CONJECTURES AND REFUTATIONS

The Growth of Scientific Knowledge

by

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TO

F. A. VON HAYEK

6

A NOTE ON BERKELEY AS PRECURSOR OF MACH AND EINSTEIN

> I had only a very vague idea who Bishop Berkeley was, but was thankful to him for having defended us from an incontrovertible first premise.
>
> SAMUEL BUTLER

I

THE PURPOSE of this note is to give a list of those ideas of Berkeley's in the field of the philosophy of physics which have a strikingly new look. They are mainly ideas which were rediscovered and reintroduced into the discussion of modern physics by Ernst Mach and Heinrich Hertz, and by a number of philosophers and physicists, some of them influenced by Mach, such as Bertrand Russell, Philip Frank, Richard von Mises, Moritz Schlick,[1] Werner Heisenberg and others.

I may say at once that I do not agree with most of these positivistic views. I admire Berkeley without agreeing with him. But criticism of Berkeley is not the purpose of this note, and will be confined to some very brief and incomplete remarks in section v.[2]

Berkeley wrote only one work, *De Motu*, devoted exclusively to the philosophy of physical science; but there are passages in many of his other works in which similar ideas and supplementary ones are represented.[3]

The core of Berkeley's ideas on the philosophy of science is in his *criticism*

[1] Schlick, under the influence of Wittgenstein, suggested an instrumentalist interpretation of universal laws which was practically equivalent to Berkeley's 'mathematical hypotheses'; see *Naturwissenschaften*, **19**, 1931, pp. 151 and 156. For further references see footnote 23 to section iv of ch. 3, above.

[2] I have since developed these ideas more fully in ch. 3, above; especially section 4.

[3] Apart from *DM* (= *De Motu*, 1721) I shall quote *TV* (= *Essay towards a New Theory of Vision*, 1709); *Pr* (= *Treatise concerning the Principles of Human Knowledge*, 1710); *HP* (= *Three Dialogues between Hylas and Philonous*, 1713); *Alc* (= *Alciphron*, 1732); *An* (= *The Analyst*, 1734); and *S* (= *Siris*, 1744). As far as I know, there does not exist an English translation of *DM* which succeeds in making clear what Berkeley meant to say; and the Editor of the latest edition of the *Works* even goes out of his way to belittle the significance of this highly original and in many ways unique essay.

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of Newton's dynamics. (Newton's mathematics were criticized by Berkeley in *The Analyst* and its two sequels.) Berkeley was full of admiration for Newton, and no doubt realized that there could have been no worthier object for his criticism.

II

The following twenty-one theses are not always expressed in Berkeley's terminology; their order is not connected with the order in which they appear in Berkeley's writings, or in which they might be presented in a systematic treatment of Berkeley's thought.

For a motto, I open my list with a quotation from Berkeley (*DM*, 29).

(1) '*To utter a word and mean nothing by it is unworthy of a philosopher.*'

(2) The meaning of a word is the idea or the sense-quality with which it is associated (as its name). Thus the words 'absolute space' and 'absolute time' are without any empirical (or operational) meaning; Newton's doctrine of absolute space and absolute time must therefore be rejected as a physical theory. (Cf. *Pr*, 97, 99, 116; *DM*, 53, 55, 62; *An*, 50, Qu. 8; *S*, 271: 'Concerning absolute space, that phantom of the mechanical and geometrical philosophers, it may suffice to observe that it is neither perceived by our sense, nor proved by our reason . . .'; *DM*, 64: 'for . . . the purpose of the philosophers of mechanics . . . it suffices to replace their "absolute space" by a relative space determined by the heavens of the fixed stars. . . . Motion and rest defined by this relative space can be conveniently used instead of the absolutes. . . .')

(3) The same holds for the word 'absolute motion'. The principle that all motion is relative can be established by appealing to the meaning of 'motion', or to operationalist arguments. (Cf. *Pr* as above, 58, 112, 115 'To denominate a body "moved" it is requisite . . . that it changes its distance or situation with regard to some other body . . .'; *DM*, 63: 'No motion can be discerned or measured, except with the help of sensible things'; *DM*, 62: '. . . the motion of a stone in a sling or of water in a whirled bucket cannot be called truly circular motion . . . by those who define [motion] with the help of absolute space. . . .')

