

John Stuart Mill (1806–1873)

JOHN WOODS

*University of Lethbridge
Department of Philosophy
Lethbridge, Alberta
Canada*

Born in London, Mill was educated by his father, James Mill, who was Bentham's friend and collaborator, and who, seeing no need to send his son to school, didn't. James was an officer of the East Indian Company and was joined by his son in 1823 as a clerk. Rising to senior levels in the Company, Mill *filis* wrote a defence of the Company's application for the renewal of its licence in 1857. When the application failed, he left the Company and in 1865 stood for Parliament as member for Westminster and was elected. Defeated in the election of 1868, he divided his time between London and Avignon until his death in the later place five years later.

Mill began his intellectual life as a philosopher radical in the manner of Bentham and his father. Following an emotional crisis at the age of twenty, he came to regard his former radicalism as too skeptical and extreme. There followed a fertile period of thinking, and Mill's maturing views were given expression in a large number of essays on economics, politics, sociology and philosophy. Dismissed by some as a "mere" pamphleteer incapable of systematic thought, Mill answered his critics with the publication in 1843 of *A System of Logic, Ratiocinative and Inductive: Being A Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. Here he argues that ethics, politics and the social sciences are indeed systematically intelligible once developed by the methods of the natural sciences. There is not much evidence of this connection in the parts of his book in which he discusses the fallacies. Even so, the *Logic* enjoyed a large success and was adopted as a text at Oxford and Cambridge, in turn.

I. DEDUCTION AND INFERENCE

It is Mill's view that the proper subject of logic is proof. Proof he understands to encompass *deduction*, *generalization* and *observation*. Mill thus inherits from Bacon the idea that logic, properly conceived of, is a theory of scientific method. But, in book three of the *Logic*, Mill adds that "a



complete logic of the sciences would also be a complete logic of practical business and common life” (BK III, Ch. i, Sec. 1).

Mill is a radical about logic. He shows himself the anticipator of developments for which others have won credit. Anyone who knows Lewis Carroll’s celebrated essay “What the Tortoise Said to Achilles” (*Mind* 1894), will be interested to know that there is nothing in this piece that isn’t in Mill’s *Logic* book two, chapter six, section five. Then, too, Mill greatly distrusted the idea that the formal sciences are analytic and was led to the view that arithmetic is an empirical science a full century and more before it became a received idea in some quarters of respectable philosophy. Beyond that, it may be said that Mill was, until Frege decades later, the strongest nineteenth century voice against psychologism in logic.

Mill is also notorious for having held that syllogisms as such commit the fallacy of “begging the question”, *petitio principii*, or of circularity. Although this view has been held by various people since antiquity – it was, for example, considered and rejected by Aristotle himself (*Posterior Analytics* 72^b5–73^a20), Mill was not one of them. In fact, it is an opinion he declared to be “fundamentally erroneous” since it misrepresents “the true character of the syllogism”. In its “true character”, there isn’t the slightest doubt of his admiration of syllogistic logic. As he says in his *Autobiography* of 1873 at chapter one, section 12:

My own consciousness and experience ultimately led me to appreciate . . . the value of an early practical familiarity with school logic [i.e., syllogistic logic]. I know nothing, in my own education, to which I think myself more indebted for whatever capacity of thinking I have attained.

Even so, Mill disagreed with Whately, whose own book, *Elements of Logic* appeared in 1825 and was approvingly reviewed by Mill. In a sentence that might have been penned by Locke, a hundred and thirty-five years earlier, Whately wrote (in book four, chapter one, section one) that

. . . all reasoning, on whatever subject, is one and the same process, which may be clearly exhibited in the form of syllogisms.

Certainly by 1843, Mill no longer accepted this position, if ever he did. But what he is rejecting is deductivism, not deductive reasoning as such. Deductivism is the view that all correct reasoning is syllogistic, hence is Whately’s own position. On the question of the circularity of syllogistic reasoning, Mill’s position was that (1) when a syllogism is forwarded as a proof and (2) when its general premiss is analyzed in conformity to the received view, then the syllogism is indeed circular. But this he took to be a *reductio ad absurdum* of the received view of generality. It can also be taken as discouragement of the idea that inference should always aspire to the status of a proof.

It was the received view that a general proposition such as “All humans are mortal” is strictly equivalent to the conjunction of all and only its positive instances: “*a* is a human and is mortal and *b* is a human and is

mortal *and c* is a human and is mortal *and . . . and* Socrates is a human and is mortal *and . . .*” and so on. Consider the syllogism

- (1) All humans are mortal
- (2) Socrates is a human
- (3) Therefore, Socrates is mortal

In as much as premiss (1) is just a reformulation of its own exhaustive conjunction of positive instances, then the conclusion (3) is already asserted by premiss (1) at the conjunct “Socrates is a human and Socrates is mortal”. There is reason to think that Mill agrees with Whately that the *petitio* is the fallacy

in which the premise either appears manifestly to be the same as the conclusion or is actually proved from the conclusion, or is such as would naturally and properly be so proved (*Elements of Logic*, BK III, Sec. 13).

