MEDICAL PRACTICE

Logic in Medicine

Doctors and witchdoctors: Which doctors are which?—I

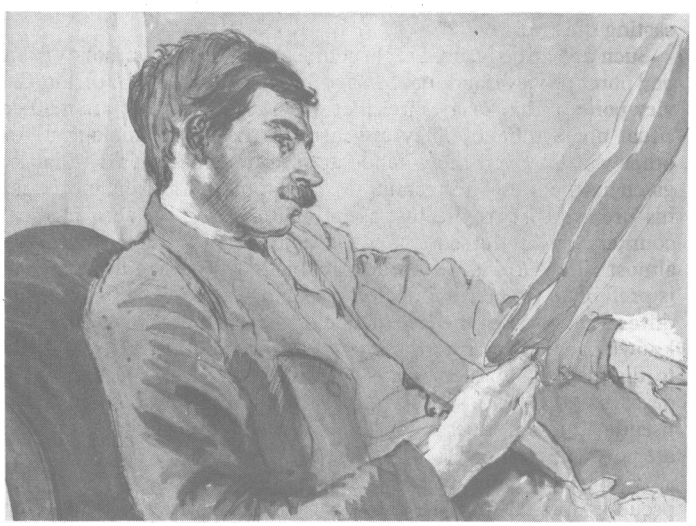
LARRY BRISKMAN

"Mark this, ye proud men of action," wrote the great German poet and philosopher Heinrich Heine, "Ye are nothing but unconscious instruments of the men of thought who, often in humblest seclusion, have appointed you to your inevitable task. Maximillian Robespierre was merely the hand of Jean-Jacques Rousseau. . . ."[1] This testimony to the power of ideas, even philosophical ideas, over even the most practical of men is echoed in our century by John Maynard Keynes.[2] "The ideas of economists and political philosophers," he wrote, "both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed, the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back. I am sure that the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas . . . soon or late, it is ideas, not vested interests, which are dangerous for good or evil."

Intellectual status

Members of the medical profession are not, of course, all "madmen in authority"; but they are practical men, and they do, in Western society at least, enjoy positions of considerable authority. This status is not fundamentally political, nor is it essentially economic. Rather, members of the medical profession derive whatever political and economic status (or power) they have from their recognised intellectual status. It is this that explains why economic resources in the West are directed to the practice and improvement of medicine (as opposed to the practice and improvement of, say, witchcraft); and it also explains why, for example, Western courts of law recognise qualified medical practitioners as being "expert" witnesses on many matters whereas the practitioners of faith healing or Christian Science, who claim to have performed many medical miracles, are not so recognised. From what source does the medical profession derive its generally acknowledged intellectual status? More precisely, what is it that demarcates Western medical science from the claims of witchcraft, faith healing, Christian Science, and so on?

This question, or rather a generalisation of it, is one of the fundamental problems of the philosophy of science: the problem of demarcation. How can we distinguish genuine empirical science from pseudoempirical superstition or pseudoscience? In so far as members of the medical profession, and the general public,



John Maynard Keynes. [National Portrait Gallery

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attribute to Western medical science an intellectual status superior to that of witchcraft, faith healing, and so on, they are assuming (if only implicitly) that there is some solution to this problem. Doctors who, as practical men, believe themselves to be exempt from any intellectual influences of a philosophical kind may thus turn out to be the slaves of some defunct philosopher of science. Rather than being impotent, philosophical ideas about science are at the root of medicine's social and economic influence.

The problem of demarcation

The problem of demarcation is not merely a matter of definition or of words; if it were it would be quite uninteresting. The problem is not that of trying to reach agreement on how the term "empirical science" is to be used as opposed to the terms "superstition" or "pseudoscience." Rather, the problem is basically one of explaining why, if at all, we should take the claims or theories of empirical science (and in particular those of medical science) more seriously than we do those of witchcraft, faith healing, Christian Science, or scientology.

This problem is of serious importance for medicine for the basis of Western medical practice would seem to be our scientific knowledge of diseases, their causes, and their cures. But this statement, though plausible enough, in fact rather understates the case—for many of the triumphs of medical science have nothing to do with disease (in its usual sense) at all. For example, having a hand cut off by a combine harvester is hardly a case of disease, yet we have developed microsurgical techniques to help to "cure" this affliction. Clearly these techniques depend on much more than a biological knowledge of the human body (its circulatory and nervous systems and so on). They also depend on our knowledge of physics—for example, the use of powerful optical instruments—and pharmacology, and the development of drugs clearly depends on chemical knowledge. Thus the basis of Western medical practice is almost the whole of empirical science.

