

THE SCIENTIFIC METHOD AS AN APPLICATION OF ECONOMICS

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In my judgement, the single most crucial feature distinguishing the scientific method from other approaches to the formation of beliefs is its at least implicit recognition that conceptual knowledge is a product of human action, created to serve human ends. Earlier systems of thought were almost always based on the assumption that concepts were in some way pre-existent, as a sort of unchangeable natural resource, and that correct belief depended on finding the right set of eternal truths and staking a claim on them — that there was a fixed, static set of concepts and truths available, and a man's only recourse was to adhere to these truths as unchangeable certainties whatever the cost. The fundamental ideas of any such system were placed outside the domain of rational discourse. Whether the source of true belief was held to be written pronouncements by Jesus or Buddha or Karl Marx, or long-standing traditions or generally accepted norms, or the intuitive revelations of a man's own subconscious mind, or visions and revelations from the supernatural world, all these systems said that a man had no power to generate ideas by the action of his own powers of observation and judgement, but was required to take what was given him. The crucial novelty of the scientific method was that it recognised that the source of knowledge is human action of a specific, structured kind, and set out to discover methods for performing this kind of action efficiently and coherently.

SCPTICISM

Earlier denials of fixed, final knowledge had occurred; but these had been, in essence, variants of scepticism. Scepticism can be defined as the position that no human action can possibly generate or obtain conceptual knowledge. Few men ever carry this view out to its logical conclusion; to do so would be to abandon all beliefs, all thoughts, all standards of judgement and conduct, all motives and purposes, as illusory, and to regard the world as the Void of Hindu and Buddhist metaphysics, toward which no action can be performed. Almost all sceptics, even the most devout Buddhists or the most complete Pyrrhonians (Pyrrho's position was, in essence, "Nobody can be sure of anything — and I'm not sure that that statement is true"), still seek to take some actions in the world they perceive, and therefore must make some use of concepts. The main result of their position is that it makes such knowledge, in essence, a black market commodity, one which they use but are in principle committed to avoiding, and thus makes it impossible for them to evolve coherent standards for distinguishing valid from invalid or workable from unworkable beliefs. As far as they believe anything, they rely on some mixture of dogma, tradition, revelation, authority, intuition, and science; but they are committed to denying this, or to hushing it up, and have no adequate critical machinery for testing its origins or worth. A consistent sceptic should be in a state of catatonia, or else of regression to infancy or animality; any theoretical position whatever, even scepticism, is ruled out by his beliefs. To the degree to which a man avoids this state, he has acted in a way inconsistent with scepticism; it is therefore justifiable to analyse the actual working basis of his beliefs and of his methods of forming them, just as one would evaluate such a basis if it were openly avowed.

THE RATIONALIST/EMPIRICIST DICHOTOMY

A more specifically philosophical variant of this controversy of dogmatists and sceptics is the rationalist/empiricist dichotomy. In essence, the rationalist position is that knowledge is to be attained by thought alone, apart from experience; the empiricist takes the reverse view. The meaning of this becomes clearer if one remembers that logic is a tool for the control of

concepts, and that perceptions of the external world are the raw material from which concepts are constructed. Most empiricists admit those procedures by which concepts are constructed from them; thus, an empiricist would admit that I know that I am now typing these words, but would deny that I know that this typewriter is the product of human manufacture, classical mechanics, or that I am of the species *homo sapiens*, or any other conceptual proposition I might make on present evidence.

A rationalist, by contrast, would generally admit the operations by which I detect inter-relations among concepts, but would deny the validity of perceptions, and would therefore conclude that my concepts, or at least the most crucial of them, are of validity independent of their capacity to order and explain my perceptions of the external world. This position implies that I do not make concepts, but merely notice their pre-established existence and use logic to see their inter-relationships. The philosophical basis of science, at least implicitly, calls for an alliance of logic and observation, logic serving to perform the operations which generate conceptual knowledge and observation providing the raw material. An excellent statement of this orientation is Ayn Rand's "Reason is the faculty that perceives, identifies and integrates the material provided by man's senses."¹ By contrast, the rationalist wants logic to operate on nothing except pure abstractions; the empiricist rejects anything except the raw data of the senses. In Francis Bacon's words,

"Those who have handled sciences have been either men of experiment or men of dogmas. The men of experiment are like the ant; they only collect and use: the reasoners resemble spiders, who make cobwebs out of their own substance. But the bee takes a middle course, it gathers its material from the flowers of the garden and of the field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy: for it neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments and lay it up in the memory whole, as it finds it; but lays it up in the understanding altered and digested. Therefore from a closer and purer league between these two faculties, the experimental and the rational, much may be hoped ..."²