(4) The words 'gravity' and 'force' are misused in physics; to introduce force as the cause or 'principle' of motion (or of an acceleration) is to introduce 'an occult quality' (*DM*, 1–4, and especially 5, 10, 11, 17, 22, 28; *Alc*, vii, 9). More precisely, we should say 'an occult metaphysical substance'; for the term 'occult quality' is a misnomer, in so far as 'quality' should more properly be reserved for observable or observed qualities—qualities which are given to our senses, and which, of course, are never 'occult'. (*An*, 50, Qu. 9; and especially *DM*, 6: 'It is plain, then, that it is useless to assume that the principle of motion is gravity or force; for how could this principle be known any more clearly through [its identification with] what is commonly called an *occult quality*? That which is itself occult explains nothing; not to mention that an unknown acting cause might more properly be called a [metaphysical] *substance* rather than a *quality*.')

(5) In view of these considerations Newton's theory cannot be accepted as an explanation which is truly *causal*, i.e. based on true natural causes. The view that gravity causally explains the motion of bodies (that of the planets, of free-falling bodies, etc.), or that Newton discovered that gravity or attraction is 'an essential quality' (*Pr*, 106), whose inherence in the essence or nature of bodies explains the laws of their motion, must be discarded (*S*, 234; see also *S*, 246, last sentence). *But it must be admitted that Newton's theory leads to the correct results* (*DM*, 39, 41). To understand this, 'it is of the greatest importance . . . to distinguish between *mathematical hypotheses* and the *natures* [*or essences*] *of things*[4] . . . If we observe this distinction, then all the famous theorems of mechanical philosophy which . . . make it possible to subject the world system [i.e. the solar system] to human calculations, may be preserved; and at the same time, the study of motion will be freed of a thousand pointless trivialities and subtleties, and from [meaningless] abstract ideas' (*DM*, 66).

(6) In physics (mechanical philosophy) there is no causal explanation (cf. *S*, 231), i.e. no explanation based upon the discovery of the hidden nature or essence of things (*Pr*, 25). '. . . real efficient causes of the motion . . . of bodies do not in any way belong to the field of mechanics or of experimental science. Nor can they throw any light on these . . .' (*DM*, 41).

(7) The reason is, simply, that physical things have no secret or hidden, 'true or real nature', no 'real essence', no 'internal qualities' (*Pr*, 101).

(8) There is nothing physical *behind* the physical bodies, no occult physical reality. *Everything is surface*, as it were; physical bodies are nothing but their qualities. *Their appearance is their reality* (*Pr*, 87, 88).

(9) The province of the scientist (of the 'mechanical philosopher') is the discovery, 'by experiment and reasoning' (*S*, 234), of *Laws of Nature*, that is to say, of the regularities and uniformities of natural phenomena.

(10) The Laws of Nature are, in fact, regularities or similarities or analogies (*Pr*, 105) in the perceived motions of physical bodies (*S*, 234) '. . . these we learn from experience' (*Pr*, 30); they are observed, or inferred from observations (*Pr*, 30, 62; *S*, 228, 264).

(11) 'Once the Laws of Nature have been formed, it becomes the task of the philosopher to show of each phenomenon that it is in conformity with these laws, that is, necessarily follows from these principles.' (*DM*, 37; cf. *Pr*, 107; and *S*, 231: 'their [i.e. the "mechanical philosophers' "] province being . . . to account for particular phenomena by reducing them under, and showing their conformity to, such general rules.')

(12) This process *may* be called, if we like, 'explanation' (even 'causal explanation'), so long as we distinguish it clearly from the truly causal (i.e. metaphysical) explanation based upon the true nature or essence of things. *S*, 231; *DM*, 37: 'A thing may be said to be mechanically explained if it is reduced to those most simple and universal principles' (i.e. 'the primary laws of motion which have been proved by experiments . . .' *DM*, 36) 'and proved,

[4] Concerning the equivalence of '*natures*' and '*essences*' see my *Open Society*, ch. 5, section vi.

by accurate reasoning, to be in agreement and connection with them . . . This means to *explain* and solve the phenomena, and to assign them their *cause* . . .' This terminology is admissible (cf. *DM*, 71) but it must not mislead us. We must always clearly distinguish (cf. *DM*, 72) between an 'essentialist' [5] explanation with appeals to the nature of things and a 'descriptive' explanation which appeals to a Law of Nature, i.e. to the description of an observed regularity. Of these two kinds of explanation only the latter is admissible in physical science.

