HUME ON MATHEMATICS

> " Une confusion s'est établie, comme un dogme, qui fait de la différence humienne entre *relations d'idées* et *points de fait* l'analogue de notre différence présente entre *logique* et *fait*."
>
> A-L. Leroy.[1]

My sole purpose in this paper is to try and correct what I take to be a common misinterpretation of Hume's opinions on mathematics. I shall not enquire whether he was right or wrong in holding these opinions. Nor shall I offer opinions of my own.

It is, I think, at the present time quite widely believed that Hume held mathematical propositions to be analytic, thus taking a view akin to that of Leibniz and sharply opposed to Kant's on the one hand and Mill's on the other. This interpretation is, of course, based on the short discussion of mathematics in the *Enquiry concerning Human Understanding*. It is recognised that it does not fit at all well the fuller discussions in the *Treatise*. Nevertheless, the present tendency seems to be to interpret the *Treatise* in the light of the *Enquiry*, and to represent Hume in the earlier work as groping after the view he finally got clear, or nearly clear, in the later one. This is the line taken by Mr. D. G. C. MacNabb in his *David Hume*, etc.[2]

So to interpret Hume's discussions of mathematics seems to me to be both anachronistic and thoroughly misleading—not least because it obscures certain affinities between his views and some aspects of those of Mill and Kant. It gives a quite disproportionate importance to the very cursory treatment of mathematics in the *Enquiry*, virtually ignoring Hume's earlier and more elaborate treatment of the subject.

I shall try to show that, whilst Hume indubitably held mathematical propositions to be *a priori* and necessary, his apparent conception of a necessary proposition was wider than the current—or indeed Kant's—conception of an analytic one ; that, whilst he did not explicitly pose the question, Analytic or Synthetic ?—the terms are after all not his—he came closer in the *Treatise* to regarding mathematical propositions as synthetic necessary than analytic truths ; and that it is at least disputable whether a significantly different view was taken in the *Enquiry*. In passing I shall try also to dispose of the view which a quick reading of the *Treatise* might suggest that Hume there held geometrical propositions to be synthetic *a posteriori* and those of arithmetic and algebra to be analytic.

[1]*David Hume*, Paris 1953, p. 76, note 4.

[2]London 1951. This is avowedly a short introduction for the general reader, but perhaps for that very reason all the more representative of current opinion.

I shall *first* examine Hume's general account of mathematics and necessary truth in *Treatise* Bk. I, Part III, Sect. I, *secondly* the account of geometry in Bk. I, Part II—incidentally drawing a brief comparison between Hume's view and Kant's, *thirdly* the relevant passages in the *Enquiry*, and *finally* I shall draw attention to some resemblances between the views of Hume and Mill.

I. *Treatise* Bk. I, Part III, Sect. I.[3]

Hume here takes the view that mathematical propositions assert relations between ideas which " depend entirely on the ideas, which we compare together " (p. 69). Such relations, which alone " can be the objects of knowledge and certainty " (p. 70), are four, namely, resemblance, contrariety, degrees in quality, and proportions in quantity or number. They are to be contrasted with three relations of another sort, [numerical] identity, relations of space and time, and causation, which " may be chang'd without any change in the ideas " (p. 69).

Relations of the former sort may, for convenience, be labelled *necessary*, those of the latter *contingent*.

One reads that the first three necessary relations " are discoverable at first sight, and fall more properly under the province of intuition than demonstration " (p. 70). The same is sometimes the case with proportions in quantity or number, i.e. when " the difference is very great and remarkable " (*ibid.*). But " in all other cases we must settle the proportions with some liberty, or proceed in a more *artificial* manner " (*ibid.*), i.e. we must employ mathematics, which comprises geometry, arithmetic and algebra.

It is clear that in this passage Hume regards mathematical propositions as necessary and *a priori*, as asserting necessary relations discoverable by " abstract reasoning and reflexion " (p. 69) and thus as distinct from propositions asserting contingent relations about which " we receive information from experience " (*ibid.*). Indeed, his general practice is to use the term " *a priori* " of anything intuitively or demonstratively established.

Moreover, it seems to me a fair inference from the passage that Hume did not regard mathematical propositions as analytic in the sense of having *formally* contradictory negations.

