or denies what another asserts, or
 - (b) two people agree to inquire into the truth of an hypothesis;
- (ii) the second step is to test that proposition/hypothesis by --
 - (a) setting "down as true whatever agrees with it" and "false whatever does not" [Burnet, 1950, p.164; cf *Phaedo* 100a], then --
 - (b) deducing consequences from the proposition/hypothesis and the additional propositions and examining these.

While there may be differences in the way the problems arise, there is no reason to assume the method of testing is not the same. Burnet's description of the method of testing hypotheses just adverted to, and Gulley's description of the *elenchus* [op. cit., p.37-38] are essentially the same. What is done is to consider propositions which are in some way related to the hypothesis, and to deduce others from those. The only way propositions can be related in a relevant sense is if they have some terms in common with the hypothesis. The only way that consequences can be deduced from the hypothesis, along with its related propositions, is by syllogism, and that means that middle, or common terms are involved. What is being indicated, then, is that both methods involve employing propositions related to the hypothesis by middle terms, or others related to those by middle terms, and using syllogism. This means that those philosophers who used dialectic and the method of hypothesis before Aristotle, before the introduction of formal logic, had an intuitive grasp of terms, propositions, logical form, and syllogism.

It is important to consider the thesis that the *elenchus* is a method confined to the destroying or disproving of hypotheses (see Gulley, op. cit., p.). If some method of argument always resulted in the disproof of the thesis or hypothesis under consideration, we would have to dismiss it as an unsatisfactory method of testing propositions, or as a general method of inquiry. Equally, any method of argument which always resulted in proving the proposition under consideration or verifying hypotheses would be unsatisfactory as a method of testing propositions. Methods of testing hypotheses which always resulted in disproof, or always resulted in verification or proof, would disprove nothing, or alternatively, prove nothing. Hence: (i) any method of disproving propositions (or showing they are false) must also be a method which permits, in principle, the possibility of verification of propositions (or establishing their truth); and (ii) any method of proving or verifying propositions (or showing they are true) must also be a method which permits, in principle, the possibility of showing they are false. If the *elenchus* is a method confined solely to the disproof or destruction of hypotheses, it is an inappropriate method for testing hypotheses in critical inquiry, philosophy or science. This interpretation is supported by the fundamental logical principle that if one proposition is disproved (shown to be false), its contradictory is proved (shown to be true); and vice versa.

The situation is no different with the method of hypothesis. Taken in its simplest form, the method of hypothesis may be described as the method of testing an hypothesis (as one premise in a valid syllogism, with another premise believed to be true) by the truth or falsity of the conclusion. An example would be the testing of the hypothesis that all humans are white-skinned, in the valid syllogism:

All humans are white-skinned	(Hypothesis)
Socrates is a human	(believed to be true)
Socrates is white-skinned	(believed to be true)

In this valid syllogism, the premise "Socrates is a human" and the conclusion are believed to be true, therefore this test verifies the hypothesis. If we took "Othello is a human" as the premise believed to be true, the hypothesis would be disproved by the falsity of the conclusion, validly drawn: "Othello is white-skinned". So this method can both verify and disprove propositions. It can verify and disprove the very same proposition, but we take disproof as conclusive; verification is never proof [SIEP, p.174].

If that is taken as a correct account of the method of hypothesis in its simplest form, it can be taken as an important model for Socrates' dialectical method, which is essentially the same method made more complex by the facts that (a) this testing procedure may be repeated over and over with different true premises, and (b) as already noted, it is employed with a wider range of premises believed to be true [see Burnet, p.164, cited p.200 above]. The outcome may be either a uniform series of verifications (which do not constitute proof but equally do not constitute disproof), or disproof, which is taken as final. The conclusions drawn here are:

- (i) Essentially, Socrates used the same dialectical method over and over, and this method is the more complex form of the method of hypothesis.
- (ii) Socrates' dialectical method is essentially the "complex" method of hypothesis employed repeatedly with one hypothesis and numerous premises believed to be true. This corresponds to Robinson's *elenchus* in the wider sense [see p.199 above] and Gulley's "progressive method of hypothesis" [op.cit., p.57]. It can either prove, disprove, or verify propositions tested.
- (iii) Socrates' *elenchus* in the narrower sense is simply the method of hypothesis used to disprove an hypothesis.

Anderson's implicit view of discourse, inquiry or dialectic

Anderson rarely used the term *dialectic* in the sense in which it is used here, but frequently used four terms closely related to it: *discourse*, *inquiry*, *investigation* and *criticism*. In characteristic fashion, he did not define these terms. Space does not permit the close examination that they deserve, but some analysis and comment is essential. It will be argued that he spoke of *discourse*, *inquiry* and *investigation* in a sense virtually equivalent to *dialectic* as used here; and *criticism* in a way perfectly compatible with it.

In SIEP, he used the following expressions as equivalent or very closely related: discourse and inquiry [p.5, 6, 11-12]; discourse and investigation [p.156]; discourse and philosophical inquiry [p.137]; discussion or inquiry [p.5-6, 6, 170-171]; empirical inquiry [p.109]; inquiry and discovery [p.160-161]; inquiry and critical thought [p.184-185]; line of inquiry [p.268];

"problem or line of investigation" [p.161]; logic and inquiry [p.172]; logical investigation [p.126]. He indicated that inquiry and investigation are related to problems [p.126, 130-1, 131, 170-171]; and spoke of the types of questions that can arise in inquiry [p.195]. He said that "while Heraclitus had this sense of the interlocking of all materials and all problems, he had by no means worked out a critical apparatus (a doctrine of types of problem and forms of solution in any inquiry) in the way that Socrates, followed by Plato, did" [p.194]; and "if the work of inquiry is to be carried on, it must be at once scientific and philosophic, that is, in particular, the scientist is not philosophic, he will fall into confusions, he will rebuff philosophic criticism -- he will lack a theory of categories, of sorts of problem, of 'method' -- " [p.183]. He spoke of inquiry as a process or activity [p.192, 242, 287]; investigation as an activity which communicates itself [p.244-245]; of study as an activity with its own ways of working [p.338]. But he also spoke of inquiry as a motive or force [p.242], as being in a mind [p.275-6]; of the spirit of inquiry [p.266, 287], the spirit of discovery [p.223], the scientific spirit [p.266, 275-276], and the love of truth [p.223]. He said philosophy governs investigation [p.187], scientific inquiry is speculative and critical [p.201] and inquiry is not directed to practical ends [p.337, 338]. He attempted to justify speaking of inquiry in both a qualitative sense (as a "thing") and as a process or relation, thus:

Taking the case of "inquiry", we see at once that this expression has a primarily relational sense, and the same is true of the expression "scientific interest". Yet, observing that this is one of many competing interests in a mind, we may be able to distinguish *what* is interested from its *being* interested in something. And, in referring to this interested thing as "the scientific spirit", I consider that I am distinguishing it qualitatively from other things in the same region. But, once such a quality had been distinguished, there would be no harm in using the term "inquiry" to refer both to the possession of the quality and to the possession of those relations which such things always have. [SIEP, p.275-6]

It is very clear that however Anderson conceived of inquiry, discourse and investigation, he viewed them as very complex things and processes. While in the last passage quoted, he seems to have conceived of inquiry as a mental thing: motive, it is clear, also, that in several places he represented inquiry, etc. as dialectic: as related to the solution of problems, and in one place to "method" (see above). In one passage the connection with dialectic is inescapable: "We have found that the conditions of discourse and inquiry demand the rejection of 'pure' science and the assertion that all sciences

deal with facts, in relation to which we assert or deny, prove or suppose" [SIEP, p.11-12].

We can gain a very clear idea of Anderson's conception of dialectic, discourse or inquiry from three aspects of his work: (i) his actual description of parts of dialectic, (ii) his statement of principles of inquiring method, (iii) his actual practice of this method. In *Empiricism*, following the enunciation of the doctrine of one way of being, and in justifying it, he gave a very brief but helpful description of the processes of dialectic, which he called *discourse*. He said: "Discourse, in fact, depends on the possibility of making separate statements, in regard to each of which the very same question can be asked -- 'Is it true?'" [SIEP, p.5]. Shortly after, he listed various dialectical processes: "Considering propositions as they occur in discourse, we find that they can be asserted or denied, questioned, proved or disproved" [Ibid]; and after rejecting certain rationalist mistreatments of the copula, he continued the description of kinds of dialectical processes:

... empiricism takes up the position that in discussion or inquiry any proposition can be treated as (a) a conclusion to be proved from premises accepted (b) a premise accepted to be used in proving some conclusion, (c) a hypothesis to be tested by the observation of the truth or falsity of the conclusions drawn from it, or (d) an observation to be used in determining the truth or falsity of conclusions drawn from a hypothesis. And if it be asked how it is determined which of these functions a proposition is to have, the empirical answer is that this is determined in discourse. Discourse depends on what the parties to it *believe*. If you deny what I assert, I may try to prove it by means of other propositions you admit; if we both agree on some propositions, we may set out to see what follows from them; if we are doubtful about any proposition, we may test it by its consequences. In general, discourse is possible when and only when persons come together who (a) agree about something, (b) either disagree, or wish to inquire, about something else. This position itself implies a common logic of assertion, implication and, I should add, definition. Apart from that logic, actual beliefs and observations are all that can be appealed to, and without them the process could not go on. Each of us (not excluding those who take a false view of logic) directs his inquiries and establishes his conclusions, in greater or less disagreement with others, by means of this mechanism of individual statements and particular inferences. [SIEP, p.6]

This passage strongly confirms the identification of logic, discourse and what is here called dialectic. The phrase "This position itself implies a common logic of assertion" etc. can hardly be understood any other way. Two other passages amplify this reading

Anderson briefly described the dialectical process when discussing ethical statements about what ought to be, or things which are obligatory: "When such a statement is taken to be true, it can be dealt with by means of the ordinary logical mechanism of assertion and denial, proof and testing of hypotheses, definition and division -- and in no other way" [SIEP, p.215, my emphasis]. This means that dialectic is the *only* means we have of dealing with (testing) such claims: is the single logic. He made the same sort of claim, and described other features of dialectic, in rejecting Descartes' method of doubt:

Here, incidentally, we may remark on how the procedure of actual inquiry differs from the Cartesian "method". ... We doubt only in relation to what we believe, i.e., to what we do not doubt. ... Descartes himself cannot express his doubts except in terms of what he does not doubt. ... Doubt arises, then, only in particular cases, and is settled not by what is indubitable but by what is believed. Propositions are not doubtful or certain; we doubt and are certain -- and sometimes when we are certain, we are wrong. Thus we may hold with assurance certain propositions about ourselves or our minds alternatively, we may be doubtful about them, or we may have our assertions challenged. Such an issue can be settled **only by observation and inference from observations**. [SIEP, p.108-109; my emphasis]

In two places, then, Anderson stated that testing by observation and inference, or "assertion and denial, proof and testing of hypotheses", etc. -- dialectic or logic -- is the only method we have of testing propositions, or settling issues (of truth or falsity), and clearly, this assertion is an alternative formulation of his doctrine that there is only one logic. The vital point is that Anderson believed this method of assertion and denial, discourse, or dialectic was the *only* method of testing propositions or hypotheses, as indicated by his claim, already cited: "Each of us ... directs his inquiries and establishes his conclusions, in greater or less disagreement with others, by means of this mechanism of individual statements and particular inferences" [SIEP, p.6]. In short, granting that the testing of propositions/hypotheses can be done in association with observing, there is no other method of testing them apart from the Socratic method described.

Anderson made many incidental remarks about principles of inquiring method throughout his philosophical papers and public controversies. A few examples must suffice. He said that 'as our ordinary discourse shows -- indeed the whole possibility of discourse depends on it -- ... there are any number of independent truths, each as 'absolute' as any truth can be" [SIEP, p.15], which is consistent with his view that any proposition which can be asserted

can be denied and tested by essentially the same processes, and "whatever can be asserted or taken for granted can also be made a subject for inquiry, can be questioned or proved, i.e., there are no unprovables" [SIEP, p.5]. While there is an unlimited number of propositions for discourse which can be asserted and tested, it is not possible to deal with them all at once. In dialectic, we deal with them one at a time.

There can be little doubt that Anderson conceived of inquiry or logic as a wide process equivalent to dialectic as described here. Another passage (in response to Ryle) confirms this claim:

Ryle does not specifically say that he takes questions of quality and questions of relation ... to belong to different regions of inquiry; but he gives no sign of seeing that the logician is concerned not with a miscellaneous bunch of types of question which can be raised about this subject or that, but with a group of types of question which have a *common ground*, which hang together in any inquiry and thus apply to any subject-matter. This, I would say, is the ground of Space and Time (or of being situational) in terms of which the universal application and the interlocking of logical questions appear. It is because questions in all the categories are spatio-temporal, because they all arise within any region or 'contour', to use Alexander's expression, that they are not *discontinuous* with one another but all form part of a common inquiry (not, of course, an inquiry into everything but inquiry into any specific subject, it being remembered that subjects are not cut off from one another but each of them embraces relations among subjects). Apart from such a common ground, there would be no such thing as logic, no sort of connection between one inquiry and another, and thus no inquiry. [SIEP, p.172]

Clearly, Anderson saw logic and inquiry as intimately related, and saw all subjects, all inquiry, as related: that "the logician is concerned ... with a group of types of question which have a *common ground*, which hang together ... and ... apply to any subject-matter". These questions may be taken to relate to the categories [see Molesworth, 1958, p.48]. Consistent with passages just discussed, we can say that the logician (or dialectician) is concerned to maintain one (dialectical) method of inquiry in relation to every issue (of truth or falsity) in every subject; that it is this uniformity of method which unifies all inquiry. This is an alternative to Anderson's claim that Space and Time are the common ground of logical questions -- as if we could consider inquiry, or anything at all, being beyond the realm of Space-Time; in Anderson's terms, that would be an "unspeakable", view.