Mill himself goes on to say of this passage:

By this last clause I presume is meant that it is not susceptible of any other proof, for otherwise there would be no fallacy (BK V, Ch. vii, Sec. 2).

It becomes evident that Mill is here endorsing a twofold conception of the *petitio* which some theorists of the present day call the “equivalence” and the “dependency” conceptions. (See Woods and Walton, 1989, chapter three). In Mill’s diagnosis, the received analysis of general propositions is the locus of the difficulty each time. For let us suppose that our sample syllogism is not forwarded as proof. It is still circular in the sense of clause one of Whately’s definition, i.e., in the equivalency sense, for part of its first “premise . . . appears manifestly to be the same as the conclusion”. But if taken as a proof, things worsen. By “proof”, Mill means what Aristotle means by a *demonstration*. A demonstration is a syllogism in which each succeeding line is less certain than its predecessor. But in as much as the conclusion (3) is *part* of premiss (1), then there can be no proof of (1) which isn’t also a proof of (3). Thus, when considered as proofs, syllogisms on the received view of generality commit the *petitio* in Whately’s second sense, i.e., in the dependency sense.

Mill is of the opinion that, correctly interpreted, syllogisms do not commit the *petitio* fallacy on either conception. To appreciate what for Mill is the correct interpretation of syllogisms (or, as we may now say, of deductive reasoning more broadly conceived), it is necessary to expose the essentials of Mill’s own theory of inference. First, and contrary to Whately, Mill holds that there are three kinds of inference: deductive, inductive and particular. Deductive reasoning is reasoning in which the conclusion is less general than its least general premiss. Inductive reasoning is reasoning in which the conclusions is more general than its most general premiss. Particular reasoning is reasoning in which the conclusion and all premisses are particular propositions. Moreover, reasoning from particulars to particulars is “not only valid but . . . the foundation of both induction and deduction” (BK II, Ch. i, Sec. 3).

A second pillar of Mill's theory of inference is his distinction between *verbal inferences* and *real inferences*. A verbal inference is one which is deductively valid. Verbal inferences may be correct in their way, but they do not advance knowledge. Real inferences do indeed advance knowledge, and for this to be so, Mill thinks that all real inferences must be

from particulars to particulars: General propositions are merely registers of such inferences already made, and short formulae for making more. The major [i.e. general] premise of a syllogism, consequently, is a formula of this description: and the conclusion is not an inference drawn *from* the formula, but an inference drawn *according to* the formula: the real logical antecedent, or premise, being the particular facts from which the general proposition was collected by induction (BK II, Ch. iii, Sec. 4)

Here, then, we meet with the idea that anticipates Lewis Carroll's article in *Mind*, namely, that general propositions are "registers" of inference *rules* and are not, as such, eligible to be premisses of real inferences.

The third basic component of Mill's theory of inference is absolutely original. It is that inductive generalizations may be all right for "big science". After all, institutional science has immense resources and is not subject to the same pressures of time as is the lowly individual. It takes little reflection to appreciate the immensity of the task of constructing a "clean" induction even to the homely generalization "All ravens are black". In fact, given the age of that species and its reproductive zeal, there is no practical possibility of examining all ravens with respect to correlations with blackness. Compare this with the task that confronts the youngster playing with matches, who learns in one encounter with a burnt finger not to do *that* again. As Mill has said, generalization are a kind of record-keeping of real inferences previously transacted.

Mill is not a tidy writer and, given the originality of his views, it is not surprising that his exposition is so often misunderstood. Linking together the three basic components of his account of inference is a fourth. It makes for an obscure connection, well worth persisting with. To see how it works, consider a syllogism just like the one we considered previously except that the conclusion is affirmed of a living person, say the neighbour's ten-year old niece, Maddy. So we have the argument

- (1') All humans are mortal
- (2') Maddy is a human
- (3') Therefore, Maddy is mortal.

Though not itself a real inference (since it is deductively valid and hence a verbal or "book-keeping" inference), it is Mill's view that it is *underlain* by a real inference. If this is right, then on Mill's own account of the matter, this real inference (a) must be an inference of a particular from particulars; (b) the induction implicit in premise (1') must be reconcilable to that fact; and (c), the deduction which overlies the real inference must likewise be reconcilable to fact (a). Mill's contention is that the real inference in question is as follows:

(1*) Maddy resembles in a relevant way those things that are positively correlated with having died and concerning which there is no known negative instance.

(2*) Therefore, Maddy too will die [i.e., is mortal].