If we are to explain why Western medical practice is preferable to the practices of, say, the witchdoctor we need to explain why the claims or theories of empirical science deserve to be preferred, from the point of view of truth, to those of witchcraft—that is, we need to solve the problem of demarcation. It is important to realise why this is so. If a patient suffering from a high fever comes to a doctor and the doctor, after examination, diagnoses a bacterial infection and prescribes penicillin he is making use of a considerable body of scientific knowledge. If the same patient went to a witchdoctor the techniques of examination, the diagnosis, and the prescribed cure would be very different. For example, the examination might include a study of the entrails of a live chicken; the diagnosis might be that the fever is the result of a spell; and the prescribed cure might be some sort of ritual purification or some sort of symbolic action (such as sticking pins in an effigy of the person identified as casting the spell).

Such prescribed cures are, of course, "ritual" or "symbolic" from our point of view (and, dare I say, in reality as well); but from the viewpoint of the "magic circle" of witchcraft ideas they are neither ritual nor symbolic. They are instrumental or technological. In other words, given the witchdoctor's view of the world—that is, given his theories—his techniques of examination and diagnosis and his prescribed cure are just as rational as their Western medical counterparts (in the sense of "weak rationality"[3]). But this entails (I almost said "entrails"), if we are to explain why our medical practice is preferable to the witchdoctor's, seeking the explanation in some difference between the knowledge or theories that we use and the knowledge or theories that he uses. In other words, we need to distinguish—or demarcate—genuine empirical science, which deserves to be taken seriously from the point of view of truth, from pseudoempirical superstitions like the theories of witchcraft, which are not so deserving.

In what way can superstitions, like the theories of witchcraft, be pseudoempirical? The answer is that such theories can seem to be supported or confirmed by empirical or observational evidence. Thus take any illness that would, if left completely untreated, spontaneously remit—for example, the common cold; or any illness whose symptoms appear only intermittently—for example, herpes; or any illness whose initial primary symptoms disappear altogether to be followed only much later by different, often more severe, symptoms—for example, syphilis. Then even if we assume that the practices of the witchdoctor have no efficacy whatsoever in curing illness these practices will *seem* to have many successes (we assume, for the sake of simplicity, that the proposed cures of the witchdoctor are not themselves injurious to health). Thus despite their superstitious character the assumptions on which the witchdoctor bases his practice can often seem to receive empirical support or confirmation. Yet in the cases described such support, or pseudosupport, is spurious. Indeed, one way of putting the problem of demarcation is precisely this: How can we distinguish between genuine empirical support (or a genuine empirical method) and spurious or pseudoempirical support (or a pseudoempirical method)?

Bacon's inductivist solution

In the British philosophical tradition the generally accepted solution to these problems stems from the inductivist philosophy of Francis Bacon. According to this view what distinguishes genuine empirical science (or support) from pseudoempirical superstition (or pseudosupport) is the use of a certain method—the inductive method. Empirical science is the product of its application, superstitious pseudoscience is not. What distinguishes the scientist (who employs induction) is that he always begins his investigation of the world without preconceived ideas: he approaches the world with an open mind and makes empirical observations in an unprejudiced manner. Only after he has collected a sufficient body of unprejudiced observations does he begin to try, using these observations, to discover their underlying causes or explanation—and this he does by the inductive method of inferring their causes or explanation from the observational evidence itself.

Francis Bacon. [National Portrait Gallery

The method of superstition (or, as Bacon called it, the method of

anticipation or speculation) is quite different from this. Here, rather than allowing our ideas to be determined by the observed facts, we *begin* with ideas—that is to say, with sheer conjectures about the causes or explanations of phenomena—and then proceed, as we saw was possible with the witchdoctor, to find empirical or observational evidence to support or "confirm" our preconceived ideas. Thus those who use this method do not begin with an open mind and attempt to accommodate their ideas to their observations (as does the scientist); rather, they begin with an idea and attempt to accommodate their observations to their ideas.

According to Baconian inductivism the fact that observational evidence that apparently supports a preconceived idea can be found is really neither here nor there—for it is always possible to find such support. Such apparent support is spurious or pseudosupport as it was gathered in the light of the very idea that it was supposed to support. The support that is called on in the use of the inductive method, on the other hand, is genuine or real support for here the support came before the idea and so could not possibly have been "rigged up" in the light of it. In other words the method of anticipation, by starting with the idea to be confirmed, allows its practitioner to interpret observations made in the light of his idea as confirmatory support for his idea; but those who practise the method of induction cannot possibly do this.

The traditional solution to the problem of demarcation—the inductivist solution—amounts, then, to this: what distinguishes genuinely scientific knowledge and genuinely scientific theories from pseudoscientific superstition is the application of the inductive method of inquiry. Genuine empirical science results from its application; pseudoscientific superstition does not. As a result the theories of empirical science are genuinely supported by our observations and experiments—and thus deserve to be taken seriously from the point of view of truth—whereas those of witchcraft (and other superstitions) are not genuinely supported by the evidence—and thus are not so deserving.