The significance of the more complex method of testing hypotheses was recognised by Anderson when he criticised Russell's notion of limited logical consistency, and said: "We ought ... to bring [in effect, any proposition being tested] into relation with every available fact, so that any real inconsistency will appear." [SIEP, p.11]

One final point is of vital importance to the present interpretation: if we can identify inquiry and dialectic, then the following passage which implies that "unrestricted inquiry" is empiricism also implies that dialectic is empiricism:

We can thus connect the opposition between (a) separate fields and restriction of inquiry and (b) unrestricted inquiry into a single field of reality (space and time, interrelated situations with no smallest and no largest) with an opposition between (a) saving hypotheses and removing appearances (e.g., ethical facts) -- which is rationalism, and (b) saving appearances and removing hypotheses -- which is empiricism. [SIEP, p.184]

This interpretation, treating inquiry, investigation, and discourse as dialectic, and therefore as identical with logic in Anderson's sense, provides a coherent and consistent reading of a large range of passages, allowing that we reject Anderson's conflation of inquiry as a process (dialectic), and as a motive. Clearly, this is an economical interpretation. However, a further economy can be effected by it. We can also take criticism, so central to Anderson's thought, as dialectic, perhaps in its more "destructive" role, as a long tradition treated Socrates' *elenchus*. However, there is no difficulty whatsoever in taking criticism as dialectic at work: as the critical testing (proof, verification or disproof) of "propositions"; there is no conflict between this view and the long traditions of dialectic and criticism.

When Anderson specifically discussed Socratic dialectic, he did so in connection with Socrates' view of education, and it is clear that he regarded it as a form of criticism involving criticism of established views: "Dialectic requires the unlearning of much that has been previously learned" [SIEP, p.211]; "We learn ... by trial and error, or, as in the Socratic theory of criticism expounded in the *Phaedo*, by the formation and testing of hypotheses ... Thus 'clearing the mind of cant' is a characteristic of the educative process in general" [SIEP, 211-212]. (We need not accept as a definition the remark that follows: "and Dialectic is simply the theory of the kind of hypotheses it is necessary to reject -- those, namely, which would make the prosecution of inquiry impossible, being set above our scrutiny" [SIEP,

p.212], since dialectic is a method, not a theory.) Though related to the educative process, this account of dialectic, coincides with the descriptions of discourse (dialectic) and criticism given above.

It has been shown that Anderson, typically, did not define several of his key terms, notably, "logic", "discourse", "inquiry", "investigation" and "criticism"; and that being the case, it is impossible to say definitively, on the basis of Anderson's explicit statements, precisely what he meant by them or whether any two (or more) of them are the same or different. It has been argued that this looseness of expression is evidence that Anderson did not have a clear and precise theory of these vital terms. Nevertheless, the questions must be raised what he meant by them, and whether any of them are to be taken as the same or different. We are left with little alternative but an interpretative answer based on contextual evidence.

It would, of course, be possible to argue that Anderson meant to refer to quite different things when he spoke of logic, discourse, inquiry and investigation, but sufficient evidence has been provided to establish that (recognising the conflation of inquiry as a process and a motive), he spoke of these without distinction. It has been argued that there are compelling reasons why Anderson's ontological view of logic cannot be sustained, and in any case, he did not formulate it as a clear or explicit theory. So the non-ontological, methodological interpretation of logic as dialectic, of a single logic, provides the only consistent reading compatible with Anderson's formal logic of four categorical forms. This methodological (or dialectical) interpretation of Anderson's core views is, therefore, parsimonious. It treats those terms which Anderson repeatedly used -- logic, discourse, inquiry and investigation -- as equivalent: as referring to that critical and structured kind of discourse known as dialectic (in a special, restricted sense); it interprets criticism (in conformity with a long tradition) as essentially the same process or an aspect of it. Later, it will be shown to provide a consistent reading of most of Anderson's major doctrines.

It is suggested here that the foregoing evidence -- and much more which could be provided -- indicates that Anderson had a profound intuitive grasp of dialectic (or inquiry as a process), a "feel" for it, so to speak, but had not worked out a clear and precise theory of it, or of logic. And according to this view, he conflated what was referred to above as "inquiry as an activity or process" and "inquiry as a motive". Dialectic or inquiry as a human

activity, or method of inquiry, may be carried out by people who have a love of inquiry (or "spirit of inquiry"), but nevertheless the two are quite distinct. We could never discover that a person had a love of inquiry unless we observed that they habitually engaged in the process, and performed that process well. Recognising this conflation of the process and motive, it is possible to insist that dialectic is a process, a perfectly overt, explicit, discursive process, completely independent of the notions of mind, mental entities and human motives.

In opposition to this interpretation, it may be asked why Anderson did not see this "solution" himself. To that sort of question there can be no conclusive answer, but the suggestion offered here is twofold: perhaps (a) Anderson was "dazzled" by Alexander's seemingly comprehensive system: that he believed Alexander's account of Space-Time provided the foundations of an ontological logic, or theory of being and, swept along by this conviction, failed to see "the obvious" which is fundamental to his own views; (b) Anderson led himself astray in attempting to adapt the notion of inquiry to his own ethical theory: by attempting to treat it as a "motive", rather than taking it as it clearly is: an explicit, discursive process. It may be that had Anderson abandoned the ontological approach, he would have seen more clearly that his own logic was a relatively modest, mundane, but extremely potent, dialectic.

Defining

As argued previously, the rationalist conceptions of mind and ideas necessarily generate a conception of logic, which leads to confusion about whether the objects of study, the "elements" or terms of logic are ideas, concepts, words or things. This confusion naturally flows into the process of definition. If we accept Anderson's view that there are no such things as ideas or concepts, and that what we are concerned with in inquiry are "independent things, or rather states of affairs" [SIEP, p.32], in giving an account of dialectic we will hold that the process of defining is concerned with "things", not ideas, concepts or words. The account of definition given here is Anderson's rather than Socrates' or Plato's. However, provided we reject Plato's rationalist, transcendental aspirations mentioned previously, it can be argued that the Andersonian account of definition which follows is consistent with Socrates' use of definition in dialectic, and with Plato's use of repeated divisions as a way of arriving at definitions.

On the Andersonian view of defining, a definition is a very special kind of description of some general kind of thing. We might, for example, describe horses as animals, vertebrates, and mammals. These descriptions implicitly involve a number of divisions, and because of that, imply a range of pairs of propositions:

All horses are animals; some animals are not horses.

All horses are vertebrates; some vertebrates are not horses.

All horses are mammals; some mammals are not horses.

A definition is different from these descriptions. When we have a definition, we can say both "All horses are one-toed ungulates" and "All one-toed ungulates are horses". That is to say, a sound definition involves two universal propositions which have the same terms in reverse order, one of which is a complex term which implies other propositions; in this case, some ungulates are one-toed and some are not.

If we accept Anderson's view of defining, then terms can be understood propositionally; they are "complex or situational": "... the content of a term can be set out in propositions, as when we define A as BC and thus identify its content with that of the proposition BiC (the position is really more complicated -- the I is only one of a *group* of propositions making up the definition);" [SIEP, p.170]. In other words, we can treat a term such as humans (symbolised as A's) in that simple form, or as rational animals (B's which are C's); and if this comes from a definition, "All A's are BC's and All BC's are A's" then either --

(a) "All B's are C's and some C's are not B's", or

(b) "All C's are B's and some B's are not C's".

[For the qualifications on Anderson's theory of defining, see Baker, 1986, p.81ff.]

It is for these reasons that Anderson said "there is no logical distinction between things and propositions" [SIEP, p.218].

On Anderson's view, then, definitions are not about meanings of words and not a special kind of proposition, although they do have a very special place in dialectic; they are not, as on some views, neither true nor false, but are part of the natural "ebb and flow" of dialectic. The important point, however, is that on Anderson's view a term that has been defined can be treated as a

proposition or series of propositions. And that means that we can test terms or conceptions, or proposed subjects of discourse, in precisely the same way -- by the same method -- that we test propositions. It is for these reasons that Anderson said: "It has, therefore, to be recognised that 'This body is fiery', 'This body is hot' and 'Fire is hot' are propositions all of the same order, and their terms are all of the same order" [SIEP, p.53]. The vital point, then, is that precisely the same (dialectical) method employed to test "propositions" can also be employed to test the terms in propositions.

On this view, what is now widely regarded as a form of definition (if not the only form of definition), that being the "definition" of words [c.f. Robinson, 1954, Ch.I, §9; Ch.VI, §13; Copi, 1961, p.89f], is not a form of definition at all. Most logicians recognise definition by genus and difference, but few explicitly recognise that it is a completely different process from the so-called definition of words, because they conflate the two [cf. Cohen and Nagel, 1961, p.234f; Copi, op.cit., p.118, 122; Jevons, 1909, p.99; Latta & Macbeath, 1949, Ch.XI]. However, a strict distinction between the two is upheld and emphasised here. It is suggested that the so-called definition of words is simply **explaining** how words are used in a specific language group or by some more limited group. It is a matter of fact that people from a certain group actually do, or do not, use specific words in a specific way. This has nothing to do with the scientific processes of classification, division and definition.

Defining by genus and difference is always concerned with some general kinds of things, not words. It is never concerned with **defining** specific individual things. Because of the nature of definition by genus and difference, we cannot define, for example, individuals such as Julius Caesar. We can **identify** them by various descriptions, and these descriptions may involve "relations". But it is obvious that defining by genus and difference, being concerned with general kinds of things, being based on classifying and dividing kinds of things into further kinds (genus into species), involves describing general kinds of things by their characteristics, but does not involve "relations" so-called. No "relations" could ever characterise a general kind of thing. Any claim that there can be relational definitions is based on a confusion of processes: (a) definition by genus and difference; (b) explaining the "meaning" of a word; (c) identifying an individual. No progress can be made in systematic inquiry by conflating these three quite different processes.

Existence

Anderson treated questions of existence consistent with the treatment of the definition of terms just described. Arguing against the Russellian view that the hypothetical "If anything is X, it is Y" covers cases where nothing is X, Anderson maintained there are no "non-existent" terms, and "A formula containing a 'non-existent' term is meaningless; that is to say, there is a set of words or, more exactly, of marks or noises, but there is no proposition, no issue" [SIEP, p.140]. When people use the term XY, e.g. one-horned horses, when no horses are one-horned (XeY), the claim "Unicorns (or one-horned horses) are animals" is not simply false, it "has no subject or point of reference and so cannot be raising an issue" [SIEP, p.182]. We might say it commits the fallacy of complex question. Whether a purported term is defined or not, it presupposes a definition, and "an assumed analysis or definition" will yield a proposition; "dragons don't exist" might become "No reptiles are fire-breathing" [Baker, 1986, p.88].

It must be emphasised that, unlike Russell's logic, where existential propositions are treated as a distinct form, and raise special difficulties [Strawson, 1952, p.163ff; Quine, 1958, p.75f], Anderson gave a formal logical account of problems of "existence" in terms of the four forms, without requiring any special procedures. Anderson's treatment does not require Russell's elaborate theory of descriptions [c.f. Russell, 1905; and 1929, Ch.V]; it is much more parsimonious.

§2 Empiricist Description of Dialectic or the Method of Critical Inquiry

In view of the claims being made here for dialectic, which are partly based on and consistent with Anderson's affirmation that there is one logic (one method of critical inquiry), what is required is a full, clear description of dialectic. However if, as maintained here, formal logic is the theory or description of dialectic, space does not permit a full account of it here. What can be done is to provide a brief description of dialectic which brings out its empirical character.

If we are to describe dialectic, we must firstly understand what that method is employed to do. People who engage in dialectic are concerned to solve specific problems of inquiry or understanding which fall into a number of broad categories:

- (a) to critically test claims, beliefs, hypotheses, assumptions, or anything expressed in propositional form;
- (b) to critically examine and test evidence (observations) for or against claims, etc., and assess the validity of observational methods;
- (c) to observe, describe and classify various subjects of inquiry;
- (d) to define subjects of inquiry, terms or conceptions;
- (e) to critically examine and test definitions, terms and conceptions;
- (f) to test the validity of arguments;
- (g) to discover the causes of certain changes;
- (h) to analyse, describe and explain quantitative matters;
- (j) to speculate theoretically: to formulate hypotheses and theories and test them.

These are all appropriate problems for dialectic or critical inquiry.

In order to describe the various processes of dialectic associated with the treatment of these various kinds of problems of inquiry, formal logic must develop a precise theory of the components of dialectic and its phases or dynamic. It must develop a theory of:

- (i) logical form of --
 - (a) "propositions" or kinds of claims,
 - (b) valid arguments;
- (ii) terms and definitions;
- (iii) what constitute sound or unsound --
 - (a) observational procedures or evidence,
 - (b) testing procedures for claims, hypotheses, definitions, conceptions etc.; that is
 - (c) proof, disproof, verification ,
- (iv) what are appropriate procedural (dialectical) steps in relation to the kinds of problems under consideration at any time.

The analysis and description of these various elements and processes will be based primarily on the actual procedures philosophers and scientists employ, and of course, will accept hints from existing formal logic; but it will be critical of the way rationalism has infected both.

The "first task of" formal "logic is to find the types of logical form" [SIEP, p.137], and these are (a) the four categorical propositional forms, and (b)

the valid forms of syllogism (which are based largely on the four propositional forms). Once these are established, it is possible to describe precisely in formal terms --

1. the characteristics of sound definition;
2. the argumentative (or "logical") procedures (given that certain evidence is established or agreed upon) for:
 - (i) logical proof, disproof, verification,
 - (ii) the method of testing any claims, hypotheses, etc., including the method of hypothesis and experiment,
 - (iii) the method of testing any terms or conceptions.