We see, then, that for Mill, when reasoning from particulars to particulars, the reasoner makes a book-keeping entry in the form of a general proposition, such as (1'), then his reasoning is *analogical reasoning*. What is more, in as much as most inductions can't be generated in a timely way, if at all, most inductions are disguised analogical inferences. Further still, the book-keeping function of general propositions accommodates what Mill has to say about the "true character" and rôle of deduction:

An induction from particulars to generals, followed by a syllogistic process from those generals to other particulars, is a form in which we may always state our reasonings if we please. It is not a form in which we *must* reason, but it is a form in which we *may* reason, and into which it is indispensable to throw our reasoning, when there is any doubt of its validity. . . . (BK II, Ch. iii, Sec. 5).

To see what Mill is getting at, consider three arguments, one from particulars to particular (PP), another from particular to general (IND), and a third from general to particular (DED):

PP	IND
P ₁	P ₁
·	·
·	·
·	·
P _n	P _n
∴ Bentham is mortal	∴ All humans are mortal
DED	
All humans are mortal	
Fact F	
∴ P _n + m	

Concerning IND, it is valid if PP is, and if PP is valid, so is IND. Thus for Mill PP arguments and their corresponding IND arguments are validated by exactly the same evidence. Concerning DED, given that F is a fact, then should the new particular P_n + m be false, it would follow that "All humans are mortal" is false. This would mean, in turn that IND is a defective argument and PP too. So the rôle of deductive arguments is to test the adequacy of the non-deductive inferences that underlie them.

With these things said, it is clear that no real inference associated with a deduction is guilty of the *petitio* fallacy. For consider again

(1*) Maddy resembles in a relevant way those things that are positively correlated with having died and concerning which there is no known negative instance.

(2*) Therefore, Maddy too will die.

It is obvious on inspection that (2*) is not affirmed in (1*). It is equally clear that (1*) is provable, if at all, well short of being a proof of (2*). The inferences embedded in deductions are circular in neither the equivalency nor the dependency sense of that term.

Although he clearly escapes the claim that inferences of this kind are fallaciously circular, the doctrine that all real inference is non-deductive commits Mill to the view that mathematical proofs are either inductive arguments or that they are deductive registers of the real thinking from particulars to particulars that underlies them. This may prove a troublesome and eventually an unsatisfactory position, but there can be little doubt that Mill is struggling to mark a valuable and important distinction between deductive arguments (which Mill calls “ratiocinations”) and inferences. If this is so, Mill can be said to be attempting a clarification of another claim he inherited from Bacon. Bacon saw logic as a branch of rational psychology. (Bacon [1960], Book 1) Thinking so drew accusations of psychologism, the scorned view that the laws of logic are to some extent dependent upon or constrained by psychological factors.

But Mill also inherits the notion that an argument (when good) is a structure of propositions which is truth-preserving or probability-enhancing, and is so independently of any psychological fact. There is plenty of evidence that Mill thought of syllogisms in precisely this way. Yet it is also clear that, in the emphasis he gives to operations of the mind which, as it were, underlie good arguments, Mill adopts a mentalistic conception of inference. Inference, then, is the revision of beliefs in the light of the interplay of new information upon old. Seen this way, inference, unlike argument, *is* constrained by psychological factors.

It follows that the rules of good argument may not always be rules of good inference. This is certainly Mill’s view in book two. As we have seen, deductions do not describe their “underlying” inferences. So rules of deductive argument are, at least sometimes, not rules of inference. Implicit in this is the idea that the term “logic” is importantly ambiguous. It is one thing when considered as a theory of argument in our present sense of that term. It is quite another thing when taken as a theory of inference. In this Mill anticipates a much later development to the same effect associated with the work of such contemporary writers as Gilbert Harman. (See Harman [1986], pp. 4–6).

Bacon’s own harshness towards syllogistic structures is now explicable (op. cit., chapter XII). It seems to be his view that syllogistic is a branch of the theory of argument, and the theory of argument is in certain important respects a bad theory of inference. Therefore syllogistic is bad *logic*. So it is in one sense of the term only, the sense in which logic is a theory of inference. What Bacon seems to have overlooked is that in the sense in which logic is a theory of argument, the syllogistic does much better than he gives it credit for. Mill’s own position, implicitly at least, is that logic has done rather better as a theory of argument, that is, in its first sense,

than it has done in its second sense, that is, as a theory of inference. One of Mill's objectives in the *Logic* is to repair that deficiency. It is regrettable that Mill himself was often forgetful of the ambiguity of "logic", and that he rather routinely failed to acknowledge the distinction between argument and inference. Even so, it is quite clear that in one of these two senses of the term "logic", Mill is a strong opponent of psychologism.