The raw material of a scientist's activity is the external world as he perceives it. Science is not concerned with anything but the perceived world in relation to which men act; it accepts something definite, meaningful, and cognitively useful about what is perceived. (This doesn't mean that an individual scientist may not behave in a way inconsistent with this principle; simply that when he does so he is not acting as a scientist.) A statement's meaning, for a scientist, is ultimately the set of all perceived events which is integrated into a coherent whole. Most scientific work involves data which have already undergone a fairly extensive amount of logical processing; but these data must in the long run be referred back to immediate perception. Science is in essence a tool evolved for the purpose of making such perceptions, and the mind's activity in analysing them, rationally comprehensible. Such comprehension may be applied to other concerns, or valued for its own sake — though it would presumably not be valued by anybody if it were not for the biological utility of having a coherent model of the world as a guide to activity; biologists are coming to regard the nervous system as a cybernetic device whose biological function, as set by evolution, is precisely to set up such a model in an animal's consciousness — but only such comprehension is the concern of science. The implicit basis of science, stated in its strongest form, is that only the natural world, the world accessible to perception and governed by causality, actually exists. This is the idea which Antony Flew refers to as "Strato's presumption".³

CONCEPTUAL KNOWLEDGE

A concept is made either from perceptions or from other concepts; essentially, it is a category within which perceived objects can be placed, which can be brought into awareness in the absence of those external objects, on the basis of its meeting criteria set by some particular aim. Concepts are in essence open-ended, serving not merely as listings of past experience but as tools for the projection and analysis of future experiences. Concepts, in turn, are formed into propositions, which assert linkages between various concepts or between concepts and perceptions.



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THE MARGINAL VALUE OF CONCEPTS

The value of concepts, like that of all products of human action, is marginal; that is, the value of a concept is determined, not by any universal criterion valid for all men or for the totality of any one man's life, but by each man's cognitive needs at a particular moment. A concept serves to make all objects which can be seen as similar in relation to particular concerns or situations into a single unit. The same objects may be cross-classified for different purposes; discovery of different relations between situations and concepts by logical analysis, which is itself a form of human action, may make old categories redundant; discovery of new data by observation may make a concept useless within the range of interest opened by that data, as the Newtonian concepts of mechanical quantities were made useless by the data of modern physics. In all these cases, the value of the concepts changes. A concept is a tool for the isolation of certain features of experience and the analysis of their relation with other such features; but tools are normally subject over the course of time to being refined or discarded. Alternatively, the same category may be retained and found useful — as the concept 'man' has been useful for millenia - but new relationships may be discovered between entities in that category and those in other categories, requiring that the definition used be changed. A definition is, in essence, the most economical test for distinguishing those entities which occupy a given category from those which do not; new observations may make the test unworkable, or new logical integrations may discover a simpler one. The same process goes on with explanatory hypotheses. Such a hypothesis postulates the existence of entities or of attributes of entities which cannot be perceived, but which would act in ways which would generate various sorts of observed events according to a common principle. For example, molecules cannot be directly perceived; but their existence would explain numerous features of the real world in a simple and economical way. Again, the value of a hypothesis depends on the context in which it is used. As this context changes, so does the value.

THE MYTH OF EQUILIBRIUM

All of these cases can be placed in a single category; the non-existence in human action of equilibrium. Equilibrium can be defined as any situation in which all observations have been foreseen, all logical integrations made, and consequently all goods are being used in the most productive way possible and no gains can be made by creating new ways of using them. A primary theorem of economics is that equilibrium does not exist; while the economy constantly moves towards this state, it is always prevented from reaching it by the occurrence of new observations or integrations. The same can be said of final certainty. For any set of data, there is an appropriate set of certainties to be arrived at by the scientific method; for any stage of logical evaluation of data, some beliefs may be held as certain; but it is never possible to arrive at a stage where new observations or new logical connections can be ignored. Concepts are not preexistent and limited; any concept is a tool created on the basis of certain experiences. At any stage of knowledge, it is possible to hold an evolutionary certainty, but not a fixed certainty. The only way a concept can properly be challenged is by the presentation of new logical integrations or new observations, and its utility remains unchanged by any challenge not based on these; but it is necessary to remain open to such challenges.

COGNITIVE PROFIT AND LOSS

The evolution of new beliefs should be guided, specifically, by profit and loss — measured in terms of cognitive productivity. If some concept is more rewarding than others, if it explains more data, then a mind unhampered by prejudice will extend its application until it is just equal to others in its power to generate new integrations, and the long-term cognitive returns on its use are just enough to outweigh the effort which must be expended in making that particular integration. In other words, if it's much easier to think about things in terms of evolutionary biology than in terms of special creation of species, then an increasing number of questions will be analysed in these terms, until everything has been classified as a case of evolution which can be so classified without becoming far-fetched or uninteresting. At this point, a new centre of thought will develop, a new theoretical integration be invented.