Dialectic presupposes observing, is compatible with observing, and takes observation as a fundamental way of testing anything in propositional form, either as a direct test, or an indirect test in conjunction with argument (or reasoning). If an assertion, belief or hypothesis is testable directly by observing, such a test is taken as final proof or disproof. For example, if someone asserts that some dogs are white, observing a white dog is proof of that claim. If someone asserts that all dogs are black, observation of a non-black (white, brown) dog disproves that claim.

However, for the most part, dialectic employs less direct methods of testing claims, hypotheses, etc. It typically employs argument; and it frequently depends upon what participants believe, or are prepared to admit, rather than upon observational testing. But even when it relies upon beliefs, it is assumed (a) that observational testing will confirm those beliefs, and (b) that any observations which do not coincide with those beliefs would take precedence over them. What dialectic does is:

- (i) identify an issue (or thesis) for testing: a belief, assertion or hypothesis ("proposition") doubted or in dispute;
- (ii) identify a whole range of beliefs, observations or assumptions (in propositional form), which have common terms with the issue or thesis, or which are linked to the issue by common terms;
- (iii) draw as many conclusions from these as possible to test or disprove the thesis;
- (iv) consider the consequences of these arguments.

If this process leads to a contradiction, or one of the consequences is contradicted (disproved) by observing, then either the hypothesis or at least one of the premises is "false". This process may be called critical testing or criticism. When it does not result in a contradiction it is called verification; when it does result in a contradiction it is called disproof or criticism. This is the only form of logical criticism. Disproof supported by observational testing, is regarded as final, in relation to the assumptions involved.

By means of the process of defining [described p.209ff, above], terms or conceptions may be transcribed into propositional form, and in that form may also be tested dialectically. So dialectic is a method of testing both (a) claims in propositional form, and (b) terms or conceptions. Three additional points must be made.

1. Neither dialectic nor formal logic **prescribes** in any way, or sets down rules. Dialectic proceeds in a critical way, exhibiting certain methodical steps; and formal logic describes the various components, procedures and principles of this process. Neither dialectic nor formal logic **prescribes** how to make observations or seek evidence, but they presuppose principles by which any observations or finding of evidence may be critically tested. If it is asked how the steps of dialectic are determined, that depends upon (i) the kind of issue under discussion, (ii) what is agreed upon and what is in dispute, (iii) what is relevant at the stage it is at -- whether evidence is required or not, or in dispute or not; it is "determined in discourse" [SIEP, p.6]. There is no need to minutely examine what is agreed (not in dispute), and what is agreed or in dispute will vary from inquiry to inquiry; so that certain procedural steps which must be followed in one discussion because of an issue (assumption, observation, evidence) in dispute, will not need to be followed in another. Thus actual dialectical procedures are immensely variable, while the underlying principles remain constant.

2. Neither formal nor informal logic is fundamentally concerned with the notion of mind or so-called mental entities (ideas, concepts, knowledge); formal logic is not concerned with or restricted to "reasoning", but is concerned with evidence and argument. Those engaged in dialectic are concerned with "things" which are, for the most part, external to their bodies. If

occasion arises, as it will, the same procedures and principles of dialectic may be turned to consideration of whether there are such things as minds, etc.

3. Since all problems of inquiry must be expressed in propositional form, there are no other problems of inquiry. However, since everything that we assert, deny, believe, observe, hypothesise or suppose is expressed or expressible in propositional form, all terms or conceptions which are defined are expressible in propositional form, both are appropriate for dialectical testing; therefore dialectic is a **universal** method of testing anything in propositional form, including terms or conceptions. Since there are no other problems of inquiry, dialectic (along with observing) is the **only** method of testing "propositions", "truth-claims", and terms. So dialectic is the one and only (informal) logic.

§3 Scientific Method

Although it is commonplace for philosophers and scientists to speak of scientific method, it is extremely difficult to find any clear or precise account of what it is, if it is anything at all, since there have been claims there is no such thing [See Yeo, 1986, p.285; Nagel, 1961, p.12; Nash, 1963, p.159; most notably, Feyerabend]. One would naturally expect scientific method to be a distinctive kind of method, but it is difficult to find sound accounts of what a method is. In an article entitled *Methodology: The Elements of the Philosophy of Science*, Papineau [1995] makes no attempt to discuss what method or methodology are; in a special entry on *Method, Methodology, Methodical, Methodological*, Sparkes [1991 p.128] gives no account of what method is; in an article entitled *Scientific Method Without Metaphysical Presuppositions*, Feigl [1954] gives no account of scientific method. It may be presumed that the reason for these omissions is that it is simply obvious. But it isn't obvious. If it was obvious and clear what method was, it would be a simple matter to explain it. Many accounts of scientific method [see Table 5, Appendix A] are unsatisfactory for several reasons. Most employ a word or phrase as an alternative for "method", for example "techniques", "the way", "approach" or "procedures"; none is specific about the steps of the method. Popper claims scientific method is a species of a wider genus: "the method of trial and error" [1969, p.312], but does not provide any account of trial and error methods, and only a brief and inadequate one of scientific method, so that we would be forced to conclude he does not establish his thesis. Cohen and Nagel's attempt to give an account of scientific method runs together

rationalist and empiricist or phenomenalist claims: "Scientific method is thus the persistent application of logic as the common feature of all reasoned knowledge. From this point of view, scientific method is simply the way in which we test impressions, opinions, or surmises by examining the best available evidence for and against them." [Ibid, p.192]; in any case, it is insufficiently detailed to specify what the main steps of the method are.

On the basis of this brief survey, it is reasonable to conclude that:

- (i) while the term "scientific method" is widely used, there are many different accounts; and conceptions of what it is; and there is no one clear, or agreed view of what it is;
- (ii) there are what might be broadly described as rationalist and empiricist conceptions of scientific method, which are inconsistent;
- (iii) of the views surveyed here, none gives a precise account of what a method is; what distinctive kind (species) of method a *scientific* method would be;
- (iv) many accounts "hover" around the method of hypothesis, but none provides a clear description of the sequential steps of the method;
- (v) Popper's thesis that scientific method is a trial and error method, is not clear and not helpful.

Towards an empiricist theory of scientific method

Either there is, or is not, some method which is common to and underpins the various sciences and each of these alternatives has significant consequences. If we accept Bunge's [1973 p.1] view, then any intellectual endeavour (including the sciences) has three components: subject matter, method and goal. It is clear that astronomy, geology, botany, zoology and psychology have different subject matters, but it also appears that they have different goals. To suggest that all sciences have the same goal, for example knowledge in general, would destroy the distinctions between sciences and create chaos within them. If astronomy, geology, botany, zoology and psychology all have knowledge in general as their goal, then what appears to be knowledge

appropriate to astronomy will also be the appropriate goal of geology, botany, and so on. Clearly, this generality would destroy all distinctions between specific sciences, and create confusion within them.

If each science has a different subject matter (as appears to be the case), and if each science has a different goal (which also appears to be the case), then on these dimensions or criteria we can only establish differences between sciences, but no common feature. Therefore, if they do not share a common method, there is no basis for calling them by a common name: "sciences"; there is no basis for saying they are species of a genus. In other words, if there is no such thing as scientific method, there is no such thing as science.

On the other hand, if it is claimed that there is a method which underpins all sciences, then it would seem it is this method which is common to them; which is what distinguishes and defines sciences amongst all other human activities such as politics, religion, commerce, sport, etc. But the consequences of this view must also be recognised. It means that we cannot positively identify or determine what human activity is or is not a science until we have identified this method -- a consequence of particular significance in the case of mathematics [see p.231ff, below]. According to this view, we must first of all identify the method peculiar to science, and then determine what are and are not sciences, not the reverse; i.e., we cannot first of all determine what are and are not sciences (by some other criterion) and then, by analysis, discover what method all sciences employ and share in common. That would be a flawed, question-begging approach. So it is vital for anyone who maintains that there is a genus, *sciences*, to identify the method peculiar to them, since it appears to be their defining feature. It hardly needs to be said that until this is done, confusion about what sciences are and what are sciences, is almost certain to prevail.

If there is such thing as scientific method, we can set down certain criteria or parameters for it; if there is such a thing as scientific method --

- (i) it must conform to the description, definition or criteria of a method;
- (ii) there must be some good reason for calling a specific method scientific: it must be distinguished from all other methods in a

definite way, and in a way that is appropriate to be called scientific;

(iii) apart from being distinguished from all other methods in some way, scientific method must be employed in, and appropriate to, all sciences equally, otherwise it would be inappropriately named; this condition has two further consequences:

(a) if some specific method (or technique) is used in astronomy and no other science, or biology and no other science, it may be called a method of astronomy, or biology, but cannot properly be called scientific method;

(b) if some specific discipline such as mathematics, religion, or cricket does not use this method, or does not use it as its principal method, or consistently, that discipline is not a science;

(iv) it must be the only, or the principal, method employed in each science, otherwise it would be mis-named.

(v) it has to be a very general -- or in some sense, universal -- method appropriate to all specific sciences, not limited to any specific area or subject of science.

If a coherent account of scientific method is to be given, these criteria must be met. But even if such a theory is put forward, it will then be necessary to describe the method in clear and precise detail. Because of the precise character of science, this description of scientific method will have to be clear and precise enough to (a) provide guidance to scientists, and (b) enable us to distinguish scientific behaviour (method) from non-scientific. We can proceed towards such a theory by following those parameters one step at a time.

Method

If we are to discover what scientific method is, it is important to state clearly what a method is. To say that it is a "procedure for attaining an object" or "a way of doing anything" does no more than substitute a set of words for one word. Caws provides a better description of a method when he

refers to "steps which must be taken, in a given order, to achieve a given end" [Caws, in Edwards, 1972, Vol.7, p.339]. The importance of *sequential* steps, or the *order* of steps, is accepted here.

However, to speak of a method implies it is a method of doing something or achieving some desired or anticipated end. Thus any method may be more fully specified as the (or a) method of chopping wood, catching fish, cooking pies, etc. This means that to speak of a method implies either some specific human (a) motive, (b) purpose, (c) aim, or (d) goal, which Caws recognises by referring to "an end". That implied element of the notion of a method is identified here by referring to some human **problem** to be solved, for the solution of which a method is employed. So broadly adopting, but slightly modifying, Caws' description, we can say:

A method is a definite procedure for solving some general kind of problem, which procedure involves a number of sequential, procedural steps (or steps which are followed in a specific order).

Methodological consistency

In the case of scientific method at least, it is not sufficient simply to have a specific method; to be a scientific method, a method must be used consistently. Scientists cannot be arbitrary in the methods they employ. To take an example from everyday life: suppose the recognised method of making an omelette is: 1. break some eggs into a bowl; 2. beat the eggs; 3. add other ingredients; 4. heat over a stove. It is obvious that we achieve a very different result if we 1. heat unbroken eggs on the stove, 2. beat the (now hard-boiled) eggs in with other ingredients; 3. heat this mixture. We can see that variations in method will produce variable results. This is so fundamental that it hardly needs to be said in relation to science. It would be absurd for an analytical chemist to use a standard method for testing a substance on one occasion, and consult a fortune-teller about a substance on another. In other words, to be a scientific method, a specific method will not only be appropriate, but consistently applied to the same kind of problem whenever that kind of problem arises.

Methods and rules

It may be thought that all methods are like recipes; that the practitioner simply follows a set of clear rules [see Chalmers, 1982, p.134ff], but that is not so. It would be possible to draw innumerable examples from the animal and

human worlds: of distinctive methods of collecting and eating food, making artefacts, etc., which are carried out without rules. In fact, the stipulation of rules for a method usually implies the pre-existence of a sound method.

Kinds of problems

It was suggested that to speak of a method implies some kind of problem to be solved. We can say that most human (and other animal) problems are practical problems: they involve --

- (i) *obtaining* something, either for its own sake, such as food, or as a means of obtaining something else, as money obtained enables us to purchase other things we want;
- (ii) *changing* something so that it is useful to us or so that we obtain something else, just as besieging armies destroyed fortifications as a means of defeating and subduing some enemy;
- (iii) *producing* something, as farmers produce grain, manufacturers produce things to sell, or artists produce or create music, paintings, plays, and so on; or
- (iv) *using* something as a means of achieving some human goal.

Problems of understanding or inquiry

No matter how we classify and define practical problems, we can say that the problems of philosophy, sciences, history and other academic disciplines are not practical problems in any of the ways just described, but by contrast, may be called problems of inquiry or understanding. The first and fundamental aim of any inquirer, philosopher, scientist, etc., is to understand the matter into which they are inquiring; it is not to obtain something, change anything, produce anything, or use anything for any other human purpose. The learned and scientific disciplines involve observing some subject or field, reading about it, describing it, explaining it, but above all, understanding it.

There is no doubt, of course, that humans have been stimulated to inquire into certain subjects with a view to achieving some practical end, but that does not alter the point. The main point is that it is clearly possible, in principle, to divide human problems into problems of inquiry or understanding on the one hand, and practical problems of all kinds on the other. So it has

been shown that the problems of science fall into a very definite and limited category, and that advances our inquiry one step.

Criteria of scientific method

It is not necessary to state immediately any specific problems or methods of inquiry. That task will be undertaken later. But it is possible to say that, if there is such a thing as scientific method, it will conform to certain quite general criteria. These are:

- (i) Scientific method will conform to the general definition of a method; it is a definite procedure for solving some general kind of human problem, which procedure involves a number of sequential, procedural steps.
- (ii) Scientific method will be a distinctive method, appropriate and restricted to sciences or inquiring disciplines; it will be concerned solely with problems of inquiry or understanding, as distinct from practical problems.
- (iii) The same sequence of procedural steps are applicable to the same general kind of problem, and may be repeated whenever that general kind of problem arises; it is possible that different specific steps may apply to different general kinds of problems or phases of inquiry.
- (iv) The sequential procedures of scientific method will (a) be adequate to deal with all the problems of science and (b) apply to every science.
- (v) In order to maintain methodological consistency, scientists consistently follow the same sequence of procedural steps for all instances of the same problem of inquiry.