II. FALLACY THEORY

Book five of the *Logic*, entitled "On Fallacies" runs to seven chapters and ninety-six pages in the definitive edition of the University of Toronto Press. It is evident throughout that, concerning the nature of induction, Mill owes a considerable debt to Bacon's *The New Organon*, and, concerning the fallacies, that he was much influenced by Whately's *Element of Logic*. In chapter one, "Of Fallacies in General," Mill writes,

In the conduct of life – in the practical business of mankind – wrong inferences, incorrect interpretations of experience, unless after much culture of the thinking faculty, are absolutely inevitable: and with most people, after the highest degree of culture they ever attain, such erroneous inferences, producing corresponding errors in conduct, are lamentably frequent. (BK V, Ch. i, Sec. 1).

A fallacy for Mill is the mistaking of apparent evidence for real evidence. Concerning the principal objective of book five, Mill proposes

To examine, then, the various kinds of apparent evidence which are not evidence at all, and of apparently conclusive evidence which do not really amount to conclusiveness. . . . (BK V, Ch. i, Sec. 3).

Here is a conception of fallacy that resonates even today. It is a conception according to which fallacies are errors that are widely committed, easy and natural to commit, and difficult to correct. They are important not just because they lead to false opinion but also to "lamentable" errors in conduct. Further, although not every mistake is a fallacy (causal errors of inattention, for example, are not), it is possible to catalogue the most common patterns of attractive error, and doing so is part of the proper job of logic.

Not only are fallacies to be distinguished from causal errors, they must also be separated from "moral errors", which in turn contrast with "intellectual" errors. Fallacies are always intellectual errors. Moral errors subdivide into *indifference to truth* and *bias*. Errors of bias involve the drawing of conclusions on the basis of one's psychological states, especially one's emotional states. It appears to be Mill's view that although there are moral causes of error, and of fallacy too, no *analysis* of a fallacy involves reference to its moral causes. A fallacy is an intellectual mistake even if it is caused by moral weakness. Thus someone biased against women could be induced to accept the inference that all women are bad drivers just because

some are. The bias might cause the inference to be drawn, but that would not make it fallacious. The inference would be bad *irrespective* of what caused it to be drawn.

III. FALLACIES CLASSIFIED

In Chapter two, "Classification of Fallacies," Mill attempts to disarm those critics who hold that in as much as there are "infinite ways to err", any finite list of fallacies will be arbitrary and unmotivated. Mill is of the view that any time an error of inference is made it is made on the basis of some fact or putative fact which appears to be "evidentiary" but is not. Whenever this happens there must be a property or a relation, either in the fact or in our way of considering it, which has "an invariable relation to a general formula" and which leads to the error of thinking that the "evidentiary" fact is constantly conjoined with the "concluded" fact. Evidently Mill thinks that every mode of mistaking non-constant for constant conjunction is discernible in principle, and that such mistakes must be of low finite number. Whatever we might think of Mill's reasoning on this point, the fallacies are classified as follows:

Fallacies

Of Simple Inspection

1. Fallacies à priori

Of Inference

Fallacies of inference, in turn, subclassify:

From evidence distinctly conceived

*Inductive
Fallacies*

2. Fallacies of
Observation

3. Fallacies of
Generalization

*Deductive
Fallacies*

4. Fallacies of
Ratiocination

From evidence indistinctly conceived

5. Fallacies of
Confusion

In a concession that anticipates a modern development known as the Asymmetry Thesis (Massey [1975]), Mill allows that his classification may be *somewhat* arbitrary. This he explains by the fact that erroneous inferences "do not admit of such a sharply cut division as valid arguments do" (BK V, Ch. ii, Sec. 3). Even so, if fully and unambiguously expressed, any erroneous argument "must . . . be so in some one of these five modes unequivocally." (op. cit.) The third confusion he catches. Arguments fully

expressed and free of ambiguity cannot commit a fallacy of confusion. But given that real life arguments are rarely complete and entirely untouched by ambiguous or vague language, “[a]lmost all fallacies, therefore, might in strictness be brought under our fifth class, Fallacies of Confusion”. (op. cit.).

IV. FALLACIES OF SIMPLE INSPECTION

Chapter three deals with fallacies of simple inspection, or *à priori* fallacies. These are a special case, since strictly speaking they are not errors of inference. They are propositions taken as sufficiently obvious as neither to require nor admit of argument, and so they simulate the fallacy of false assumption. These include superstitions and common misconceptions (themselves fallacies in a widely recognized sense of that word). Mill does not here invoke the term “*argumentum ad populum*,” but it is clear what his own analysis of it would be. We might imagine someone holding that an *ad populum* fallacy is an argument in the following form:

1. Proposition P is a popular belief
2. Therefore, P is true.

Mill would demur from this analysis. For one thing, it is a transparently silly argument, hence not a seductive one, hence not a fallacy in Mill’s sense. The fallacy, rather, is that of affirming P without argument; and what makes it so is that popular beliefs often have the property of seeming to be correct even when they are not, and these are well-exemplified by biased opinion, a particularly “vulgar error.” It may seem that Mill is again forgetting his own distinction between moral and intellectual errors, concerning the second of which only are fallacies attributable. The appearance is mistaken. Mill allows that bias may cause an error, but bias is not what the error consists in. Biased beliefs can be true as well as false. Even when true, a fallacy occurs when the biased reasoner mistakes non-evidence for evidence or inconclusive evidence for conclusive evidence. All the same, Mill does deviate from his own account in another respect. A fallacy of simple inspection is not the mistake of over-rating the evidential backing of a proposition; it is the mistake of supposing that the proposition in question requires no evidence. It is not the distinction between moral and intellectual errors that Mill is forgetting. It is rather his own core concept of fallacy.