Nothing can indeed be made of the fact that he does not in this place maintain that the negations of mathematical propositions, or of relations of ideas propositions generally, are contradictions. For he certainly holds that their negations are inconceivable so long as the ideas compared together remain the same, and there are several places in the *Treatise* (e.g. pages 43, 80 and 87) where he equates the terms ' inconceivable ' and ' contradictory '. But it does not appear to me that he confines the term ' contradiction ' to the sense of ' *formal* contradiction '. There is, it is true, one place where he actually uses the phrase ' formal contradiction ' (p. 111), and it cannot be

[3]All page references to the *Treatise* are to Selby-Bigge's edition (Oxford 1888, 1949 reprint) ; to the *Enquiry* to Selby-Bigge's second edition of the *Enquiries* (Oxford 1902, impression of 1951).

maintained that he had no conception of a formal contradiction. For, as Professor Passmore points out, Hume's dark pronouncement that the only ideas in themselves contrary are existence and non-existence may be interpreted as " an obscure way of saying that ' X is Y ' and ' X is not Y ' are the only propositions which are *formally* incompatible ; to see their incompatibility we do not need any special knowledge of ' X ' or ' Y ' ".[4] But, whilst this certainly implies that Hume holds that the relation of formal contradiction subsists between a mathematical proposition and its negation, it also implies that the negation of a mathematical proposition is not itself a formal contradiction. And, in any event, Hume's usual practice is to use ' contradictory ' as a simple synonym for ' inconceivable ', and indeed to use the latter as if it were synonymous with ' unimaginable '.

More importantly, Hume's classification of propositions leaves mathematical propositions alongside others some at least of which would seem to be synthetic—*pace* Professor Kemp Smith who states that the kind of necessity belonging to (necessary) relations of ideas propositions may be entitled " analytic necessity ".[5] Any proposition Hume would regard as asserting contrariety (it has to be remembered that the only ideas in themselves contrary are existence and non-existence), say, ' There cannot both be and not be X's ' would of course be analytic, for it cannot be denied without formal contradiction. But the case is different with propositions asserting resemblance or degrees in quality. It is unfortunate that Hume gives no explicit examples, so that one cannot be sure that he would include under this head so patently synthetic a proposition as ' Tom is more like Dick than he is like Harry ', but he could surely not repudiate the following examples : ' Blue is more like green than it is like scarlet ' (an adaptation of a remark made by Hume in a different context—p. 637), ' Black differs from white ' (an example of Professor Moore's[6]), and ' Ice is colder than steam '. Of such propositions it can at the very least be said that they are not obviously analytic—they have close affinities with such notorious contenders for the role of synthetic necessary truth as ' Nothing can be red and green all over '. And it is completely clear that Hume does not think that the truth of such propositions follows from the definitions of their terms. He rather thinks that they are " seen " to be true when the objects in question are *presented* in the sense of observed or imagined. He even takes this view of a proposition asserting a proportion in quantity—" A yard measure is longer than a foot measure "—which could very plausibly be held to be true by definition (p. 47).

It would, of course, be grotesque to read into these passages a definite contention that mathematical propositions are synthetic necessary truths.

[4]*Hume's Intentions*, Cambridge 1952, p. 27.

[5]*The Philosophy of David Hume*. London 1941, 1949 reprint, p. 69. But see J. Laird, *Hume's Philosophy of Human Nature*, London 1932, p. 54, where it is rightly pointed out that " the *principle* enunciated in the *Treatise* did not imply that chains of intuitions into the connexions of ideas were necessarily *analytic* ".

[6]" Hume's Philosophy " in *Philosophical Studies*, London 1952, p. 147.

But it is surely clear that this possibility is not even by implication excluded. For Hume's distinction between propositions asserting necessary and those asserting contingent relations does not coincide, not even denotatively, with the analytic/synthetic distinction.

Immediately following his remarks on mathematics and necessary truth in general Hume makes some more particular comments on algebra, arithmetic and geometry. He lays great stress on what he takes to be the inferior precision and exactness of geometry—even withholding from it the title of ' science ' in favour of ' art ' (pp. 70-71). It is worth considering the basis of the distinction thus drawn between arithmetic and algebra on the one hand and geometry on the other in order to see whether it commits him to, or betrays a tendency to move towards, the view that the propositions of arithmetic and algebra are analytic whilst those of geometry are synthetic *a posteriori*.

The reason given for the superior precision and exactness of arithmetic and algebra is, however, simply this :

> " We are possest of a precise standard, by which we can judge of the equality and proportion of numbers ; and according as they correspond or not to that standard, we determine their relations, without any possibility of error. When two numbers are so combined, as that the one always has an unite answering to every unite of the other, we pronounce them equal ; and 'tis for the want of such a standard of equality in extension, that geometry can scarce be esteem'd a perfect and infallible science " (p. 71).