(13) From both of these we must now distinguish a third kind of 'explanation'—an explanation which appeals to *mathematical hypotheses*. A mathematical hypothesis may be described as a procedure for calculating certain results. It is a mere formalism, a mathematical tool or instrument, comparable to a calculating machine. It is judged merely by its efficiency. It may not only be admissible, it may be useful and it may be admirable, yet it is *not science*: even if it produces the correct results, it is only a trick, 'a knack' (*An*, 50, Qu. 35). And, as opposed to the explanation by essences (which, in mechanics, are simply false) and to that by laws of nature (which, if the laws 'have been proved by experiment', are simply true), the question of the *truth* of a mathematical hypothesis does not arise—only that of its *usefulness as a calculating tool*.

(14) Now, those principles of the Newtonian theory which 'have been proved by experiment'—those of the laws of motion which simply describe the observable regularities of the motion of bodies—are true. But the part of the theory involving the concepts which have been criticized above—absolute space, absolute motion, force, attraction, gravity—is not true, since these are 'mathematical hypotheses'. As such, however, they should not be rejected, if they work well (as in the case of force, attraction, gravity). Absolute space and absolute motion have to be rejected because they do not work (they are to be replaced by the system of fixed stars, and motion relative to it). ' "Force", "gravity", "attraction",[6] and words such as these are useful for purposes of reasoning and for computations of motions and of moving bodies; but they do not help us to understand the simple nature of motion itself, nor do they serve to designate so many distinct qualities. . . . As far as attraction is concerned it is clear that it was not introduced by Newton as a true physical quality but merely as a mathematical hypothesis' (*DM*, 17).[7]

(15) Properly understood, a mathematical hypothesis does not claim that anything exists in nature which corresponds to it—neither to the words or terms with which it operates, nor to the functional dependencies which it appears to assert. It erects, as it were, a fictitious mathematical world behind that of appearance, but without the claim that this world exists. 'But what

[5] The term 'essentialist' (and 'essentialism') is not Berkeley's but was introduced by me in *The Poverty of Historicism*, and in *The Open Society and Its Enemies*.

[6] The italics in the Latin original function here as quotation marks.

[7] This was more or less Newton's own opinion; cp. Newton's letters to Bentley, 17th January, and especially 25th February 1692–3, and section 3 of ch. 3, above.

is said of forces residing in bodies, whether attracting or repelling, is to be regarded only as a mathematical hypothesis, and not as anything really existing in nature' (*S*, 234; cf. *DM*, 18, 39 and especially *Alc*, vii, 9, *An*, 50, Qu. 35). It claims only that from its assumptions the correct consequences can be drawn. But it can easily be misinterpreted as claiming more, as claiming to describe a real world behind the world of appearance. But no such world *could* be described; for the description would necessarily be meaningless.

(16) It can be seen from this that the same appearances *may* be successfully calculated from more than one mathematical hypothesis, and that two mathematical hypotheses which yield the same results concerning the calculated appearances may not only differ, but even contradict each other (especially if they are misinterpreted as describing a world of essences behind the world of appearances); nevertheless, there may be nothing to choose between them. 'The foremost of men proffer . . . many different doctrines, and even opposite doctrines, and yet their conclusions [i.e. their calculated results] attain the truth . . . Newton and Torricelli seem to disagree with one another, . . . but the thing is well enough explained by both. For all forces attributed to bodies are merely mathematical hypotheses . . . ; thus the same thing may be explained in different ways' (*DM*, 67).

(17) The analysis of Newton's theory thus yields the following results:

We must distinguish

(*a*) Observations of concrete, particular things.

(*b*) Laws of Nature, which are either observations of regularities, or which are proved ('*comprobatae*', *DM*, 36; this may perhaps mean here 'supported' or 'corroborated'; see *DM*, 31) by experiments, or discovered 'by a diligent observation of the phenomena' (*Pr*, 107).

(*c*) Mathematical hypotheses, which are not based on observation but whose consequences agree with the phenomena (or 'save the phenomena', as the Platonists said).

(*d*) Essentialist or metaphysical causal explanations, which have no place in physical science.

Of these four, (*a*) and (*b*) are based on observation, and can, from experience, be known to be true; (*c*) is not based on observation and has only an instrumental significance—thus more than one instrument may do the trick (cf. (16), above); and (*d*) is known to be false whenever it constructs a world of essences behind the world of appearances. Consequently (*c*) is also known to be false whenever it is interpreted in the sense of (*d*).