And so we can consider the hypotheses that --

- (a) Scientific method is a systematically related set of sequential procedural steps for inquiring into any issue, or any general kind of problem of inquiry (in any scientific discipline), which involves considering, criticising and testing (proving or disproving) anything asserted, etc., in propositional form.
- (b) Scientific method is the defining feature of sciences.

- (c) Dialectic meets all of the criteria of scientific method, and appears to be the only thing that does so.

An empiricist description of scientific method

In this section an attempt is made to establish an empiricist theory of science as founded in scientific method; of dialectic as the basis of that method. In working towards this theory of science and scientific method, it will be necessary to examine and reject central rationalist doctrines and assumptions, notably the rationalist notions of (a) mind, (b) science as knowledge, and (c) mathematics as the model for all sciences: the reification of mathematics as the ideal of scientific knowledge. Clearly, our conception of science and scientific method will be different if we regard mathematics as a science or not; equally our conception of mathematics will be different if we regard it as a science or not. These issues will be taken up a little later.

It has been suggested that dialectic is consistent with the processes of observing, and presupposes observing both in relation to (a) some of the beliefs and assumptions held in any phase of dialectic, and (b) the consequences deduced by the dialectical process. This interrelationship between dialectic and observing was implicit at the time Socrates practised dialectic as it is today. It is also claimed that through the history of philosophy and science, dialectic has been greatly strengthened and supplemented by --

- (i) scholarship: study of the history of theories and controversies within specific disciplines and recording of ongoing work;
- (ii) systematic, disciplined, and critical methods of observing;
- (iii) experiment, which combines the dialectical method with critical observation under contrived (and controlled) conditions;
- (iv) methodological consistency;
- (v) mathematics: universal and methodologically consistent methods of dealing with quantitative matters and problems.

Space does not permit a detailed account of how these five components of scientific method have been integrated with dialectic, but some comments upon

each are necessary, especially in relation to the radical empiricist view taken of mathematics.

Scholarship: the study of the history of theories and controversies

It is hardly contentious that study of the history of a subject -- study of its theories, controversies, outstanding people and landmark findings or experiments -- is an important part of a trainee's introduction to any learned discipline, especially the sciences. It is equally traditional for an established scientist embarking upon a specific study to research the literature in that field: the history of past and current views. This kind of learning of views that have been put forward, discussed, criticised, and accepted or rejected, is a standard and vital part of learned disciplines including the sciences, and its functions should be understood, even if they appear obvious. Firstly, if there was no tradition of learning, or it was not followed, thinkers at one time would not have the benefit of the theories and arguments of earlier workers in the field, may well be going over ground already well covered, and may well go over that ground less thoroughly than it was covered previously. Secondly, if studying the works of earlier scholars is important for the scientific tradition, recording, and making available to others, (one's own) current work is an equally important part of that tradition for precisely the same reason. It is not unreasonable to conceive of science(s) as a long dialectical inquiry that continues through history between different contributors: some make a contribution and die; others pick up where they left off, and so on. If we take this view of science(s) -- of learning what others have done and said in the field previously; of recording one's views, arguments and findings; of engaging in a continuous history of investigation and theoretical controversy -- it is clear that scientists implicitly live by a morality not at all dissimilar from that which Socrates required of his partners in dialectic (and which Anderson echoed), that of stating forthrightly what one believes on the issue under discussion. Thirdly, it means that researchers in a specific science share a common understanding through common assumptions about their field. This is important during further dialectical inquiry, for a particular scientist's assumptions can be readily identified and understood by other participants in current discussions and, if necessary, examined, disputed, criticised and accepted or rejected.

This component of learning: of understanding of the history of a subject, is one important aspect of what Anderson described as **classicism** [SIEP, p.189ff]. Although it is well recognised as part of the scientific tradition, it is not

widely recognised as a vital part of scientific method. As conceived here, scholarship (including the recording of one's reflections, methods and findings) is important for the reasons given, in facilitating continued, informed dialectical discussion. If it is not regarded as scientific method, it must be regarded as the context within which scientific method takes place. One consequence of this conception of the place of "learning" and participating in ongoing inquiry in science is that it represents science as a discursive, dialectical, disputatious tradition as opposed to the rationalist conception of it as "knowledge".

Disciplined observing

If dialectic is a discursive method confined to discourse, then, while it may presuppose observing and be compatible with observing, it would not usually involve observing except, perhaps, in those relatively rare cases where the subject of discussion is present or visible. Whereas in a purely discursive method of inquiry it might be accepted or assumed that certain observations have been carried out or could be carried out, this is not the case in scientific inquiry where observational claims and assumptions are, whenever possible, tested, recorded and re-tested observationally. The vital point, of course, is that certain issues in discussion or inquiry can only be settled by observation; that observation is the ultimate test of certain issues, and by "ultimate test", we should understand the ultimate method of **proof** or **disproof**, given certain conditions. If we accept along with the rationalists that **under certain conditions** deductive proof is **proof** of a specific proposition, empiricists should not shrink from asserting that **under certain conditions**, observation of some "fact" is also **proof** of a specific proposition, and **disproof** of its contradictory [see p.214, above].

In requiring and adhering to rigorous methods of observation, scientific method extends and strengthens the discursive (that is critical reasoning) method of dialectic in another vital area of inquiry. Those who wish to co-operate in inquiry by discourse for a limited time may not be at the appropriate place(s) to carry out the necessary observations, and may have to settle for certain conclusions on the basis of assumed observations -- or agree that sufficient reliable observational evidence is not available to settle the issue. It must also be recognised that those skilled in dialectic may not have the necessary observational skills required to discover the sort of evidence they require.

Humans can easily make fundamental errors in dialectic if they rely entirely upon what they believe, assume, or assume they have observed. For example, if a person believes witches (women with supernatural powers) exist, they can readily believe they have seen a witch. It requires considerable dialectical skill to uncover hidden assumptions and fallacies of this kind: to show that what people believe they have observed is not so, but is based on what they assume. In connection with a quite different kind of problem in observing, critical thinkers (philosophers and scientists) are aware that we, as observers, can be deceived by the senses [c.f. Descartes, CSM,I,127]; that we can make errors of judgment in perception if, for example we attempt to estimate (a) the temperature of a room when we have a fever; (b) the temperature of a bucket of cold water after immersing our hand in hot water; (c) the colour of a bird flying against a brightly-coloured sunset sky; (d) whether a stick partly immersed in water is straight or bent; (e) the relative heights of a person standing next to us and one a kilometre away. We are aware that certain conditions of observation are not ideal and are prone to lead us into certain quite predictable sorts of error, and for accurate and reliable observations of a specific kind we must make those observations under quite definite, controlled conditions. Scientific observation, as opposed to "merely" perceiving or observing, attempts to take account of these sorts of problems and therefore becomes a much more critical and disciplined form of observing.

Furthermore, scientific observation takes place within a context -- it is always observing within the framework of some hypothesis, theory or rival theories [c.f. Chalmers, 1982, Ch.3; Chalmers, 1990, §4.2] -- and under certain restraints, which make it much more critical, restricted in its focus, and thus much more disciplined than "merely" perceiving. Scientists engaged in their field of work do not simply gaze out of their window, or "watch the grass grow", so to speak, and expect some hypothesis to present itself, or some important discovery to occur to them. Those thinkers who were (either favourably or unfavourably) interested in Copernicus' heliocentric theory were aware of certain implications or consequences of the theory. It implied that Venus would go through phases similar to the moon's [Chalmers, 1982, p.31f], and that there would be some difference in the apparent positions of the stars due to parallax in relation to the earth's orbit around the sun [Ibid, p.86]. They were therefore concerned to test this hypothesis or theory by observing or failing to observe those phenomena it implied. Their observations were quite specific: they were looking for something quite definite one way or the

other. They recognised that variations in the apparent brightness of Venus might be related to two different factors: its distance from the earth, or its phases. Copernicus' theory challenged, and was in opposition to the Ptolemaic, geocentric theory. Anyone involved in the controversy at the time would have been aware of that, and aware that both theories held circular movement in some esteem, and that the Ptolemaic theory postulated epicycles, etc. These assumptions would have been recognised and would have borne upon the arguments and observations both ways.

Scientific observation, then, is a disciplined form of observing. It is observing largely confined by the specific issues (theories) under consideration; it recognises a relevant range of assumptions; and in both of these ways, it recognises the possibility or likelihood of error due to partiality. It also recognises a range of other factors which might lead to error if the conditions under which certain observations are carried out are not favourable to exact discrimination in the area involved. It cannot make error impossible, but precautions can be taken to recognise, minimise, or eliminate, certain likely errors, to eliminate bias and to consider possible alternative explanations of observed differences.

Experiment

Where disciplined observing adds a dimension of exactitude to one aspect of dialectic, experiment adds another to the combined strengths of dialectic and disciplined observing. In fact, experiment is essentially dialectic combined with disciplined observing, except that where certain scientific studies cannot be contrived -- as, for example, observations of the stars, or animal behaviour "in the wild" -- controlled experiments are a distinctive scientific procedure insofar as the situation(s) to be studied are not naturally occurring, but are contrived situations, manipulated by the experimenter. The vital elements in an experiment, then, are (i) an hypothesis is put forward; (ii) it is tested by observation(s); (iii) the observations are based on a contrived situation set up by the experimenter. It is for these reasons that Anderson maintained "There is no real distinction between thinking and experiment. In each case we require some hypothesis, and in each case we test it by reference to what we believe, or find, to be the case, i.e., by whether or not its consequences are in accordance with facts which we know" [SIEP, p.14].

Methodological consistency

It seems clear that methodological consistency is implicitly recognised in everyday life as well as in philosophy and science, yet this term is not one in common use and very little, if anything, of a general theoretical nature is written about it. Methodological consistency is a form of behavioural consistency. It is implicitly recognised in systems of law, for example, when all cases of the same kind are dealt with in the same way. Kant's categorical imperative is, effectively, an appeal for methodological consistency, as more or less: treat all cases of a certain kind according to the same principle. We recognise methodological consistency in a person's behaviour if we believe they "practice what they preach", and methodological inconsistency if we believe they do not.

Methodological consistency must be distinguished from logical consistency and inconsistency which are relations which hold between "propositions".

It should suffice to illustrate the maintenance of methodological consistency in critical inquiry by examples from just three quite distinct areas: reasoning, observing and counting. We would regard as completely arbitrary (methodologically inconsistent) any person who sometimes accepted valid arguments as valid on some occasions and invalid on others: who argued validly when it suited their purpose to do so, but argued invalidly at other times when it suited their purpose. It could be contended that this kind of methodological inconsistency will inevitably yield variable results in reasoning, that is, fallacious results sometimes. Methodological inconsistency of this kind is clearly incompatible with a consistent approach to critical inquiry.

Consistency is equally important in observing. Let it be assumed that certain species of parrots are identified and distinguished by a distinctive colouration. Then it would be methodologically inconsistent, and produce inconsistent results, to sometimes identify these parrots under good lighting conditions, and at others under poor lighting conditions, e.g., flying against the sun, or in a red light.

Counting is an important observational process, and if it is to yield correct results, it must be done in a consistent, methodical way. It is not possible to count the number of birds in a large flock if many individuals are continually moving. An observer who sometimes counted the number of birds in flocks which are stationary and others in which there is considerable movement

would be methodologically inconsistent, and produce variable or unreliable results.

The point need not be laboured any further. It is assumed in science, although perhaps not so clearly in dialectic, that not only are methods of investigation required for various inquiring purposes but, once established, a method must be adhered to -- unless there is good reason to revise it; or, to express that another way, adherence to methodological consistency is taken as an integral part of having a method in inquiry and science. What needs to be shown is that mathematics, as it has evolved and been refined by the attention of scientists, provides methodologically consistent methods of counting, measuring (in a wide range of "dimensions") and calculating, and it is this which makes it an appropriate complement to science.

Consequences for the history of science

The foregoing account of science as a critical, disputatious, discursive process, based in the questioning and critical testing of beliefs, along with speculation (the formulation of hypotheses and theories) has important consequences for the history of science by contrast with the rationalist conception of science as knowledge. If science is knowledge, we cannot determine when or where science began, because on that view, we cannot distinguish between the mass collection of observations, or annals, which may be found in ancient Babylonian and Egyptian observations of the stars for example, and the genuinely theoretical and speculative science of the ancient Greek philosophers. According to the present view, the collection of data, without relating it to theories and without critical testing of theories, is not science. According to this view, on the evidence we have, the criticism of traditional views, and the positive activity of proposing alternative theories -- theoretical speculation -- began with the Greeks.

§4 Mathematics and Science

Anderson on mathematics

In Part II of *Empiricism*, Anderson argued for an empiricist view of mathematics consistent with his views argued in Part I. Unfortunately his discussion is restricted to geometry, leaving the issues of arithmetic, algebra, logarithms and calculus, etc. out of the discussion. Nevertheless, these arguments provide important guidelines for a wider view of mathematics. Anderson pointed out that on the view of the mathematical subjects as

"rational" sciences, it is maintained that over and above the theorems of geometry, there are first principles "which are unprovable" and "the whole science follows from these principles" [SIEP, p.6], a view propounded by Leibniz, who also claimed these principles cannot be denied [SIEP, p.7]. Anderson pointed out that such principles cannot provide us with, for example, the notion of a triangle: only observation can; and "without the figures there would be no proof because there would be nothing to talk about" [SIEP, p.7]. He argued that we could not treat or test "rational" principles against such "physical" things as diagrams of triangles "unless there were definite points of contact between" them [Ibid], and that means unless "rational" propositions and propositions concerning physical objects had terms in common. Assuming there are common terms between "rational" principles and "contingent" geometrical truths, then any inconsistency or contradiction which might arise between them would throw doubt on both equally:

If any such contradiction arose, the conclusion would not be that physical facts had failed to come up to geometrical requirements; it would be that our geometry had to be revised. The logic of application is simply the logic of syllogism; and if a geometrical theorem and a physical observation together imply the contradictory of a physical observation, we are as much entitled to question the theorem as to reject the observations. And if careful observation continues to give us the same results, we are bound to deny the theorem. [SIEP, p.8]

This is a justifiable procedure since "our geometrical theorems are ... the results of careful observation" [Ibid]. Thus, implication works both ways: "that which is capable of implying a fact is equally capable of being falsified by a fact" [Ibid]. On the other hand, if the rational principles of geometry (or any other mathematical principles) "have no practical consequences, there are no such principles" [SIEP, p.11]. Anderson argued, then, that there are no necessary or *a priori* truths or axioms in that sense, and no "rational" sciences in that sense; and concluded by saying:

... that science depends entirely on observation, i.e., on finding something to be the case, and on the use of syllogism, either for proof or for testing; or, more generally, on observation in connection with, and in distinction from, anticipation. This means that there is no distinction between empirical and rational science. Since everything that can be asserted can be denied or doubted, since deduction and hypothesis are always possible, all sciences are observational and experimental. [SIEP, p.6]

This suggests that the propositions of mathematics can be dealt with in precisely the same dialectical way as any other propositions.