Another example is one against which Mill argues at length in book two, the idea that whatever “is inconceivable must be false” – a principle that was falsely directed against the Copernican idea of a vast empty space which was thought inconceivable, hence non-existent. Further examples include the natural inclination to ascribe objective existence to abstractions, and the philosophical principle of sufficient reason. This principle is sometimes invoked in connection with the law of inertia:

A body at rest cannot, it is affirmed, begin to move unless acted upon by some external force: because, if it did, it must move up or down, forward or backward, and so forth; but if no outward force acts upon it, there can be *no reason* for its moving up rather than down, or down rather than up, etc., *ergo*, it will not move at all. (BK V, Ch. iii, Sec. 5)

“This reasoning” Mill conceives “to be entirely fallacious,” and so it may be. But it is not an example faithful to Mill’s own category of simple inspection. Such fallacies are not fallacies of reasoning or inference, and Mill would have been better served had he cited the principle itself as fallacious, that is, the “self-evident” principle that if there is no reason for something to happen, then it cannot happen.

Other examples involve the fallacious principle that distinctions in language invariably mirror differences in nature, an echo of Locke; that an event cannot have more than one cause; and that the causes of something must resemble – have the same properties as – the thing caused.

Perhaps the best summary statement of Mill’s position on simple inspection fallacies can be found in chapter seven, paragraph four, of his *Autobiography*.

The notion that truths external to the mind may be known by intuition or consciousness, independently of observation and experience, is, I am persuaded, in these times, the great intellectual support of false doctrines and bad institutions. By the aid of this theory every inveterate belief and every intense feeling, of which the origin is not remembered, is unable to dispense with the obligation of justifying itself by reason, and is erected into its own all-sufficient voucher and justification. There never was such an instrument devised for consecrating all deep-seated prejudices.

V. FALLACIES OF OBSERVATION

Chapter four takes us to fallacies of observation which, unlike those we have been examining, namely prejudices “superceding proof”, are instead “those which lie in the incorrect performance of the proving process.” “Proof” here is intended “in its widest extent . . . [and] embraces one or more, or all, of three processes, Observation, Generalization, and Deduction. . . .”

Mill cites the belief that “a fortunate-teller was a true prophet.” This involves two fallacies, only one of which is a fallacy of observation. The observation fallacy is the mistake of attending to observations which exclude negative instances and further observations which qualify the others. Thus if one’s observations don’t include those instances in which the fortune-teller’s predictions turn out false, or those cases in which the accuracy of the observed predictions is the result of some kind of trick, then it is Mill’s view that the very having of those original observations is a fallacy. It is also a fallacy of a different kind to infer from those tainted observations, e.g., that the fortune-teller is a prophet. This is a generalization fallacy.

Mill reveals that he has learned well a lesson from Bacon, whom he

approvingly mentions. In its most general and lethal form, an observation fallacy is the fallacy of collecting evidence without any principle of organization. No set of observations collected willy-nilly is ever the justified basis for a generalization from them. And so Mill expressly forbids that “weak” form of induction, the collecting of evidence merely by simple enumeration of observations chanced upon. More generally still, an observation fallacy is the mistake of overlooking relevant considerations. These considerations may themselves be directly observable or they may be inferable from what is observed. Even so, Mill decides to include the latter in the category of observation fallacy.

VI. FALLACY OF GENERALIZATION

Fallacies of generalization are the business of chapter five, and Mill says that the “class of Fallacies of which we are now to speak, is the most extensive of all; embracing a greater number and variety of unfounded inferences than any of the other classes, and which it is even more difficult to reduce to sub-classes or species.” (BK V, Ch. v, Sec. 1).

This difficulty aside, one kind of fallacy is the groundless generalization, such as that of inferring that the whole universe must have the same character as our solar system. The example carries an important presupposition. It is that whatever we currently know of the universe it is knowledge of only a part of it – of our solar system, to make a simplifying and outdated assumption. So the universe can be subdivided conceptually into the known KU and the unknown UU. Now it is a fundamental principle of induction, says Mill, that any generalization about UU on the basis of KU must involve observed or correctly inferred constant conjunctions of the form “ku and uu.” But in the nature of the case, we have no data of the uu-kind, and so we lack the wherewithal for any induction to properties of UU. Mill’s point is not well-formulated. An ambiguity lurks in the term “unknown”. If by the “unknown” is meant those reaches of reality to which present inductive resources are inapplicable, then it is an empty truism to go on to say that it is an inductive error to reason from the known to the unknown. On the other hand, if by the “unknown” is meant only those aspects of reality that have not yet been experienced – for example, future settings of the sun – then it is quite untrue to say that present inductive resources are inapplicable to the unknown in this sense.