There is nothing here which implies that the difference between arithmetic and algebra and geometry is that the two former are analytic and the latter synthetic *a posteriori*. It is not suggested that the negations of the propositions of the two former are inconceivable or impossible in a way that the propositions of geometry are not. What geometry lacks is not certainty and necessity, but precision and exactness.[7] Hume's idea seems simply to be that whilst a quick look[8] will give us all the assurance we can possibly have that two (small) collections are equal in number, a quick look will assure us only that two geometrical figures are *roughly* equal in area, a longer look will enable us to make a more exact judgment, but however long we look, whatever procedures of juxtaposition, etc., we may carry out in thought or in fact, we shall only make our judgments *more*, never completely, exact.

II. *Treatise* Bk. I, Part II.

Consider now the observations on geometry which Hume makes in the course of his long discussion of the ideas of space and time.

[7]There is, of course, a choice here. If geometrical propositions are construed as precise they lack certainty, if certain they lack precision. Leaving out of account the ultra sceptical remarks at the beginning of Bk. I, Part IV, it seems to me that Hume, at least in the main (but see pp. 71-72), opts for the latter alternative, for he thinks it absurd to talk of a perfection (i.e. precision) beyond anything our facilities can judge of (p. 51).

[8]Cf. Leroy, *op. cit.* p. 78 : " Mais, ici encore [i.e. in arithmetic], c'est la perception directe d'une égalite, ou d'une équivalence, qui assure la rectitude d'un raisonnement et la certitude des résultats ".

One finds the same emphasis as in the passages previously considered on the imperfect precision and exactness of geometry. E.g. :

> " When geometry decides anything concerning the proportions of quantity, we ought not to look for the utmost *precision* and exactness. None of its proofs extend so far. It takes the dimensions and proportions of figures justly ; but roughly, and with some liberty. Its errors are never considerable ; nor wou'd it err at all, did it not aspire to such an absolute perfection " (p. 45, and cf. pp. 50-51).

Again, it is made even clearer that Hume does not regard geometrical propositions as analytic. Almost explicitly he denies the analyticity of ' A straight line is the shortest distance between two points ' :[9]

> " this is more properly the discovery of one of the properties of a right line, than a just definition of it. For I ask anyone, if upon the mention of a right line he thinks not immediately on such a particular appearance, and if 'tis not by accident only that he considers this property ? A right line can be comprehended alone ; but this definition is unintelligible without a comparison with other lines, which we conceive to be more extended. In common life 'tis establish'd as a maxim, that the streightest way is always the shortest ; which wou'd be as absurd as to say, the shortest way is always the shortest, if our idea of a right line were not different from that of the shortest way betwixt two points " (pp. 49-50).

This passage and one or two other remarks in the *Treatise* (p. 127 and p. 249) make it clear that Hume found it difficult to see how a proposition could be analytic without being a trivial identity—a difficulty which he still felt when he wrote the *Enquiry* (see p. 163, and Section III of this paper below).

Hume, then, in effect regarded geometrical propositions as synthetic. But, in view of his radical empiricism, must it not be inferred from this that he also regarded them as *a posteriori* ?[10] I think not, for as the following passage shows he was prepared to accord the highest necessity rating to a patently synthetic proposition—and, as for Kant, so for Hume necessity is always a mark of the *a priori* :

> " 'Tis evident, that the eye, or rather the mind is often able at one view to determine the proportions of bodies, and pronounce them equal to, or greater or less than each other, without examining or comparing the number of their minute parts. Such judgments are not only common, but in many cases certain and infallible. When

[9]Cf. Kant *K.r.V*, B. 16.

[10]This appears to be Leroy's interpretation, at any rate where geometrical axioms are concerned—*op. cit.* p. 76, note (4). He writes of Hume's " empiricisme géométrique " and continues " la géométrie porte sur des apparences sensibles, même si ces apparences sont le plus évidentes et les moins trompeuses. . . . La théorie apparaît, pour Hume, lorsque les mathématiciens délaissent les apparences sensibles pour raisonner sur des vues pures et intellectuelles . . . et des idées limites. . . C'est donc à l'intérieur de la géométrie que Hume distingue la théorie et le fait ". This seems to me mistaken. It is true that Hume makes a distinction within geometry *as he found it,* but this is a distinction between the acceptable and unacceptable parts of geometry. Hume surely regarded " les vues pures et intellectuelles " of the mathematicians as sheer fantasies.

the measure of a yard and that of a foot are presented, the mind can no more question, that the first is longer than the second, than it can doubt of those principles which are the most clear and self-evident " (p. 47).