From this very brief outline, two points of special interest must be stressed. Firstly, it appears that Anderson regarded geometry as a science, and we must assume he regarded other mathematical disciplines as sciences too. Secondly, his insistence that geometrical axioms should be subject to observational testing, is a plea for methodological consistency. Any attempt to exempt certain propositions from dialectical and observational testing is a case of special pleading, or methodological inconsistency.

Are mathematical disciplines sciences?

The issue of the relevance of mathematical reasoning to science cannot be settled until the relation between mathematics and science is understood. The rationalist view that science is knowledge is the basis of the claims that mathematics is science and the model for all other sciences. Once the rationalist theory of science is challenged and rejected, the question of the status of mathematics must be re-assessed. On the face of it, scientific investigation of the heavens, earth's atmosphere and oceans, plants, animals, etc., does not appear to conform to the deductive model of sciences that mathematics offers. The claimed distinction between rational and empirical sciences admits a fundamental distinction while masking it by claiming both are species of a genus. The rationalist definition of science as knowledge ignores the differences of method by which the "knowledge" of mathematics and empirical sciences is gained. Comparison of these two classes of disciplines is instructive. IF (empirical) sciences --

1. study a limited field of general kinds of things, and these general kinds of things are --
 - (a) naturally occurring (that is, not made by humans),
 - (b) things which are observable by their characteristics;
2. are concerned with --
 - (a) observing the kinds of things which are the objects of their study,
 - (b) describing them,
 - (c) classifying and dividing them into kinds,
 - (d) defining them by genus and difference, and
 - (e) explaining their relationships and causal interactions with other things;

3. proceed by speculation and dialectical testing --

- (a) formulating hypotheses in relation to the objects of their study and critically testing them in relation to what is known and what is observed, and
- (b) rejecting some of these hypotheses, and provisionally accepting some;

THEN mathematical disciplines do not conform to this description of science. They --

- (i) (a) DO NOT typically study naturally occurring general kinds of things, but study "things" which are human inventions, such as "numbers", dimensionless points, lines, triangles, etc. -- and if these are the "objects" of mathematics, they are not observable by their characteristics.
- (b) ARE NOT limited to some field of naturally occurring general kinds of things, but their quantitative principles, if they apply, apply generally; for example, the (quantitative) principles of arithmetic apply to any quantitative aspects of naturally occurring general kinds of things; the spatial principles of geometry apply to any field of two- or three-dimensional naturally occurring general kinds of things.
- (ii) ARE NOT primarily concerned with --
 - (a) observing the kinds of things which are the objects of their study,
 - (b) describing them,
 - (c) classifying and dividing them into kinds,
 - (d) defining them by genus and difference (but typically define their objects of study at the outset), or
 - (e) explaining their relationships and causal interactions with other things; they are not concerned with causal interaction between the objects of their study if these are numbers, dimensionless points, lines, triangles, etc.
- (iii) DO NOT typically proceed by --
 - (a) formulating hypotheses in relation to the objects of their study and critically testing these hypotheses in relation to what is known and what is observed about them,
 - (b) rejecting some of these hypotheses and accepting others.

On the basis of this comparative analysis, a case has been made out for saying that the mathematical disciplines are of a fundamentally different kind from the "empirical" or "physical" sciences; that while both are undoubtedly areas of study or learned disciplines, they do not employ the same methods and are not both "sciences" in the same sense.

If we take those disciplines agreed by all to be sciences: astronomy, physics, chemistry, geology, biology, etc., it appears science cannot be knowledge, because the main theories and propositions of those sciences have been subject to continual doubt, critical examination, revision and rejection, which is not possible if they consist of knowledge that is "certain" and true for all time. Because of this history of continual theoretical controversy, revision and rejection, we could never say which body of knowledge we should accept (at a particular time) as the science (knowledge) of astronomy, physics or chemistry. So the rationalist theory of science as knowledge appears to be both unhelpful and false, and the inclusion of the empirical sciences under the rationalist definition of "science" is based on an inconsistency in the rationalist theory itself. The rationalist division of sciences into rational and empirical is an acknowledgment that the mathematical disciplines are fundamentally different from the empirical sciences, but provides no justification whatsoever for calling both "sciences".

The material (empirical) foundations of mathematics

There can be no serious doubt that the bases of all mathematics were practical and absolutely empirical. Humans in various places on earth had devised systems of counting, measuring and calculating quantities before the age of dialectic, philosophy and science and, of course, before formal logic had been devised. These systems of counting and measuring quantities were recorded by conventional systems of numerals. What is clear from the earliest records concerning quantities is that they relate to quite mundane things such as gifts or taxes in the form of produce given or paid to the central temple or palace within specific communities [The New Encyclopaedia Britannica, 1992. pp.561, 563, 565]. The first appearance of mathematics (in the form of quantitative records) pre-dates Greek science by some two and a half thousand years. So it is safe to say that the earliest forms of arithmetic were non-scientific, mundane, practical, material, and empirical; and that the science of mathematics had its beginnings and foundations in material and empirical activity. So, while there is no question of our reconstructing or understanding the steps that occurred in the earliest development of

arithmetic, there is equally no question that they were *a priori* or non-empirical as rationalism would suggest. Subsequently, Greek mathematics treated numbers in a quite material and empirical way. Greek mathematicians represented numbers by pebbles or as dots in various configurations: as triangular, square, or oblong [Burnet, 1950, p.51-56]. Greek geometers, like all who followed them, drew diagrams of triangles and parallelograms upon which they based their arguments and findings or conclusions. There is, therefore, no doubt that the beginnings of Greek mathematics, like its pre-scientific foundations, were quite empirical. The practical basis of mathematics was recognised in ancient times: "Proclus, in his *Commentary on Euclid* for example, observes that geometry, literally 'measurement of land', first arose in surveying practices among the ancient Egyptians, for the flooding of the Nile compelling them each year to redefine the boundaries of properties. Similarly, Proclus continues, arithmetic started with the commerce and trade of Phoenician merchants." [The New Encyclopaedia Britannica, Vol.23, p.565]

Even if Proclus was not quite correct in that last detail, it is important to recognise that the ancients linked mathematics to practical problems. There is no place in the historical origins of mathematics for an account of *a priori* principles, or a non-empirical, "necessary" basis of these human activities.

We can relate the mathematical processes of counting and measuring to what the Greeks called "discrete quantity" and "continuous quantity": "The Greeks divided the field of mathematics into arithmetic (the study of 'multitude' or discrete quantity) and geometry (that of 'magnitude', or continuous quantity)" [The New Encyclopaedia Britannica, Vol.23, p.565].

We count discrete entities of the same general kind; we measure degrees of magnitude or quantity in a specific dimension or quality. Whenever we wish to count, we must --

- (a) first of all recognise a distinctive general kind of thing which we are going to count, or determine the quantity (number) of;
- (b) accept or devise a conventional system of counting.

If we were counting the number of sheep in a yard we would be making a fundamental mistake if we included the sheep dogs and the farmer, which clearly illustrates the "empirical" nature of counting. The conventions of counting can be very simply described. In order to correctly count the number

(quantity) of apples in a barrel or sheep in a pen, we have to adopt several conventions. At the very least, we must adopt --

- (i) some convention of indicating **every one** of the things in question;
- (ii) some convention of indicating each one **only once**;
- (iii) some convention of **reciting** certain counting words in correct order: "one, two, three.."; and
- (iv) the convention of reciting only one word for each single thing indicated (this could involve a system of marks, one-for-one; but these have to be counted along with recitation).

These conventions have to be learned and followed meticulously if numerous, fundamental errors in the relatively simple mathematical process of counting are to be avoided. Whenever we wish to measure, we must --

- (a) first of all recognise a distinctive general kind of characteristic or quality which we are going to measure, or distinguish by degrees of magnitude;
- (b) accept or devise a conventional system of measuring: a scale of degrees of quantity in the quality or dimension concerned; for example, a standard measure of length, angle, volume, temperature, or pressure, etc.;
- (c) accept or devise a conventional system of counting which will enable us to objectively measure (count) according to the standard unit.

Calculating is based on a conventional system of counting, but may be applied to "discrete" or "continuous" quantities. It, too, has its own conventions. The vital point is that the conventions relevant to each of these three aspects of mathematics are devised by humans, and are part of the method of any quantitative studies.

Just as counting, measuring and calculating were integrated in everyday life prior to the emergence of Greek science, so have they been integrated in science. In fact, the problems of empirical science have provided a great stimulus to mathematics. However it came about, mathematics became a partner to science and was advanced by philosophers who took a theoretical, not a

practical, interest in it. It seems inconceivable that it could have been discovered that the moon shone by reflected light without an appreciation of both (a) the shadows that would be formed on a spherical body relative to the different positions of a light source and an observer; and (b) the projection of these relative positions (angles) onto the heavenly bodies of sun and moon. The implications for astronomy of this application of geometrical knowledge to the heavenly bodies can hardly be overestimated. It was very significant in astronomy to recognise that the four seasons were not equal in length which would be the case if the sun orbited the earth (or vice versa) in a perfect circle [Farrington, op.cit., p.217]. The work of Plato's successors, influenced by Pythagoreanism, prompted Aristotle to complain that they were turning philosophy into mathematics, and to leave the Academy [Kitto, 1953, p.116]. However, the simplest of all mathematical procedures, counting, is of considerable importance to various sciences. It is vital in distinguishing kinds of flowering plants according to the number of their petals and leaves; it is vital in distinguishing and classifying kinds of animals by the numbers of their legs: two, four, six or eight. It should be emphasised that Kepler's mathematical account of planetary motion was an attempt to accurately describe the motion of the planets. If it does describe the way planets orbit around the sun, it is an important scientific achievement; but if it does not accurately describe the way planets orbit the sun, then it is false, and the actual way in which the planets orbit the sun would remain to be discovered and described. The conclusion which follows is that in this case, and many others like it, mathematics -- quantitative analysis and description -- is an integral part of scientific observation and description. It must be recognised that, conventional or not, counting and measuring are fundamental to discriminating observation and to accurate description, that is, describing of a quantitative nature. Description robbed of quantities would be an extremely limited kind of description.

It is not unreasonable to suggest -- in fact it would be absurd to deny -- that there has been interaction between mathematics and sciences from the moment Greek science emerged. As has been shown, (a) mathematical, or quantitative issues arise in any science and are essential for accurate description, if for nothing else; (b) geometry provided a stimulus to astronomy and was involved from the early years in Plato's assumption that the heavenly bodies moved "at *uniform* speed in perfect circles" [Ibid, p.216]; (c) scientific problems provided a stimulus to mathematics, for example in Kepler's calculation of planetary motion [O'Neil, op.cit., p.48f].

It is suggested here that the "certainty" of mathematics which appealed to Descartes, is based in these human conventions. If we accept the convention that the counting of discrete quantities proceeds in the invariable order: "one, two, three, four", it should not come as a surprise to anyone that two (of any kind of thing) added to two (of that kind) is four. There is no peculiar "necessity" about this; it is a simple, plain consequence of adopting that convention of counting. There is clearly no "necessity" about the number of planets being nine; though they consist of two nearer the sun than the earth, the earth, and six beyond earth, there is no "necessity" in the "contingent" fact that they are $2 + 1 + 6 = 9$. Any presumed "necessity" comes merely from the convention that most humans adopt in counting: $1 + 1 = 2$; $2 + 1 = 3$; ...". The same can be said of angular degrees. We cannot find in "nature" 360° around the centre of a circle. But once we adopt that convention, it is inevitable (but not "necessary" in any mystical sense) that (a) there are four right angles around the centre of a circle, or (b) the sum of the angles in a triangle is 180° .

The vital point is that all of these involve conventions established by various human groups and societies. None originates from a divine source, or from some *a priori* realm of mathematical Truths. None is inherent in humans, "the human mind" or human cultures. It is utterly implausible to suggest that although (a) any system of counting is conventional, and may differ from culture to culture, (b) any system of numerals (mathematical notation) is conventional and may vary from culture to culture, (c) any system of measurement (in any of thousands of possible qualities or dimensions) is conventional and may differ from culture to culture, (d) any system of calculating is conventional and may vary from culture to culture -- certain truths or principles of mathematics are "true", "necessarily true" and known *a priori*, or are inherent in the mind, which can only mean in all human minds.