(18) These results clearly apply to cases other than Newtonian theory, for example to atomism (corpuscular theory). In so far as this theory attempts to explain the world of appearances by constructing an invisible world of 'inward essences' (*Pr*, 102) behind the world of appearances, it must be rejected. (Cf. *Pr*, 50; *An*, 50, Qu. 56; *S*, 232, 235.)

(19) The work of the scientist leads to something that may be called 'explanation', but it is hardly of great value for *understanding* the thing explained, since the attainable explanation is not one based upon an insight

into the nature of things. But it is of practical importance. It enables us to make both *applications* and *predictions*. '. . . laws of nature or motions direct us how to act, and teach us what to expect' (*S*, 234; cf. *Pr*, 62). Prediction is based merely upon regular sequence (not upon causal sequence—at least not in the essentialist sense). A sudden darkness at noon may be a 'prognostic' indicator, a warning 'sign', a 'mark' of the coming downpour; nobody takes it as its cause. Now *all* observed regularities are of this nature even though 'prognostics' or 'signs' are usually mistaken for true causes (*TV*, 147; *Pr*, 44, 65, 108; *S*, 252–4; *Alc*, iv, 14, 15).

(20) A general practical result—which I propose to call 'Berkeley's razor'—of this analysis of physics allows us *a priori* to eliminate from physical science all essentialist explanations. If they have a mathematical and a predictive content they may be admitted *qua* mathematical hypotheses (while their essentialist interpretation is eliminated). If not, they may be ruled out altogether. This razor is sharper than Ockham's: *all* entities are ruled out except those which are perceived.

(21) The ultimate argument for these views, the reason why occult substances and qualities, physical forces, structures of corpuscles, absolute space, and absolute motion, etc. are eliminated, is this: we know that there are no entities such as these because we know that the words professedly designating them must be meaningless. *To have a meaning, a word must stand for an 'idea'*; that is to say, for a perception, or the memory of a perception; in Hume's terminology, for an impression or its reflection in our memory. (It may also stand for a 'notion', such as God; but the words belonging to physical science cannot stand for 'notions'.) Now the words here in question do not stand for ideas. 'Those who assert that active force, action, and the principle of motion are in reality inherent in the bodies, maintain a doctrine that is based upon no experience, and support it by obscure and general terms, and so do not themselves understand what they want to say' (*DM*, 31).

III

Everybody who reads this list of twenty-one theses must be struck by their modernity. They are surprisingly similar, especially in the criticism of Newton, to the philosophy of physics which Ernst Mach taught for many years in the conviction that it was new and revolutionary; in which he was followed by, for example, Joseph Petzold; and which had an immense influence on modern physics, especially on the Theory of Relativity. There is only one difference: Mach's 'principle of the economy of thought' (*Denkoekonomie*) goes beyond what I have called 'Berkeley's razor', in so far as it allows us not only to discard certain 'metaphysical elements', but also to distinguish in some cases between various competing hypotheses (of the kind called by Berkeley 'mathematical') with respect to their *simplicity*. (Cf. (16) above.) There is also a striking similarity to Hertz's *Principles of Mechanics* (1894), in which he tried to eliminate the concept of 'force', and to Wittgenstein's *Tractatus*.

What is perhaps most striking is that Berkeley and Mach, both great admirers of Newton, criticize the ideas of absolute time, absolute space, and absolute motion, on very similar lines. Mach's criticism, exactly like Berkeley's, culminates in the suggestion that all arguments for Newton's absolute space (like Foucault's pendulum, the rotating bucket of water, the effect of centrifugal forces upon the shape of the earth) fail because these movements are relative to the system of the fixed stars.

To show the significance of this anticipation of Mach's criticism, I may cite two passages, one from Mach and one from Einstein. Mach wrote (in the 7th edition of the *Mechanics*, 1912, ch. ii, section 6, § 11) of the reception of his criticism of *absolute motion*, propounded in earlier editions of his *Mechanics*: 'Thirty years ago the view that the notion of "absolute motion" is meaningless, without any empirical content, and scientifically without use, was generally felt to be very strange. Today this view is upheld by many well-known investigators.' And Einstein said in his obituary notice for Mach ('Nachruf auf Mach', *Physikalische Zeitschr.*, 1916), referring to this view of Mach's: 'It is not improbable that Mach would have found the Theory of Relativity if, at a time when his mind was still young, the problem of the constancy of velocity of light had agitated the physicists.' This remark of Einstein's is no doubt more than generous.[8] Of the bright light it throws upon Mach some reflection must fall upon Berkeley.[9]

IV

A few words may be said about the relation of Berkeley's philosophy of science to his metaphysics. It is very different indeed from Mach's.