Now the main burden of this paper is that it is misleading to classify Hume's views by reference to distinctions he did not himself make. But, if this is to be done at all, the least objectionable way to do it seems to me to be to regard Hume as holding, like Kant, that the propositions of geometry are synthetic *a priori*, i.e. necessarily true but to be established not by the analysis of concepts but by an appeal to intuition. Kant is, however, undoubtedly the more thorough and self-consistent in working out his view. He saw that if geometrical propositions were *a priori* then the intuition in question must be *pure* intuition, and that space must be a pure (form of) intuition. Hume, on the other hand, is committed to the view that space and time are empirical ideas, and some of his observations—e.g. on the impossibility of conceiving empty space and time (*Treatise*, pages 40, 53, 64)—can be read as replies direct to some of Kant's arguments for the apriority of space and time. Hume's " official " view of space and time is thus diametrically opposed to Kant's, but there are nonetheless not infrequent indications in the *Treatise* that Hume was sometimes tempted to modify his view in the Kantian direction. This has been noticed by several of Hume's commentators.. For instance, by C. W. Hendel in his *Studies in the Philosophy of David Hume*,[11] and by Kemp Smith, who writes :

> " Since the only impressions which [Hume] has allowed are impressions lacking in any element of extension or duration, the spatial and temporal features so undeniably apprehended by the vulgar consciousness have to be treated as non-empirical, and therefore, by implication, *a priori* ".[12]

And Leroy too :

> " Certes on hésiterait encore à comparer les opinions des deux philosophes [Hume and Kant] sur l'espace et le temps. Hume, loin d'en faire des conditions de l'appréhension des phénomènes, les tient pour des abstraits dégagés de l'expérience de la simultanéité et du changement. Toutefois les deux idées répondent à des impressions de réflexion du second degré, et à un retour de l'imagination sur soi ; elles sont donc bien données dans l'expérience ; mais l'imagination doit les dégager par une sorte de réflexion critique ; et, bien que, psychologiquement, les deux idées soient postérieures aux perceptions, elles peuvent paraître très semblables à des conditions logiquement antérieures ".[13]

III. *Enquiry concerning Human Understanding.*

The *Treatise* distinction between necessary and contingent relations of ideas reappears in the *Enquiry* (Section IV) as the distinction between

[11]Princeton, 1925. Chap. V.

[12]*op. cit.* p.548 and cf. pp. 288-9.

[13]*op. cit.* pp. 155-6.

relations of ideas and matters of fact. Mathematics is treated under the former head, but with a difference. No distinction in point of precision and exactness is made between arithmetic and algebra and geometry, and the last is now allowed to be a science. There are, moreover, frequent references to the contraries of relations of ideas propositions implying contradictions whereas those of matter of fact propositions do not (e.g. pp. 25-6 and p. 35).

Does it follow that Hume has come to think of mathematical propositions as analytic ? There are some strong, if not quite conclusive, reasons for thinking not.

(1) For what it is worth—not perhaps very much—Hume betrays no awareness that the view of mathematics taken in the *Enquiry* is significantly different from that of the *Treatise*. The doctrine of infinite divisibility is attacked in both works. It appears to me that the treatment of mathematics in the *Enquiry* is simply a shortened and simplified version of that in the *Treatise*.

(2) In the *Enquiry*, as in the *Treatise*, it seems at least arguable that Hume's notion of a contradiction is not exclusively that of a purely formal one. He seems usually to mean by a contradiction simply something which cannot be conceived by a clear and distinct idea, combining (to his readers' and perhaps his own confusion)[14] with this high rationalistic doctrine the ultra-empiricist view that any clarity and distinctness an idea might have is derivative from the corresponding impression.

Compare the following passage :

> " matter of fact and existence . . . are evidently incapable of demonstration. . . . The case is different with the sciences, properly so called. Every proposition which is not true, is there *confused and unintelligible*. That the cube root of 64 is equal to the half of 10, is a false proposition, and can never be *distinctly conceived*. But that Caesar, or the angel Gabriel, or any being never existed, may be a false proposition, but still is perfectly conceivable, and implies no contradiction " (pp. 163-4, my italics).