All the same, Mill is onto something important. His principle seems to be that a generalisation from the known to the unknown is legitimate if it is sustained by constant conjunctions that are governed by certain implicit limitations on the generalization’s range. Although we don’t normally say so explicitly, when we make the generalization that all ravens are black, we are not intending to say that all ravens on Mars are black or that all ravens in the genetic aftermath of a nuclear holocaust are black. Certainly

conditions of locale and of normalcy are presupposed, difficult as they may be to state satisfactorily, and Mill is saying that without them generalizations are at grave risk. More particularly, if a would-be generalizer proposes to exceed such constraints, that is, to generalize beyond them, he must have principled reasons for doing so, and knowing that his generalization holds *within* those constraints (e.g. earthbound ravens are black) is not reason enough to hold that it holds beyond them (e.g., Martian ravens are black). In fact, Mill surely knew that there weren't any ravens on Mars, but this nicely makes his point. For if Mars is raven-free, the generalization about ravens being black there fails, except in the trivial sense that there are no non-black ones there either. In this, Mill can be seen as making the point that induction is always relativized to blocks of background information. Since we may assume that we don't have, or that he didn't in 1843 have appropriate kinds of background information about the outer galaxies, there will be certain generalizations that hold in our galaxy which might well fail in those beyond. The same is true, as we now see, even of inductions of a more local character.

Mill also does well with his next type of example, namely, reductionist theories such as those which claim that heat is just motion of a certain kind or that consciousness is but a state of the nervous system. We commit a fallacy of reductive generalization, as we ourselves might call it, when we confuse the true claim that phenomena of type *K* *supervene* upon phenomena of type *L* with the false or unproved claim that *K*-phenomena are identical to *L*-phenomena. We may say, for generality, that *K*-phenomena *supervene* upon *L*-phenomena when and only when there is no change among the *K*-phenomena without some corresponding change in the *L*-phenomena. In this sense, it might well be true that the phenomena of consciousness *supervene* upon the phenomena of neural activity, that there is no change in one's consciousness without some specific change in one's neural states, but this would not show that the conscious mind just is the nervous system. Thinking so would be a species of generalization fallacy in Mill's sense.

A further type of generalization error is that of inferring from observations collected in such a way as to involve an observation fallacy, lately discussed. Here too the principal culprit is the "law" of simple enumeration, and Mill again applauds "Bacon's emphatic denunciation of it . . ." In its most general form it is the inference.

This, that, and the other are *A* and *B*, I cannot think of any *A* which is not *B*, therefore every *A* is *B*. (BK V, CH V, Pt. 4).

The premisses Mill is prepared to concede may well reflect "empirical" laws or regularities between *As* and *Bs*, but these may represent no causal connection. So we may take it that the core mistake is that of investing mere correlations with a causal significance that they do not lack, or concerning which there is no independence evidence.

Mill also treats of the *post hoc, ergo propter hoc*, which he is careful to distinguish from the former case. This might surprise today's readers, in as much as many a contemporary writer analyses the *post hoc* as precisely the error of confusing accidental correlations with causal connections. Mill, at any rate, sees them as different. In the previous example, the fallacy involves a failure to appreciate how a causal enquiry should be conducted. In the present case, that failure doesn't occur. The error is committed by someone who has an adequate general appreciation of how causal inferences are to be drawn but who is misled by the *appearance* that a prior event is causal with regard to a succeeding event into thinking that it is in fact causal with respect to it.

There follows a discussion of false analogies.

An argument from analogy, is an inference [sic] that what is true in a certain case, is true in a case known to be somewhat similar, but not known to be exactly parallel, that is, to be similar in all the material circumstances. (BK V, Ch. v, Sec. 6).

This constitutes the first of two kinds of analogical argument. Let X and Y have property P and let X not be known to possess property Q which Y does possess, and let Q “not be connected with” P. Then the “conclusion to which the analogy points” is that X also has property Q. Concluding this is an analogical inference, and indispensable to its being so is that we have “not the slightest reason to suppose any real connexion between the two properties.” Consider the planets. The earth is inhabited and the earth bears very many similarities to the other planets, none of which is known to be inhabited. Further there is no known connection between any of the properties shared by the planets and the property of the earth's being inhabited. Nonetheless, such a connection there *may* be, and Mill is ready to say that if it is even slightly less probable that an alien planet would be inhabited if it did not resemble the earth, then the analogical inference is a defensible one. In the light of this, it would be well to revisit Mill's point about (in our example) inducing that ravens on Mars are black. Mill now seems to be saying that such a claim might have something to be said for it, however slightly, when considered as an analogy. If so, this cannot be an *induction*, which is precisely what Mill says it is not. Mill is here contradicting, or revising, his earlier claim that all inferences are inductive. Analogical reasoning of the kind we have just discussed is a kind of inference, but it is not inductive according to Mill.