The empiricist theory of mathematics

There is no reason to suppose that mathematics is a science, and no reason to suppose it is an entirely separate science from astronomy, physics, chemistry, biology, botany, or zoology. On the basis of the comparative analysis [p.231-2 above], it is clear that mathematics is quite different from the sciences in character and in method. Very clear and obvious evidence suggests that mathematics is integrated with the sciences, and is a vital, integral part of all science. On the evidence and arguments put forward here, then, it is

reasonable to claim that, no matter what other functions mathematics fulfil in practical human affairs, mathematics has an indispensable role in science, and the question then arises what that role is. The answer suggested here is that, no matter how it arose, mathematics constitutes an integral part of the method of inquiry in science, that part of the method of inquiry concerned with quantitative matters: with quantitative aspects of any problem of inquiry whatsoever. On this empiricist view, the conventions of counting, measuring and calculating which evolved in various cultures for various practical purposes have been adapted, standardised, refined and adopted as a vital part of the (conventional) method of inquiry in science; and as far as possible, these conventions are employed in methodologically consistent ways.

The empiricist view of mathematics is that mathematics is not a science, but an integral part of the method of all sciences; that part of the method of critical inquiry concerned with quantitative matters. Mathematics consists of three basic processes: counting, measuring and calculating. All aspects of mathematics are founded in a system of counting which is a thoroughly "empirical" process; is a form of observing, and fundamental to observing in all sciences. It is founded in human conventions in relation to general kinds of things with which people come into contact.

Mathematics -- the mathematical conventions of counting, measuring and calculating -- can only be distinguished from culturocentric beliefs and customs, from mysticism and magic, if it has some "objective", "empirical", or publicly observable reference, or can be applied indifferently to any relevant quantitative problem in any subject, in any culture. That is to say, if counting any discrete or continuous quantities (based on a specific convention of counting) applies in the fields of astronomy, architecture, land measurement, mechanical engineering, and so on indifferently, and irrespective of whether we are English, French, Chinese, or Maori, then it has transcended any specific subject matter and any particular culture. Or, to take another example, if the calculation of the area or circumference of any circular object (based on a specific convention of counting, another specific convention of measuring and another of calculating) applies in any field of investigation and irrespective of our cultural background, then it has transcended any specific subject matter and any particular culture. The universalisation of all systems of counting, measuring and calculating has not been achieved yet, although the standardisation of these conventional systems for science has moved a long way in that direction. But it must be recognised

that the various fields of mathematics have had long and often contentious histories, which is inconsistent with any claim that mathematics deals with the "certain", the "necessary" and what is known *a priori*.

It might be added that on this empiricist view, all sciences are both qualitative and quantitative, or are concerned with both issues of quality and issues of quantity or degree; that qualitative and quantitative matters are not separable into totally distinct realms of inquiry, or worlds. In other words, wherever issues of quality arise, there, too, issues of quantity arise, and vice versa. This is compatible with Anderson's claim that there is a single logic which all sciences share, and is the methodological interpretation of his doctrine of one way of being.

\$5 Conclusions

It has been argued that Anderson's doctrine of one way of being is incompatible with his own formal logic, appears to be *a priori* and metaphysical, thereby inconsistent with empiricism, and that this ontological view does not elucidate what logic is as a method. On the other hand, it has been argued that it is possible to obtain a consistent reading of his view of logic as dialectic, provided these ontological claims are abandoned. The main thesis being argued for in this dissertation is that Anderson's core philosophical position -- his empiricism, realism, pluralism and determinism -- is not metaphysical, but is founded in an overt method of inquiry: Socratic dialectic, which makes no assumptions, does not depend upon the notions of mind, forms, ideas, concepts, etc.; which method is empiricism, and so empiricism is not a doctrine.

In this Chapter, the method of Socratic dialectic, adopted and perhaps slightly modified by Anderson, has been described, shown to be the only method of critical inquiry, and the basis of scientific method. This account is consistent with empiricism as it is widely understood, and consistent with Anderson's claim that there is only a single logic. It elucidates several of his key (undefined) terms: logic, inquiry, discourse and criticism. This description shows that Anderson treated definition and problems of existence in a consistent way, in line with all other dialectical procedures. It might be added here that problems of definition and existence have always been fundamental concerns of dialectic, and are only made to appear extraordinary philosophical issues within a rationalist framework. In Chapter 6 [p.137ff, above], one of Anderson's most distinctive forms of argument -- his criticism

of relativism -- was described as a general methodological principle, and is therefore regarded here as one of his most important contributions to the clarification of dialectical method. So is his treatment of causality [see p.172, above]. So a number of major steps have been taken in support of the main thesis.

On this interpretation, Anderson's claim that there is only one -- a single -- logic does not mean merely that any beliefs, assertions, assumptions, etc., are expressible in one or other or a combination of the four categorical forms, but that they are testable only by the one dialectical method. And that explains why he held -- contrary to so much twentieth century philosophy -- that the same logic (method) applies equally to ethics, the social and psychological sciences, as well as the physical sciences.

Significantly, this account is consistent with the account of the opposition between rationalism and empiricism outlined at the beginning of Chapter 8, based on the central place of mind in rationalism and its rejection in empiricism. On that view, rationalist method is based on the notion of mind, and empirical method is not, but is founded in (a) dialectic: explicit, overt discourse, (b) public (usually repeatable) observational procedures, about and in relation to (c) publicly observable "things". Empiricism does not presuppose or depend upon any of those transcendental, rationalist postulates: mind, forms, ideas, concepts, qualia, knowledge (*a priori* or *a posteriori*), Laws of Thought analytic, necessary or contingent truths; the method of empiricism is not internal, unobservable and private or about unobservable and private entities.

It is interesting to note that empiricism as the dialectical, propositional, observational method of inquiry which makes no assumptions -- of a theological nature, or about mind, forms, ideas, etc. -- can nevertheless be employed to examine whether there is a God, whether humans are immortal, whether there is such a thing as mind or ideas, etc. Empirical method does not pre-judge these issues; does not presume minds exist or do not exist. It is appropriate for the examination and testing of all such questions.

It is significant that evidence already provided [p.120ff, above] established that Anderson wished to exclude mind from the processes of inquiry and logic, and this is supported by material from the introduction to his unpublished logic manuscript [c. 1923]. Although that introduction does not explicitly reject mind from logic, it states that logic is not concerned with motives and

is therefore not a mental science [p.1], and places logic in the realm of discourse and argument: "The study of logic ... begins from the fact that we argue with one another" [p.2]. This is clearly consistent with the theory of logic as dialectic, and with Anderson's important claim that "The empiricist, like Socrates, adopts the attitude of considering things in terms of what can be said about them, i.e., in propositions" [SIEP, p.4]. Whether Anderson realised it or not -- and it seems he did not -- that position is perfectly consistent with the complete rejection of the notion of mind.

Of course, it is not being claimed Anderson said that mind was a rationalist notion; but it is being claimed (a) that the exclusion of mind from inquiry or logic is perfectly consistent with a great deal that he said, and with the general "drift" of his thought; and (b) that what have been outlined as the empiricist views of logic, dialectic, criticism and scientific method are implicit in Anderson's position. Some major definitions associated with this view are set out in Appendix E.

Chapter 10: THE METHODOLOGICAL INTERPRETATION OF ANDERSON'S MAJOR ONTOLOGICAL DOCTRINES

In the two previous chapters it has been argued that the only consistent reading of Anderson's view of logic is that it is dialectic; that dialectic is empiricism, and that this interpretation elucidates several of Anderson's key terms and doctrines. In this chapter, that process is continued. Here it will be argued that the significance of Anderson's doctrines which appear metaphysical, is actually methodological or dialectical, not metaphysical. It has been argued (a) that Anderson's doctrine of one way of being, taken ontologically or metaphysically, is incompatible with his formal logic (and empiricism), (b) as are his claims about "things" (which encompass his realism, pluralism and determinism), and (c) that no sense can be made of "the conditions of existence". It will be argued that the methodological interpretation makes sense of the first two, and Anderson's concern with the categories, but that the notion of "conditions of existence" must be rejected. The crucial test of these radical emendations is whether they retain, and bring out, the distinctive character and "force" of Anderson's core "doctrines".

(i) The methodological interpretation of the doctrine of one way of being

The methodological interpretation of the doctrine of one way of being put forward in Wild [1993, p.142] and adopted with a slight amendment here, is:

1. All genuine problems of inquiry can be accommodated within a logic of four categorical propositional forms and syllogism, or within a system of propositional discourse.
2. All attempts to deal with matters of inquiry outside a logic of four propositional forms are illogical; which is to say --
 - (a) it is methodologically inconsistent to attempt to deal with issues which can be dealt with in a logic of four propositional forms, in some other form;
 - (b) any so-called issue for discussion or inquiry which cannot be expressed either as one, or a number of the four propositional forms is illogical, meaningless, nonsensical and untestable.

It is clear that this methodological formulation of the doctrine of one way of being makes no claim about being or existence, but removes that doctrine from the realm of metaphysics. It must be inquired whether it conveys the full and unique significance of the doctrine, and the answer is (a) that it certainly conveys something unique: Anderson's adherence to a categorical logic of four forms and a single method of inquiry; and (b) that it makes sense of a wide range of Anderson's key terms and claims, especially those expressed in terms such as:

- a single logic (of events) [SIEP, p.80-81, 87, 247]
- a logic of propositions or events [S/p.53]
- a predicative logic [S/p.148]
- a logic of things as historical [S/p.83]
- a pluralistic logic of events [S/p.87]
- a logic of situations [S/p.107-108]
- a spatio-temporal logic [S/p.123]
- the interlocking of all materials and all problems [S/p.194]
- there is a single logic which applies to all the sciences [S/p.212]
- the establishment of all scientific objects on a single level of investigation [S/p.247]

These are certainly distinctive Andersonian claims. If they have any significant meaning, then the methodological interpretation of the doctrine captures that significance. We can also see how this interpretation would construe other of Anderson's claims and terms, such as: "things on a common level" [S/p.54], that is, as falling under one method of inquiry or logic; "all things belong to the single order of events or propositions" [S/p.67]; "the equal reality of all existing things" [S/p.187] as requiring us to treat any "things" or subjects of inquiry in the same logical manner; "the interlocking of all materials and problems" [S/p.194] as any object of study and any problem of inquiry will be treated in accordance with the same logical or methodological principles appropriate to that problem; "explanation must be on the same level as the thing explained" [S/p.212], that is, in terms of the four categorical propositional forms. It also explains Anderson's claim that when we have made a mistake, "correction" (if it occurs at all) "will only occur by means of judgments of the same order" [S/p.37].

In short, this reading of the doctrine of one way of being is perfectly consistent with the theory of propositional discourse, or logic as dialectic, and consistent with many other related claims Anderson made. It removes all appearance of metaphysics from this doctrine yet reinterprets it as a very significant one consistent with -- or an alternative formulation of -- Anderson's unique views that there are only four propositional forms [SIEP, p.137ff] and one logic. It is consistent, also, with the main thesis that empiricism is a method of inquiry which makes no theological assumptions and does not presuppose the notions of mind or ideas.

(ii) The methodological interpretation of Anderson's claims about "Things"

The methodological interpretation of Anderson's many claims about "things" [see p.16 above] takes them as claims about the dialectical treatment of **any subject of inquiry** which might arise in discourse, which Anderson indicated by "those things we wish to speak about": "Taking 'things' roughly in the sense of subjects of possible propositions, it may be said that we can select those things we wish to speak about but what we say about them will be either true or false" [SIEP, p.18].

According to the methodological interpretation, the fundamental significance of all Anderson's claims about "things" is the maintaining of **methodological consistency** with any subject of inquiry or dialectic. In other words, if we are following a **method** of inquiry, we will follow precisely the same steps in relation to the same type of problem of inquiry; we will therefore treat any specific subject of inquiry (or any term in formal logic) in precisely the same way -- by the same method, or same procedural step -- as we would treat any other subject or term. This might be expressed another way, as "In critical inquiry, we do not treat any subjects or terms in a special or privileged way; we recognise as a kind of (as yet un-named) fallacy, the fallacy of special pleading or exceptional treatment of terms or subjects". Under this broad banner of methodological consistency, it is possible to re-phrase all of Anderson's claims about "things", while retaining their crucial significance. It should not be necessary to deal with every specific case; a number of key examples should suffice.

"Things" in space and time

According to Anderson's spatio-temporal theory, "all things belong to the single order of events or propositions" [SIEP, p.67]. Interpreted

methodologically, this means that any subject of inquiry has spatial relations to other things (or subjects of inquiry) and temporal relations to other events that, at other times, are also subjects of investigation. Expressing that another way, if someone claimed that some specific subject of inquiry had no spatial (or temporal) relations to anything else -- did not occur anywhere, or did not occur at any time -- we would not be able to understand *what* they were talking about, would not be able to understand how they could know, or find out about such a thing, and would not know how we could test *any* of their claims about such a "thing". Obviously, on these grounds, Anderson would have a strong case against Descartes' view of mind as a non-extended thing: or as occurring nowhere. It is reasonable to accept Anderson's suggestion that these are conditions of discourse: the kinds of implications, assumptions or presuppositions (although strictly speaking they are none of these) involved when we say anything, or assert that anything *is* something or other.

"Things" have characters and relations

What was just said about any subject of inquiry (any "thing") having spatial and temporal relations, is also the explanation of their having "relations":

The point is that we are always confronted simultaneously with questions of relations and questions of qualities, that relations and qualities are linked in the recognition, as in the existence, of any situation, any complex state of affairs, and that there is nothing less, and nothing more, than a complex (spatio-temporal) situation that we can be confronted with in dealing with any material, i.e., in any recognition of or search for connections and distinctions. ... there will always be connections to be found between any object and any other object, between any and any other problem or line of investigation. [SIEP, p.161]

Clearly, it would be appropriate to substitute for "object" here, "subject of inquiry (or investigation)".