FREE COMPETITION OF IDEAS

A crucial feature of this process is free competition among ideas. Any concept's worth can be judged accurately only against the entire mental field of perceptions and concepts. The suppression of data, or the invention of pseudo-data — in particular, of apparently meaningful symbols which are either equivocal or based on exclusion of significant data — can block thought from producing the fullest degree of comprehension and efficacy. It is necessary that all data be given recognition, and that all concepts be allowed to develop the fullest cases for their validity and to com-

pete for belief. This has in fact been at least partially recognised as an explicit principle of science; a scientist is expected to prevent his own preference for an established theory from blinding him to data inconsistent with that theory or favouring another theory. Now, free competition among institutions satisfying people's wants on the market can be seen in precisely this way; nonintervention in other men's use of their property, and avoidance of fraud, are precisely means of allowing men free access to data concerning the various means of satisfying their wants, rather than giving them a false or distorted picture of the resources available to them. The essence of the scientific method is free competition among various conceptual systems for explaining and organising the data of experience. At any stage, any hypothesis gets exactly the degree of reliance it can by its power to organise experience. Many other features of the scientific method as classically formulated can be seen as plainly economic in intent; for example, Occam's Razor, the principle that the entities postulated by any explanatory hypothesis must be kept to a minimum. The essential guide to the rational use of concepts is profit and loss, formulated in informational terms as measured by data.

THE PHILOSOPHY OF SCIENCE

A similar statement can be made about the meta-level of scientific thought, the structure of analyses of the correct procedures in forming concepts. Normally, these procedures are thought of as themselves fixed; but there is no reason why they should be regarded in this way. One important application of the scientific method should be to the generation of new formulations of the philosophical basis of the scientific method itself, and the creation of better procedures for logical thought. The scientific method need not in fact be defined by the specific procedures worked out for investigation of any set of phenomena; it can be defined better by reference to its central orientation toward free competition of ideas, or to whatever other formulation may be developed as an extension of this principle. Philosophy traditionally involved the defense of positions which were taken as final truth; but if philosophy is to be itself a science, then it must be subject to the evolution of new approaches and integrations. I normally view philosophy as investigation of the nature and presuppositions of the scientific method; new logical integrations can be developed in this field, and should be evaluated as rigorously as those which appear in any other field.

DOGMA AND MONOPOLY

Finally, on the basis of this analysis, it becomes possible to see fixed belief in economic terms, as in essence the entrenchment of a special interest group in a position of monopoly which enables it to suppress free competition — in this case, by suppressing relevant data or making up false data to support a position. As with competition in material production, this is most often done by subverting the agency which is supposedly charged with protecting other systems from such attack. In the mind, this is philosophical belief; in social systems, government or its analogs. This is where the existence of competing, mutually critical analyses of the procedures of science can play a crucial role. Any one philosophy may be subverted into dogma; this process is vastly restrained by the existence of a number of competing philosophical systems for the ordering of procedures of thought. Those philosophies which have rigidly prescribed every aspect of belief have made neither scientific nor philosophical progress, but have settled into stagnation analogous to that of the middle ages or of totalitarian societies; those which have permitted free competition among scientific ideas have achieved progress in this area, but have tended to remain armed camps within the mind, resisting all innovation, a spectacle as anomalous as the existence of national barriers to trade and travel and communication and the defense of individual liberty in an age of worldwide communications and trade. New ideas characteristically originate away from such systems of belief, around novel problems and questions, just as new enterprises are seldom created by any government. To the degree to which philosophy can be separated into schools and systems, it has ceased to be scientific, and is instead priestly or political; and in just this degree it is incapable of serving any genuinely valuable function, and is a nucleus of stagnation and confusion. A system can integrate thought without dominating it so as to fix it into stagnation, but only to the degree to which it is constantly tested by new thought and given only such reliance and certainty as it can justify in free competition with other systems.

NOTES

1. Ayn Rand, *For The New Intellectual*, New American Library, New York, 1961, p. 125.
2. Francis Bacon, *Novum Organum*, Book I, Aphorism XCV; cp., see *The Philosophical Works of Francis Bacon*, J. M. Robertson, ed., George Routledge and Sons, London, 1905, p. 288.
3. Antony Flew, *The Presumption of Atheism*, Pemberton-Elek, London, 1976. And see also "Stratonician Presumption" in A Flew, ed., *A Dictionary of Philosophy*, Pan Books, London, 1979, p. 317.