While the positivist Mach was an enemy of all traditional, that is non-positivistic, metaphysics, and especially of all theology, Berkeley was a Christian theologian, and intensely interested in Christian apologetics. While Mach and Berkeley agreed that such words as 'absolute time', 'absolute space' and 'absolute motion' are meaningless and therefore to be eliminated from science, Mach surely would not have agreed with Berkeley on the reason why physics cannot treat of real causes. Berkeley believed in causes, even in 'true' or 'real' causes; but all true or real causes were to him 'efficient or final causes' (*S*, 231), and therefore *spiritual* and utterly beyond physics (cf. *HP*, ii). He also believed in true or real causal *explanation* (*S*, 231) or, as I may perhaps call it, in 'ultimate explanation'. This, for him, was God.

All appearances are truly caused by God, and explained through God's intervention. This for Berkeley is the simple reason why physics can only describe regularities, and why it cannot find true causes.

It would be a mistake, however, to think that the similarity between

[8] Mach survived Einstein's Special Theory of Relativity by more than eleven years, at least eight of which were very active years; but he remained strongly opposed to it; and though he alluded to it in the preface to the last (seventh) German edition (1912) of the *Mechanik* published during his lifetime, the allusion was by way of compliment to the opponent of Einstein, Hugo Dingler: Einstein's name and that of the theory were not mentioned.

[9] This is not the place to discuss other predecessors of Mach, such as Leibniz.

Berkeley and Mach is by these differences shown to be only superficial. On the contrary, Berkeley and Mach are both convinced that there is no physical world (of primary qualities, or of atoms; cf. *Pr*, 50; *S*, 232, 235) behind the world of physical appearances (*Pr*, 87, 88). Both believed in a form of the doctrine nowadays called phenomenalism—the view that physical things are bundles, or complexes, or constructs of phenomenal *qualities*, of particular experienced colours, noises, etc.; Mach calls them 'complexes of elements'. The difference is that for Berkeley, these are directly caused by God. For Mach, they are just there. While Berkeley says that there can be nothing physical behind the physical phenomena, Mach suggests that there is nothing at all behind them.

V

The great historical importance of Berkeley lies, I believe, in his protest against essentialist explanations in science. Newton himself did not interpret his theory in an essentialist sense; he himself did not believe that he had discovered the fact that physical bodies, by their nature, are not only extended but endowed with a force of attraction (radiating from them, and proportional to the amount of matter in them). But soon after him the essentialist interpretation of his theory became the ruling one, and remained so till the days of Mach.

In our own day essentialism has been dethroned; a Berkeleian or Machian positivism or instrumentalism has, after all these years, become fashionable.

Yet there is clearly a third possibility—a 'third view' (as I call it).

Essentialism is, I believe, untenable. It implies the idea of an *ultimate* explanation, for an essentialist explanation is neither in need of, nor capable of, further explanation. (If it is in the nature of a body to attract others, then there is no need to ask for an explanation of this fact, and no possibility of finding such an explanation.) Yet we know, at least since Einstein, that explanation may be pushed, unexpectedly, further and further.

But although we must reject essentialism, this does not mean that we have to accept positivism; for we may accept the 'third view'.

I shall not here discuss the positivist dogma of meaning, since I have done so elsewhere. I shall make only six observations. (i) One can work with something like a world 'behind' the world of appearance without committing oneself to essentialism (especially if one assumes that we can never know whether there may not be a further world behind that world). To put it less vaguely, one can work with the idea of hierarchical levels of explanatory hypotheses. There are comparatively low level ones (somewhat like what Berkeley had in mind when he spoke of 'Laws of Nature'); higher ones such as Kepler's laws, still higher ones such as Newton's theory, and, next, Relativity. (ii) These theories are not mathematical hypotheses, that is, *nothing but* instruments for the prediction of appearances. Their function goes very much further; for (iii) there is no pure appearance or pure observation: what Berkeley had in mind when he spoke of these things was always the result of interpretation, and

(iv) it had therefore a theoretical or hypothetical admixture. (v) New theories, moreover, may lead to re-interpretation of old appearances, and in this way change the world of appearances. (vi) The multiplicity of explanatory theories which Berkeley noted (see Section ii (16), above) is used, wherever possible, to construct, for any two competing theories, conditions in which they yield different observable results, so that we can make a crucial test to decide between them, winning in this way new experience.