Anderson also spoke about our recognising differences between two different things. If, when we say "A is different from B" we "are somehow also saying that A is B and B is A", discourse would be impossible [SIEP, p.28]. The methodological points can be made by considering two different cases: (i) studying two identical "things", A and B; i.e., when we are concerned with two subjects of investigation which are identical in characteristics; (ii) when we are concerned with two subjects of investigation, C and D, which are not identical, but distinguishable by their characteristics. In order to recognise that A and B are identical in their characteristics, we will have to be assured that when we study A at a specific time T_1 and a specific location L_1 ,

B is at a different location L_2 ; otherwise we may be observing A at location L_1 at T_1 , and A at location L_2 at T_2 . On the other hand, in order to know that C and D are two different "things", we need to (a) observe their respective distinctive characteristics, and (b) also observe their respective locations over periods of time. Seen at isolated times, what we believe are different "things" may be the same "thing"; e.g., as a larva turns into a fly or mosquito. If we see C at L_1 at T_1 , and D at L_2 at T_2 , we cannot be assured D is not C at a later stage at a different location. Even if we observe C at L_1 at T_1 and D at L_2 at T_2 , we cannot be assured that C's do not turn into D's at L_2 .

In summary, then, recognising that sometimes we are discussing --

- (a) the same "thing" (subject of investigation) at different locations and/or times,
- (b) two identical but different "things" (at the same or different locations and/or times), or
- (c) two quite different "things" at different locations,

this always involves or presupposes recognising certain characteristics and making observations that take into account spatial relations and temporal relations. These are conditions of critical inquiry, critical observing, and (critical) discourse.

This view constitutes a basic case against the rationalist-idealist claim (found in Leibniz's work) that a thing's relations are part of, or inherent in, the thing itself; and so constitutes an important part of Anderson's rejection of constitutive relations [see p.103 above].

"Things as complex"

Anderson's objection to utterly simple things involves his objection to the rationalist notions of mind and simple ideas or sense data. In the one case, it is directed against the claim that in knowing our own mind (as knowing), we know "all about it" [SIEP, p 31]. In the other case, it is directed against ideas whose "whole nature" can be apprehended [S/p.34]. In fact, the two cases are essentially the same. If we apprehend a "thing's" whole nature we know "all about" it; and such a claim can only be made about "something" conceived as utterly simple. The argument Anderson used against these two notions of simple substances is essentially the same argument he used against Parmenides' One: "as soon as [the Eleatics:] say anything about it whatever, they represent

it as having 'aspects' which are only relatively to it and are nothing in themselves; so that ... there are no aspects and there is no One. ... Thus, as soon as the monist says anything at all, he can be refuted" [S/p.48]. Interpreted methodologically, this can be re-phrased as: anything we assert, we assert in propositional form. But in doing so we cannot help but imply some difference (between subject and predicate). Therefore, if we assert anything, we cannot avoid implying that what we are talking about are of different kinds: X's and Y's. [See S/p.119, cited p.181f, above]

Digressing from the methodological account of Anderson's claims about "things", to an important related one: that of Anderson's metaphysical claims, some critical comment is in order. We can say that in terms of the number of actual parts two machines have one is relatively more complex than the other, or conversely, one is relatively more simple than the other. A pair of scissors (having two main parts and a fulcrum) is far simpler than a motor car. However, we cannot say this sort of thing in relation to infinite complexity. If all things are infinitely complex as Anderson claimed, then a pair of scissors is infinitely complex, and a car cannot be any more complex in that sense than a pair of scissors. (Nor could we compare "absolutely simple things" with relatively simple things if such terms were accepted.) The important point is that these notions of "absolute simplicity" and "infinite complexity" do not belong to the same dimension as relative simplicity and relative complexity. In fact the former are very peculiar notions quite properly called "metaphysical" -- no matter how vague that attribution may be. The vital conclusion from this digression is that in attempting to refute metaphysical claims and notions, by means other than "destructive" criticism of them -- that is, by setting up opposed claims and notions -- Anderson was led into metaphysics himself.

The methodological interpretation of Anderson's pluralism is not the assertion that all things are infinitely complex [SIEP, p.128], but the objection to any claim to utter simplicity; an insistence that we cannot understand **what** is being asserted or spoken about (what the subject of investigation is), since we cannot observe such a subject, cannot understand how anyone could know anything about such a subject, and cannot understand how any claims about such a subject could be tested. In other words, the empiricist who follows a critical method consistently, in relation to any term used in discourse, will require that such terms be subjected to the same observational procedures and tests as any other. Consistent empiricists will therefore reject the notion of

"absolute" or infinite complexity for precisely the same reason they would reject "utterly simple" things, minds or ideas.

It is assumed that all of Anderson's major, and unique claims about things can be interpreted in this way: can all be understood as methodological principles concerned with the way any subject of inquiry (or term) is treated in dialectical inquiry.

(iii) *The categories*

It must be inquired what the categories could possibly be within an empiricist position. They cannot be 'the *a priori* or non-empirical characters" [Alexander, 1966, Vol.1, p.185] of things or some transcendental kind of things over and above "ordinary things", or universal qualities in addition to "ordinary qualities". If we reject the notion of mind, they cannot be features of mind in a Kantian sense; and even Anderson, who accepted the notion of mind, could not accept that view, for he argued --

If it is held, in a Kantian manner, that existence in Space and Time and subjection to categories are our ways of regarding things, the answer is that either things are *not* under these conditions and so our principles are principles of error -- and in that case, moreover, we are wrong even about there being such principles, and in fact know nothing at all -- or things are under those conditions, and, while we are right in thinking so, their being so is an independent fact. [SIEP, p.46].

On the latter alternative, these conditions would be completely independent of mind, but Anderson would have to explain what these conditions are, and that seems to be impossible since it involves treating "them" as unobservable *a priori* conditions.

The methodological or dialectical interpretation is much simpler, and avoids all appearance of metaphysics. It is that at any time in inquiry, we are entitled to ask certain general kinds of questions about any purported subject of inquiry (or term); we are entitled to ask: "Where is it?", "When is it?", "How many of them?", "What effect did it/they have on other things?", "What effect did other things have on it/them?" etc. Following Anderson, Molesworth [1958, p.48] treated the categories in almost precisely this way. These methodological procedures are perfectly consistent with, and have effectively been covered by, the discussion of Anderson's claims about "things". Asking these questions in relation to any subject of inquiry is a matter of following a consistent method; they are, therefore, principles of method. They can be regarded as steps in a methodologically consistent method in relation to any

subject of inquiry, which will be followed with all subjects of inquiry without exception. So the methodological treatment of the sorts of problems raised in connection with categories seems to be the only way empiricists could recognise and deal with this important philosophical issue.

(iv) *The conditions of discourse and the conditions of existence*

It seems to be possible to accept Anderson's notion of the conditions of discourse [SIEP, p.11f], and say that anyone who failed to observe certain conventions of dialectic -- who, for example, was prepared to contradict themselves or accept invalid argument -- made discourse (with them) impossible; but it is not possible to accept Anderson's notion of the conditions of existence. We cannot understand what they could possibly be. If we are to consider the possibility of conditions of existence, we must know what existence is, and then what the conditions of existence are. But it appears that we could not explain what existence "is"; it cannot be regarded as an independent "thing" with its own qualities, as Anderson's realist criteria require; it cannot function either as a propositional subject or predicate; therefore we cannot understand in what way "the conditions of existence" would be conditions of "it". As argued p.23 above, they could not be compared to causal conditions which hold at certain times and not others; space is not operative at some times or places and not others; nor is time at some places and not others. To employ an extremely curious sort of argument, they are pervasive "things" which operate at all times and all places: they "hold" when whatever exists, exists; and when whatever does not exist does not exist. They cannot be compared to causal conditions, and therefore cannot properly be called conditions at all.

The methodological interpretation of these ontological doctrines throws light on each except the notion of the conditions of existence. The crucial test of these readings is whether they convey anything unique and important about Anderson's views. It is claimed here that they meet this requirement. This fact, coupled with the fact that they are consistent with the methodological interpretation of Anderson's logic as dialectic, means that this interpretation applies across the full range of Anderson's core philosophical views; it appears to be a significant one.

Chapter 11: CONCLUSIONS

This dissertation set out to identify and describe the bases of -- what is central and distinctive in -- Anderson's core philosophical position, and to understand his position as a systematic one. It began with a number of fundamental criticisms, and by asserting that some emendation of Anderson's views will be necessary if he is to be understood as an important, systematic philosopher. It suggests there are conflicting strands in Anderson's core position: arguments against the notion of mind and its paraphernalia; arguments for the notion of mind; a positive movement away from metaphysics yet an illogical re-introduction of it. If this is correct, it is not surprising that Anderson did not work out his position or give a systematic account of it. But that does not diminish his place in the history of philosophy.

It has been argued that Anderson made not one, but several fundamental errors at the point where he introduced his account of empiricism: the doctrine of one way of being. He incorrectly described (a) rationalism, (b) the opposition between rationalism and empiricism, and (c) empiricism; and was led into metaphysics as a result. Expanded, this argument is:

1. Anderson incorrectly described rationalism because he took the dichotomies of rationalism (which are generated by the notion of mind) as the marks of rationalism rather than (a) the notion of mind itself, and (b) the supposed method of inquiry which accompanies the notion of mind.
2. He incorrectly described the nature of the opposition between rationalism and empiricism as one of assertion and denial [SIEP, p.3] or contradiction, which it does not appear to be, and could not be if, as Anderson maintained, rationalism is an "illogical" or "unspeakable" view.
3. This led him to incorrectly describe empiricism as a doctrine. However, if rationalism is a metaphysical doctrine and empiricism is the contradictory of it, that suggests that empiricism is also a metaphysical doctrine, which appears incompatible with empiricism as usually understood. It is this incorrect interpretation of the opposition between the two that resulted in the appearance of metaphysics in Anderson's core position.

4. Anderson failed to see the pivotal role of the notion of mind in rationalism, and by accepting it, felt compelled to give an alternative realist-pluralist account of it.

The alternative argued for here, which is compatible with the great bulk and "direction" of Anderson's work is --

- (i) Rationalism is based in the notion of mind, and promotes the mistaken view that inquiring method is a function of mind. Through the notion of mind, rationalism generates the transcendental notions of forms or ideas, and from these the dichotomies of rationalism (divisions of knowledge and opinion, etc.). Also through the notion of mind (and "knowledge"), rationalism generates its own distinctive views of science, method, scientific method, logic (and mathematics), which results in those methods being viewed as private and untestable, quite unlike the methods of science. Nothing Anderson said disproves or seriously challenges this view.
- (ii) The opposition between rationalism and empiricism is not one of contradiction between doctrines, but an opposition about method -- related to the rationalist notion of mind and the claim that there is a method of inquiry governed by the mind (a view approximated by the claim that there are two ways of knowing).
- (iii) Empiricism is an overt method of inquiry, not a doctrine: a method which makes no assumptions, especially not about mind, ideas, etc.

It has been argued that this reading is consistent in major respects with what Anderson said about rationalism, and corresponds in most major respects with what he said about empiricism, metaphysics aside.

These are, without doubt, radical amendments to Anderson's stated position. On the other hand, they can be justified to a very large extent in principle and in detail; in principle because as argued previously, in order to avoid certain inconsistencies (which if left unattended would be absolutely fatal to Anderson's position), some radical revision is essential -- revision that necessarily involves rejecting some of Anderson's stated doctrines. But these amendments have also been supported or justified by a range of detailed claims. Furthermore, it is claimed that both of these rejected doctrines only serve to cloud and obscure what is central to and distinctive about Anderson's

core position, and that the methodological interpretation retains and elucidates this.

The main thesis argued for in this thesis is that Anderson's core philosophical position is not metaphysical, but is founded in an overt method of inquiry: effectively Socratic dialectic, which makes no assumptions, does not depend upon the notions of mind, forms, ideas, concepts, etc.; which method is empiricism, and so empiricism is not a doctrine. Also, it is claimed, this is the only way it can be understood as a coherent, systematic position. In other words, we can more readily understand Anderson as a consistent empiricist if we reject his apparently metaphysical claims and reinterpret them methodologically: as principles of critical inquiry or the dialectical method. The specific details of this thesis are:

- (i) Anything which anyone asserts, denies, believes, assumes, observes, describes, defines or hypothesises is expressed or expressible in one or another, or a combination, of the four categorical propositional forms.
- (ii) All valid arguments are, or can be, expressed as syllogisms or sequences of syllogisms (or sorites) consisting of premises and conclusions in the four categorical propositional forms.
- (iii) Through the process of definition, all terms or conceptions can be transcribed into (and tested in) propositional form.
- (iv) All assertions, denials, beliefs, assumptions, descriptions, definitions or hypotheses can be fully, adequately and consistently tested by --
 - (a) observation or
 - (b) dialectic in conjunction with observation.
- (v) The only ways that new theoretical findings can be made are by --
 - (a) observation -- subject to dialectical testing, and
 - (b) speculation (hypothesis, theory formulation) and dialectical testing.
- (vi) The foregoing processes completely exhaust the requirements of critical inquiry.
- (vii) It has not been demonstrated that there is any other --

- (a) completely consistent way of expressing, in a limited number of forms, everything that people assert, deny, believe, assume, observe, describe, define or hypothesise, etc.;
 - (b) completely consistent method of expressing valid arguments, and distinguishing valid from invalid arguments by form alone;
 - (c) consistent method of transcribing terms or conceptions (by definitions) into propositional form;
 - (d) methodologically consistent way of (a) making new theoretical discoveries, or (b) testing assertions, beliefs, hypotheses, etc. -- other than by observing, or dialectic and observing.
- (viii) Therefore, the propositional dialectic described previously is the only fully adequate and methodologically consistent method of discursive inquiry.
- (ix) Therefore --
- (a) All genuine problems of inquiry can be accommodated within a logic of four categorical forms of propositions and syllogism.
 - (b) All attempts to deal with matters of inquiry outside a logic of four propositional forms are illogical; which is to say:
 - it is methodologically inconsistent to deal with issues which can be dealt with in a logic of four forms, in some other form(s);
 - any so-called issue for discussion or inquiry which cannot be expressed either as one, or a number of proposition(s) of the four forms is illogical, meaningless, or nonsensical. [Wild, 1993, p.142]
- (x) In critical inquiry, in attempting to prove or disprove claims, beliefs, hypotheses, etc., we cannot appeal to any such postulates as --

- (a) an ultimate agent, mind, which determines truths;
- (b) ultimate or fundamental units underpinning truths or knowledge, such as ideas or concepts;
- (c) ultimate units or atoms underpinning reality, upon which all other realities or appearances depend;
- (d) knowledge, as if we can discover issues of truth or falsity already settled for all time;
- (e) truth: "true propositions" are not distinguished from "false" by any recognisable characteristics;
- (f) necessary truth or self-evident truth;
- (g) truths known *a priori*;
- (h) certainty or probability.