A second kind of analogical argument is quite different. Analogical arguments of the first kind are in no sense inductive, as we have just seen. Of the second kind, they are arguments having an inductive character but which fail to be “real inductions.” Mill has in mind the case in which conditions C_1, \dots, C_n are (as it happens) parts of the cause of an event-type E. Inferring that whenever C_1, \dots, C_n occur so does E is not, therefore, a real induction, but rather a flawed or incomplete induction. Even so, if the probability of E's occurrence *given* the occurrence of C_1, \dots, C_n , is

greater than the probability alone of E's occurrence, then Mill is of the view that the inference in question is analogical in our second sense and that it may be allowed as a modestly justified inference.

It is evident that Mill recognizes what has come to be known as inference by conditional probabilities. If the probability of an event A's occurring *conditional* upon an event B's occurring is high enough, say in excess of 50–50, and in any case higher than the probability of A alone, it might be said that the inference

- (1) The probability of A, given B is greater than 0.5
- (2) B occurs
- (3) Therefore, A occurs

registers an acceptable analogical conjecture, until such time as it may be overridden by additional evidence.

Now, Mill certainly had the concept of conditional probability from his reading of Laplace's *Essais philosophiques sur les probabilités*, but he was critical of Laplace, especially in relation to Principle VI of the *Essais*, said by some to be an anticipation of Bayes' Theorem. What is interesting is Mill's desire to assimilate the idioms of probability to a theory of analogy, never mind that the project was largely uncompleted.

There are two ways of committing the *fallacy* of analogy, according to Mill. One way is simply "overrating the probative force" of a correct analogical argument of either kind. The other way, "more deserving of the name of fallacy," involves ignoring independent evidence that properties concerning which a connection is proposed on analogical grounds are *not* in fact connected. "This is properly the Fallacy of False Analogies."

It appears that here too Mill has run foul of his own core concept of fallacy. A fallacy is a kind of misinference, the finding of evidence when there is none, or the over-rating of such evidence as there may be. But Mill also thinks that the conclusions of analogical reasoning are always singular propositions. This matters in two ways. One is that analogical mistakes can hardly be fallacies of *generalization*, as Mills claims. The other is that, in as much as all inference is inductive and fallacies are errors of inductive inference, it can hardly be true that there are any fallacies of analogy, contrary to fact and to what Mill himself claims.

VII. FALLACIES OF RATIOCINATION

Up to this point Mill would acknowledge that what he has been calling fallacies are not generally called so. Chapter six returns us to a more common usage. For we "have now, in our progress through the class of Fallacies, arrived at those to which, in the common books of logic, the appellation is in general exclusively appropriated; those which have their seat in the ratiocinative or deductive part of the investigation of truth." The deductive fallacies don't hold much interest for Mill, for two reasons. One

is that he thinks that Whately's *Logic*, published seventeen years earlier, handles this topic "most satisfactorily." The other is "the rules of the syllogism are a complete protection;" all we need do is to show a deduction's syllogistic form, and "we are sure to discover if it be bad, or at least if it contains any fallacy of this class." (BK V, Ch. vi, Sec. 1).

It may seem that by book five, chapter six, Mill has entirely forgotten his position of books one and two: deductions are not inferences, but only apparent inferences, and all inferences are inductive. This is so if we hold Mill strictly to the view that a fallacy is always a probative offence against evidence and that a syllogism is not a reasoning from evidence. On the other hand, it is more realistic to attribute to Mill the view that there is a conception of fallacy appropriate to (inductive) inference and a different conception of fallacy definable for syllogisms or radiocinations. In any event, the discussion of deductive fallacies is somewhat *pro forma*. Fallacies of conversion are noted, as in the inference from "All A are B" to "All B are A". They are the fallacies that have come to be known as affirming the consequent and denying the antecedent. Also recognized is the error of confusing the contrary of a proposition with its contradictory; and then, too, the syllogistic fallacies of four terms and undistributed middle.

Special attention is reserved for what are 'certainly the most dangerous fallacies of this class,' namely *secundum quid* mistakes, and these it seems can infect inferences and radiocinations alike. They are fallacies which result from reasoning from premisses, on which an essential qualification has been ignored, as when from the premiss, "This black man is white-haired," it is concluded "Some black men are white." In so saying, Mill gives contemporary recognition to a type of fallacy, of the same time, first noted by Aristotle in his *Sophistical Refutations*, and the analysis he gives to it is scarcely different from Aristotle's own.