A main point of this third view is that science aims at *true* theories, even though we can never be sure that any particular theory is true; and that science *may* progress (and know that it does so) by inventing theories which compared with earlier ones may be described as better approximations to what is true.

So we can now admit, without becoming essentialist, that in science we always try *to explain the known by the unknown*, the observed (and observable) by the unobserved (and, perhaps, unobservable). At the same time we can now admit, without becoming instrumentalist, what Berkeley said of the nature of hypotheses in the following passage (*S*, 228), which shows both the weakness of his analysis—its failure to realize the conjectural character of all science, including what he calls the 'laws of nature'—and also its strength, its admirable understanding of the logical structure of hypothetical explanation.

'It is one thing', Berkeley writes, 'to arrive at general laws of nature from a contemplation of the phenomena; and another to frame an hypothesis, and from thence deduce the phenomena. Those who suppose epicycles, and by them explain the motions and appearances of the planets, may not therefore be thought to have discovered principles true in fact and nature. And, albeit we may from the premises infer a conclusion, it will not follow that we can argue reciprocally, and from the conclusion infer the premises. For instance, supposing an elastic fluid, whose constituent minute particles are equidistant from each other, and of equal densities and diameters, and recede one from another with a centrifugal force which is inversely as the distance of the centres; and admitting that from such supposition it must follow that the density and elastic force of such fluid are in the inverse proportion of the space it occupies when compressed by any force; yet we cannot reciprocally infer that a fluid endowed with this property must therefore consist of such supposed equal particles.'

7

KANT'S CRITIQUE AND COSMOLOGY

ONE HUNDRED AND FIFTY years ago Immanuel Kant died, having spent the eighty years of his life in the Prussian provincial town of Königsberg. For years his retirement had been complete,[1] and his friends intended a quiet burial. But this son of an artisan was buried like a king. When the rumour of his death spread through the town the people flocked to his house demanding to see him. On the day of the funeral the life of the town was at a standstill. The coffin was followed by thousands, while the bells of all the churches tolled. Nothing like this had ever before happened in Königsberg, say the chroniclers.[2]

It is difficult to account for this astonishing upsurge of popular feeling. Was it due solely to Kant's reputation as a great philosopher and a good man? It seems to me that there was more in it than this; and I suggest that in the year 1804, under the absolute monarchy of Frederick William, those bells tolling for Kant carried an echo of the American and French revolutions —of the ideas of 1776 and 1789. I suggest that to his countrymen Kant had become an embodiment of these ideas.[3] They came to show their gratitude to a teacher of the Rights of Man, of equality before the law, of world citizenship, of peace on earth, and, perhaps most important, of emancipation through knowledge.[4]

[1] Six years before Kant's death, Poerschke reports (see his letter to Fichte of 2nd July 1798) that owing to Kant's retired way of life, he was being forgotten even in Königsberg.

[2] C.E.A.Ch. Wasianski, *Immanuel Kant in seinen letzten Lebensjahren* (from *Ueber Immanuel Kant, Dritter Band*, Königsberg, bei Nicolovius, 1804). 'The public newspapers, and a special publication have made Kant's funeral known in all its circumstances.'

[3] Kant's sympathies with the ideas of 1776 and 1789 were well known, for he used to express them in public. (Cf. Motherby's eye-witness report on Kant's first meeting with Green in R. B. Jachmann, *Immanuel Kant geschildert in Briefen—Ueber Immanuel Kant, Zweiter Band*, Königsberg bei Nicolovius, 1804).

[4] I say 'most important' because Kant's well-deserved rise from near poverty to fame and comparatively easy circumstances helped to create on the Continent the idea of emancipation through self-education (in this form hardly known in England where the 'self-made

A broadcast given on the eve of the hundred and fiftieth anniversary of Kant's death. First published (without the footnotes) under the title 'Immanuel Kant: Philosopher of the Enlightenment' in The Listener, **51**, 1954.