All of these are fictions; or illusions; that is, no assumptions we make, no beliefs that we hold, are in any way ultimate, necessarily true, certain, or in some way superior to other things we believe; everything that we believe or assume is of the same order, and that means they can all be doubted, tested, proved or disproved by the dialectical method.

- (xi) There is no demonstrable observable or practicable method of observing, describing, comparing or analysing any "mental entities": any ideas or concepts "in the mind", for there are no such things.

- (xii) It would be methodologically inconsistent to assert that some proposition(s) --

- (a) is the foundation of all human knowledge;
- (b) is above critical testing.

- (xiii) It cannot be maintained that there is only one, or a limited number of, proper starting place(s) for inquiry; on the contrary, inquiry can begin with any issue.

- (xiv) It cannot be maintained that there is any end to inquiry. On the contrary, there can be no logical end to inquiry. There is no distinguishing mark of "true propositions", or of any such thing as a "final truth" [see #(x) e), above].

(xv) In inquiry, or in settling matters of "truth/falsity", we can do no more and no better than dialectical investigation:

- (a) believe what we have observed;
- (b) believe, or accept as provisionally proven, what we have tested by dialectic and observing within the context of a range of beliefs or assumptions, not all of which can have been tested;
- (c) have reservations about certain claims, hypotheses, theories which have not been subjected to critical testing (to our knowledge or satisfaction);
- (d) reject, or seriously doubt any theories, etc., which conflict with what we believe and have observed or tested;
- (e) be prepared to critically test --
 - any of our own beliefs or assumptions,
 - any other claims hypotheses, theories.

The conviction that there is some other way of justifying or testing beliefs, or that there is some final authority on "truth", or that there is some fundamental basis of "knowledge" or belief, is an illusion.

(xvi) There is only one method by which we can make any progress in inquiry, discover anything, or test anything in propositional form, and that is by observing and dialectic; by "arguing it out", so to speak; that is by the method of stating what we believe on a specific issue, along with the assumptions we make in relation to that, then arguing out the consequences of what we believe and assume against (a) what others believe and assume, and (b) what we observe and discover by observational testing and reasoning. There is no other method of inquiry: of discovering or testing beliefs, etc. The process is one of continual risk, continual tension, continual "give and take"; of holding beliefs provisionally; of constant revision against continual new findings (or "the unexpected"). In this tussle we have no ultimate foundations, no

certainities, no undeniable truths, no ultimate standards except the standards of dialectic itself.

Now the methodological interpretation of Anderson's doctrine of one way of being, or his claim that there is a single logic, has considerable force. It is not just that this single dialectical method is adequate to all problems of inquiry, it also asserts that there is no other method of inquiry.

This methodological interpretation may be justified in a number of ways. Firstly, in presenting Anderson's position as a coherent, non-metaphysical empiricism of great generality and --

1. It describes Anderson's empiricism (interprets the doctrine of one way of being) as a **method**, not a doctrine, and therefore removes any appearance of metaphysics, or any appeal to *a priori* principles, from empiricism.
2. It explains --
 - (i) Anderson's realism pluralism and determinism:
 - (a) "negatively" as the rejection of unjustifiable rationalist-idealist metaphysical postulates, assumptions or methods; and
 - (b) "positively" as methodological principles of dialectic;
 - (ii) Anderson's claims about "things" (and hence his realism, pluralism and determinism) as methodological principles;
 - (iii) elucidates some of Anderson's most important (yet undefined) key terms: *logic, inquiry, investigation, discourse, criticism*;
 - (iv) Anderson's (implicit and unexplained) conception of logic: as dialectic, and elucidates his many claims about a single logic;
 - (v) why Anderson placed such great importance upon criticism since, on this view, criticism is identified with dialectic;

- (vi) Anderson's conception of science and scientific method as continuous with, and not essentially different from, philosophy [SIEP, p.181-183];
- (vii) Anderson's concern with academic freedom, freethought, and education;
- (viii) his opposition to rationalism, idealism, the theory of ideas, representationism and voluntarism under one main principle: the rejection of the notion of mind and all that goes with it, especially the notion of a method of discovering truths by analysis of what is in the mind.

3. Although radical, it is parsimonious, involving only two main amendments: (a) the rejection of the notion of mind, and (b) the rejection of the ontological/metaphysical claims. Both of these amendments are justifiable: in principle because some emendation of Anderson's core position is essential to avoid inconsistencies which are fatal to it; in detail because the first is compatible with a great deal that Anderson said, and compatible with the thesis that mind is a fundamental rationalist notion; the second removes the appearance of metaphysics from empiricism and those potentially fatal inconsistencies from Anderson's position.

4. Importantly, this interpretation preserves the distinctive character of Anderson's core position; it does not lose anything of major significance except what is metaphysical, ontological, and inexplicable.

The thesis that rationalism is based in the notion of mind and empiricism is a method which dispenses with that notion, can stand and be judged on its own merits. The thesis that Anderson's empiricism is based in a method which dispenses with the notions of mind, forms, ideas, concepts, etc.; that his whole position was moving in the direction of rejecting the notion of mind, is much more debatable. It at least has the virtue of providing a unity to a wide range of otherwise disjointed doctrines, and makes the radical character of Anderson's revolution more readily understood. Only a great deal more discussion of his work will reveal whether this thesis is justified. If it stimulates that sort of discussion it will have served philosophy well.

EPILOGUE [Supplementary material]

Had space permitted, this dissertation would have concluded with a chapter on the educational significance of the dialectical method and its place in the major public controversies of Anderson's life. If dialectic is the only method of critical inquiry; if it is the basic and defining method of philosophy, science and all learned disciplines, then it must hold *the* central place in education. Education can be defined as the process of passing on from teachers (critical inquirers) to students the understanding of this method, or alternatively, as Anderson might have put it, the induction into *culture*. Once this place of dialectic in the learned disciplines and education is understood, we can represent Anderson's role as public controversialist as that of a splendid practitioner and defender of that method. It is not an excess to view him as a modern Socrates. This uncompleted task partly explains the title of this dissertation. It is a task which the present writer hopes to complete.

Apart from giving a wide-ranging and coherent account of Anderson's views, the methodological interpretation also has two important consequences in bringing out differences between his position and that of almost all contemporary Anglo-American philosophers. The first is the clear incompatibility and opposition between Anderson's conception of logic and the Russellian; and the second, only touched upon here [p.5-6 above], is the difference between Anderson's apparent conception of "language" and the relation between logic and language to that of most contemporary philosophers. Some comment upon these two issues is in order.

It is clear that Anderson's formal logic, based on four categorical propositional forms, is incompatible with Russell's calculi; and that the present theory of logic as dialectic is incompatible with both Russell's calculi and Russell's apparent conception of logic. This presents a very serious difficulty for the adherents of Russell's logic. The theory of logic presented here is a perfectly "naturalistic" one insofar as it requires no special explanation; that being the view that logic is dialectic, and formal logic is the theory or description of dialectic. Now dialectic is a naturally occurring, observable, human phenomenon; there is nothing unusual about it; it is not metaphysical or transcendental; and it is certainly not a "deductive system" in the rationalist sense. Formal logic as the theory or description of dialectic is, similarly, non-mysterious, non-metaphysical, non-transcendental, and is not a "deductive system". That places Russell's calculi in a curious

position: they are obviously not naturally occurring things; they are supposed to be "deductive systems"; and so an account (definition) of their nature is imperative, and must be compatible with them.

This creates three crucial issue[s]. (i) It is clear that Russell and Whitehead **devised** the system of calculi: what might be called Russell's logic, and so it must be asked whether logic existed before that time, and if so, what it is. It might be argued that Russell's logic (calculi) has been in existence "implicitly" for all time, or since humans began to think rationally. But that appears to be false, and does not explain what it is. If it is maintained that Russell's calculi simply make explicit what has always been implicit in the human mind, or "Reason", then that theory is clearly rationalist, not empirical, and we are certainly entitled to ask (a) how that is known, and (b) how that could be tested, proved or disproved; and it would then appear that anyone committed to Russell's logic is committed to some -- it would seem, unexplained and untestable -- "theory" or conception of mind in which this logical, deductive system plays a vital part.

These are difficulties enough, but there is another, perhaps more intractable, problem. (ii) If logic is Russell's logic, it is obvious that Russell and Whitehead could not have used that logic -- the logic they were constructing -- in constructing it. That would be absurd. So they either constructed Russell's logic without employing logic, by employing a non-logical method, or they employed some other logic. It seems to be absurd to suggest that they constructed a logical system (which is the basis of all subsequent logical thinking) from a non-logical (i.e., illogical?) basis. Yet adoption of the other alternative -- that they employed some other logic in constructing the calculi -- is an admission that there is something, some "logic", more fundamental than the calculi. Taking a quite different view, it makes perfectly good sense to say that they employed, or engaged in, dialectic in constructing their calculi; but that would be recognition of the primacy claimed here for dialectic.

But there is a further difficulty: (iii) Russell's calculi have no place for, and appear to be incompatible with, dialectic. Certainly, they do not explain what dialectic is; they do not, and could not, describe its dynamic; they do not appear to recognise its existence or importance; but rather suggest that

dialectic is not required, as if "calculation" within the calculi fulfils all our logical purposes -- in the way Leibniz envisaged.

These difficulties within the theoretical bases of Russell's logic are critical. Clearly, they do not arise within the empiricist theory of logic as dialectic. But the second point concerning the construction of Russell's calculi, cannot possibly be answered without an answer to the first point: i.e., without an account or theory of logic.

In connection with these issues, it should also be pointed out that without a theory of logic, it is quite obviously impossible to give a satisfactory theoretical account of "the relation" between logic and language; and by the same reasoning, explanation of that relation is not possible either without a sound theory of language. These are areas in which contemporary philosophy has proceeded more on the basis of rationalist presumptions than theory; on the presumption that logic is concerned with the mental processes of thought and reasoning mediated through ideas, and the presumption that language is the expression of thought [c.f. Devitt and Sterelny], certain words representing (or standing for) certain ideas; while ideas somehow represent "things". While the methodological interpretation is of major importance in showing why Anderson's logic is not representationist, and so much contemporary philosophy (connected with Russell's logic) is, adequate discussion of these matters would require another dissertation.

At any rate, the methodological interpretation provides a view of Anderson's place in the history of philosophy as unique: as a revolution against the prevailing and powerful influence of rationalism, or the pervasive and abiding influence of the Socratic notion of soul or mind; as an attempt to assert and defend the complete autonomy of that method of inquiry identified here with empiricism. It could be argued that Anderson's life and work, his philosophical thought and the controversies in which he was involved, all centred around one thing: the practice and defence of the method of critical inquiry, a method which is subject to no authority, no rules, and no laws, but operates solely according to its own principles. He saw that any interference with this process is an attack upon its integrity -- and he refused to subvert its principles in the service of any other human interest.

The implications of rejecting the notion of mind are profound and far reaching, and for that reason the ramifications of rationalism should be recognised. It has been argued that rationalism generated or determined a specific view of science and a specific view of inquiring method. However, this sort of claim can be generalised, so that rationalism -- and the notion of mind especially -- should be seen as fashioning a distinctive conceptual scheme of humans, human behaviour, thinking, morality, even of human society and law.

1. From its theological assumptions interwoven with the notions of soul or mind, will and reason, rationalism has fashioned its own conceptions of:
 - (a) human behaviour, controlled by that part of the mind called the will, which is a completely autonomous, "active" agent, not subject to any outside causal influence;
 - (b) morality and moral responsibility, as if there is only one element at work in human behaviour: the goodness or badness of the will;
 - (c) human society and law, as if society was firstly, an institution of God amongst humans, and secondly, consisted solely of individuals, each having only moral responsibility, not social responsibility, or attachments to different social forces;
 - (d) science, as the examination of various parts of God's creation.

2. Through the notion of mind, or that part of it called intellect or reason, classical rationalism has fashioned its own **representationist** conceptions of --
 - (a) human perception or observation, as mediated through mental entities, *sensa*, ideas, concepts;
 - (b) knowledge, mediated through ideas, etc., but true in the absolute sense of incontrovertible or true for all time;
 - (c) memory, as something contained wholly within the mind (what Anderson called the "storehouse" view of knowledge; SIEP, p.72n, 173n) and mediated by mental entities: ideas, etc.;
 - (d) reasoning, as a completely internal and private process of mind, mediated by mental entities;
 - (e) logic, or inquiring method, as concerned with reasoning, that is, with a completely internal and private process of the mind;

- (f) language, as the communication of thought, therefore involving a relationship with mental entities that cannot be observed, therefore involving a relationship which can never be observed, tested, verified or falsified.
3. Through the notion of mind, rationalism represents mathematics as a rational science: as the manifestation of pure reason operating independently of sense and the ideas of sense.

It is being claimed that the notion of mind, like the notion of God or any supernatural power, is a very pervasive one: it infuses many other human conceptions, so that any thorough-going rejection of the notion of mind requires critical examination and revision of many other related fields. If we reject the notion of mind, probably the most important revision that is necessary is the rejection of the notion of ideas or concepts, and it will be obvious that in philosophy this alone would constitute a major revolution. It cannot be claimed that Anderson saw his own empiricism-realism as a revolution against the notion of mind and its ramifications, but it is not unreasonable to portray his criticisms of rationalism as a move in that general direction.