VIII. FALLACIES OF CONFUSION

Finally, in Chapter seven, come the fallacies of confusion. Under this heading fallacies of ambiguity are discussed at some length, and there is much quotation from Whately's *Logic*.

Mill accepts Whately's suggestion that "[o]ne not unusual form of the Fallacy of Ambiguous Terms, is known technically as the "*Fallacy of Composition and Division." (BK V, Ch. vii, Sec. 1). This fallacy occurs "when the middle term is collective in the premises, or *vice versa*: or when the middle term is collective in one premises, distributive in the other" (op. cit.). Thus the fallacy of division is committed when it is true collectively that Italians are charming and yet concluded that Guido is charming; for it would not be true that even Italians are charming in a distributive sense; i.e., it is not true of each and every Italian that he or she is charming. Composition is the reverse of this. It may be true, distributively, of every

citizen of a country that he or she is thrifty, yet not true, collectively, that the citizenry as a whole is thrifty, for it may have a spendthrift government.

Next discussed is the fallacy of *petitio principii*, a distinct kind of confusion fallacy. Mill writes that

every case where a conclusion which can only be proved from certain premises is used for the proof of those premises, is a case of *petitio principii*, (BK V, ch. vii, Sec. 2)

a fallacy which “includes a very great proportion of all incorrect reasoning.” An astonishing claim and, on the face of it, beyond believability, it seems clear that Mill has in mind the following kind of example. Let “P” be any term for which there is a synonym, “Q”. Suppose that someone asserts “S is P” (say, “Jones is a bachelor”). A critic challenges: “You can’t prove that.” The other replies, “Oh yes, I can, since S is Q” (“Jones is a man who has never married”). An argument is constructible out of this exchange:

1. Jones is a man who has never married.
2. Therefore, Jones is a bachelor.

Mill thinks that, although (2) follows from (1), (1) is not provable except by (2); and this is a *petitio* fallacy of as great a commonality as there are synonymous terms “P” and “Q”.

Mill has committed a great howler, of course. It is certainly not true that the only way to establish that Jones is a man who has never married is to marshal the proposition that he is bachelor. One could have asked “Have you ever married?” and have been told “No;” or one could have checked the record of marriages for all jurisdictions in which Jones has lived during the period of his nubility. Mill confuses two things. It may be that synonymous terms “P” and “Q” are interdefinable and that neither is definable in any other way. But it does not follow from this that “S is P” and “S is Q” are interprovable or that neither is provable in any other way.

The third and final subdivision of the fallacies of confusion gives us the fallacy of *ignoratio elenchi*. Whereas the fallacy of ambiguity involves “misconceiving the import of the premises,” and the *petitio principii* is a matter of “forgetting what the premises are,” the present fallacy consists “in mistaking the conclusion which is to be proved,” and this is the fallacy of *ignoratio elenchi* “in the widest sense of the phrase.” As Mill observes, the fallacy is called by Whately the “Fallacy of Irrelevant Conclusion”. Mill remarks that the works of controversial writers “are seldom free from this fallacy.” He means that they have a way not of committing it themselves but in provoking the commission of it by their critics. Thus the best-known argument against Berkeley’s proofs of the non-existence of matter is Dr. Johnson’s “I refute him thus,” said as he kicked a stone. But this is “a palpable fallacy,” an argument, so to speak, in which the conclusion “I, Samuel Johnson, have just kicked a stone” is, though quite true, irrelevant as a refutation of the claim that things like stones possess a propertyless material substratum.

IX. MILL'S IMPORTANCE

One of Mill's objects in writing *A System of Logic* was to produce a general theory of inference which would set methodological standard for ethics and the social sciences. There is not much evidence of this connection in his treatment of the fallacies, although elsewhere in the treatise the connection is developed in greater detail. Even so, Mill is of the view that considered as general and recurring mistakes of inference, fallacies stand as much chance of infecting politics or sociology as astronomy or chemistry, and in this he is surely correct.

With the exception of the ratiocinative and confusion fallacies, Mill's treatment can be seen as an extension and refinement of Bacon's earlier effort. From Bacon he learned the folly of trying to generalize from disorganized and undisciplined observations. But in various ways, Mill exceeded Bacon's reach. He seems to have recognized that good inductive generalizations are always embedded in contexts of background information, and he caught the importance of inference by conditional probabilities. He was also alert to the critical difference between supervenience and identity, and he recognized the importance of distinguishing between inferences and argument.

As for the fallacies of ratiocination and of confusion, there is less that is novel in Mill. For the most part, they are fallacies that were first noted and as capably handled by Aristotle, and Mill's discussion of them often is little more than a recapitulation of Whately. But of all that Mill is known for in his writings on logic, it is supremely ironic that his most celebrated claim, that valid deductive inferences commit the fallacy of *petitio principii*, turns out to be a claim that he denies.

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