This is an example of Hume's rationalistic manner. The next quotation illustrates the empiricist twist he gives to it :

> " the great advantage of the mathematical sciences above the moral consists in this, that the ideas of the former, being sensible, are always clear and determinate, the smallest distinction between them is immediately perceptible, and the same terms are still expressive of the same ideas, without ambiguity or variation. An oval is never mistaken for a circle, nor an hyperbola for an ellipsis. The isosceles and scalenum are distinguished by boundaries more exact than vice and virtue, right and wrong. If any term be defined in geometry,

[14]Cf. Laird, *op. cit.* p. 81 : " [Hume] relied upon what he called the " establish'd maxim in metaphysics " . . . " that nothing we imagine is absolutely impossible ". The " establish'd " maxim, however, was the very different Cartesian proposition that whatever we *clearly* conceive (in the rationalistic sense) must be true ; and Hume's translation of ' clear conception ' into ' obvious imagery ' made nonsense of the doctrine ".

the mind readily, of itself, substitutes, on all occasions, the definition for the term defined : Or even when no definition is employed, the object itself may be presented to the senses, and by that means steadily and clearly apprehended " (p. 60).

(3) Again, in the *Enquiry* as in the *Treatise*, Hume is prepared to draw a distinction between a mathematical proposition and a *patently* analytic one. He maintains, for instance :

" that the only objects of the abstract science or of demonstration are quantity and number. . . . As the component parts of quantity and number are entirely similar, their relations become intricate and involved. . . . But as all other ideas are clearly distinct and different from each other, we can never advance further, by our utmost scrutiny, than to observe this diversity, and, by an obvious reflection, pronounce one thing not to be another . . . that *the square of the hypothenuse is equal to the squares of the other two sides*, cannot be known, let the terms be ever so exactly defined, without a train of reasoning and enquiry. But to convince us of this proposition, *that where there is no property, there can be no injustice*, it is only necessary to define the terms, and explain injustice to be a violation of property. This proposition is, indeed, nothing but a more imperfect definition " (p. 163).

In so far as Hume would seem prepared to make this sort of remark of any obviously analytic proposition, and not prepared to make it of mathematical propositions, he can hardly be said to regard the latter as analytic. He is at one with Locke and Mill in dismissing analytic propositions as " trifling " or " merely verbal ", though he is of course unable to follow Locke in finding (substantial) necessary truths concerning morality.

IV. Hume and Mill.

In this last Section I shall explore briefly some of the resemblances between the opinions of Mill and Hume which have, as it seems to me, been obscured by the too simple view that Hume held mathematical propositions to be analytic whilst Mill held them to be synthetic *a posteriori*.

There are two major discussions of mathematics in Mill's *System of Logic* :[15] in Book II, especially Chapters V and VI, and in Book III, Chapter XXIV.

(1) *Logic Bk. II, Chapters V and VI.*

(*a*) Mathematics is here presented as an inductive science. Mr. R. P. Anschutz[16] claims to detect also a different and opposed view, namely, that mathematics is hypothetical, i.e. simply the development of the consequences of hypotheses or postulates. It appears to me, however, that Mill combines these two views in a manner which, however odd, is not inconsistent. He

[15]Page references are to the 1956 impression of the 8th Edition by Longmans, Green & Co., London. The left and right hand columns are referred to as A and B respectively.

[16]*Philosophy of J. S. Mill*, Oxford 1953, Chap. IX.

maintains, of geometry for instance, that the *axioms* are inductive truths whilst the so-called *definitions*--i.e. the existence assumptions associated with the definitions proper : that there are points without magnitude, lines without breadth and perfectly straight, etc.—are hypotheses in the sense, not of propositions not known to be true, but of propositions known not to be exactly true (149A note). In a way markedly reminiscent of Hume's observations on the imperfect precision and exactness of geometry, Mill contends that there exist neither in nature nor the human mind objects exactly corresponding to the definitions of geometry, and argues that since the science cannot be supposed to be about non-entities it must be about, though not exactly true of, the lines and points and figures of experience (148B). Thus mathematics and the deductive or demonstrative sciences generally are held to present both inductive and hypothetical aspects (see pp. 164-6 for a summary statement of the view). Mill refuses to accept a purely " hypothetical " account of mathematics because of his conviction, shared by Hume and Kant, that it is not just a happy accident that mathematics finds application in the world of experience.

(*b*) Although Mill insists throughout on the inductive character of mathematics, he makes considerable concessions to opposed viewpoints. A major part, indeed, of what he means by this doctrine is simply that mathematical propositions and inferences are " real ", i.e. not merely verbal identities or tautological transformations. Both Hume and Kant agree with him with respect to the propositions, and Hume in effect with respect to the inferences too, though Kant holds that the inferences of mathematics proceed in accordance with the principle of contradiction.[17] Moreover, Mill does not oppose the terms ' inductive ' and ' deductive ', the opposition is between ' deductive ' and ' experimental ' (144A). And whilst he is capable of saying that geometrical axioms are experimental truths (151B), he also comes very close to allowing that they are not. His general view appears to be that whilst experiment would establish the axioms of geometry, there is no need actually to experiment (154A). We may satisfy ourselves that two straight lines cannot enclose a space merely by thinking of them without looking at them. Though this is only because we have learnt from experience that imagined lines exactly resemble real ones, that whatever is true of the former is true of the latter (154B). And again, whilst Mill maintains that the necessity of geometrical axioms is an illusion (147B), i.e. that like all non-verbal propositions they are synthetic, he concedes that their negations are *in fact* inconceivable. Though, of course, he insists " that our capacity or incapacity of conceiving a thing has very little to do with the possibility of the thing in itself " (157A).

(*c*) Something like Hume's *Treatise* distinction between geometry and algebra/arithmetic appears in Mill when he holds that the hypothetical element is much less conspicuous in the two latter (and indeed in some applications altogether absent from them) than in the former. It may be inferred, he writes, that

[17] *K.r.V.* B. 14.

> "the science of numbers is an exception to other demonstrative sciences in this, that the categorical certainty which is predicable of its demonstrations is independent of all hypothesis" (169B-170A).

But

> "even in this case, there is one hypothetical element in the ratiocination. In all propositions concerning numbers, a condition is implied, without which none of them would be true; and that condition is an assumption which may be false. The condition is, that $1 = 1$; that all the numbers are numbers of the same or of equal units" (170A).

Still

> "It is certain that 1 is always equal in *number* to 1; and where the mere number of objects, or of the parts of an object, without supposing them to be equivalent in any other respect, is all that is material, the conclusions of arithmetic, so far as they go to that alone, are true without mixture of hypothesis" (*ibid.*).

> "What is commonly called mathematical certainty, therefore, which comprises the twofold conception of unconditional truth and perfect accuracy, is not an attribute of all mathematical truths, but of those only which relate to pure Number, as distinguished from Quantity in the more enlarged sense" (170B).

(2) *Logic Bk. III, Chapter XXIV.*

Here the resemblance between Hume and Mill is very marked—no doubt because they had a common source, or point of divergence, in Locke. Like Hume, Mill makes a classification of propositions on the basis of a classification of relations (see also 67B), and where Hume treats mathematics under the heads of relations of resemblance and proportions in quantity or number, Mill treats it under resemblance and order in place.

Mill's resemblance, moreover, appears to cover Hume's resemblance, degrees in quality and proportions in quantity or number (46A, 66A, 399B-403B). Yet Mill's treating mathematics under order in place might well seem to constitute a sharp disagreement with Hume, for whom relations of space (and time) are contingent and who does not include geometrical propositions under that head. This difference is, however, more apparent than real, for: (*a*) Mill does not regard geometrical propositions as asserting *particular* spatial relations, which is what Hume understood by relations of space, but rather general laws "through which we are able, from the order in place of certain points, lines, or spaces, to infer the order in place of others which are connected with the former in some known mode" (398B) —laws which Hume would have regarded as asserting proportions in quantity or number. And, (*b*), when Mill undertakes to explain how the vast multitude of geometrical truths can be deduced from so few premises, he himself maintains that questions of position and figure (order in place) can be resolved into questions of magnitude (405B).

It would, of course, be easy to exaggerate the extent and importance of the resemblances between Hume and Mill, and also of those between

Hume and Kant. But resemblances there are, and their existence should serve to remind us that Hume's account of mathematics is more than an anticipation of, say, Chapter IV of *Language, Truth and Logic*. No doubt Hume's view will not do just as he left it. No doubt it could be developed in the direction of *Language, Truth and Logic*. But it could equally well be developed in direction of either Mill or Kant. And right or wrong, confused or clear, Hume's account of mathematics is interesting enough to be considered as it stands and not merely as a short or long step towards something else.

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