Something like this inductivist solution to the problem of demarcation is, I suspect, accepted by many doctors (and, indeed, by many scientists). It is also, I suggest, accepted by most members of the general public. This acceptance is reflected in the common image of the scientist as an unprejudiced searcher after truth—one who sticks closely to the facts and does not speculate in advance of them; who does not allow his observations to be clouded by preconceived ideas; and who puts forward only those theories that can be deduced from the unprejudiced facts. This view of science was summed up by the incomparable Mr Newton (as John Locke called him): "The main business of natural philosophy [that is, of empirical science] is to argue from phenomena without feigning hypotheses, and to deduce causes from effects." It is the view of scientific method popularised by Sherlock Holmes: Conan Doyle was, after all, a medical doctor.

The above considerations are, of course, elementary (my dear Watson). Yet only 50 years after Newton's *Principia*, and some 150 years before Conan Doyle, the inductivist solution to the problem of demarcation was refuted by the great Scottish philosopher David Hume.[4] That most contemporary philosophers of science, although highly appreciative of Hume, do not recognise Hume's achievement is testimony to the lasting influence of inductivist ideas.

Hume's refutation of inductivism

Hume's refutation of the inductivist solution to the problem of demarcation rests on his discovery that the inductive method itself requires what is, given the inductivist solution, a pseudoempirical superstition. In other words, from the point of view of inductivism, empirical science, rather than being demarcated from superstition, is simply another form of superstition. For if what distinguishes or demarcates empirical science from pseudoempirical superstition is the use of the inductive method, and if Hume is right in arguing that this method itself depends on or requires the assumption of a pseudoempirical superstition, then empirical science is just a pseudoempirical superstition and so cannot be demarcated from it. Induction, the philosopher C D Broad lamented, which was thought to be the glory of science, turns out to be the scandal of philosophy.

How did Hume show that the inductive method itself depends on a pseudoempirical superstition? To see this, return for a moment to the fundamental rules of inductive method: (*a*) start from observations, not speculations, and do not allow any preconceived ideas to prejudice empirical observation; (*b*) after collecting a sufficient body of observations (of particular effects) infer their underlying causes or the universal laws of nature that explain them. It is quite clear from these rules, and especially from rule (*b*), that inductivism requires us to be able to reason from the observation of effects to their underlying causes, or from the observation of particular instances to the universal laws that explain them.

David Hume. [Mary Evans Picture Library

Hume's argument can now be formulated as follows: every inference, or process of reasoning, from observed effects to their underlying causes or from observed particulars to universal laws, is effectively an inference from what has been found in observation (or in "experience," as it is sometimes put) to that which is not found in observation (experience). For though the observable effects can, of course, be observed, the underlying causes cannot be observed; and though particular instances of a universal law can be observed, the universality of such a law cannot be observed. But this means that every inductive inference (from effects to causes or from particulars to universal laws) must make use of a "hidden" assumption—the assumption that observed effects are a good guide to their underlying causes or that observed particulars are good guides to universal laws. In general, the inductivist must assume that unprejudiced observation is a good guide to what lies beyond observation, or that experience is a good guide to what lies outwith it.

Now, asks Hume, does the inductivist have a right, from his own point of view, to make any such assumption? According to the inductivist solution to the problem of demarcation such an assumption should be made only if it itself can be reached in accordance with rules (*a*) and (*b*); otherwise it is merely a preconceived idea to be shunned by genuine empirical science. But it is clear, argues Hume, that it cannot be so reached. For to reach this assumption in accordance with these rules we should have to infer, from a sufficient body of unprejudiced observation, that unprejudiced observation is a good guide to what lies beyond observation. But this claim is one that itself lies beyond observation, for it cannot be observed that unprejudiced observation is a good guide to what has not been, or cannot be, observed. Thus to infer from unprejudiced

observation that such observation is a good guide to what lies beyond it we shall need to assume that such observation is a good guide to what lies beyond it. But this is the very assumption that we were hoping to *reach* in accordance with rules (*a*) and (*b*). Thus the attempt to reach this assumption by these rules gets absolutely nowhere, as it simply traps us in a circle. To put it another way, we cannot possibly inductively infer from observation the very assumption that is required by every inductive inference—for as it is required by every inductive inference it must be required by this inductive inference and so cannot (except in a circular fashion) be reached by inductive inference.

Preconceived principle

This result of Hume's completely devastates the inductivist's hope of demarcating empirical science from pseudoempirical superstition—for what it shows is that at the very heart of the inductive method lies an assumption that cannot be part of genuine empirical science. This assumption, often called the "principle of induction," turns out to be a preconceived idea, one that can receive empirical support only if it is first presupposed. But according to inductivism any such support is merely spurious, or pseudosupport, as it can be seen as support only in the light of the very idea that it is supposed to support. Thus the inductivist must, by his own rules, reject such a principle as a pseudoempirical superstition. But in that case empirical science, in so far as it is characterised by its use of inductive inference, must also be rejected as a pseudoempirical superstition and so cannot be demarcated from it.

Hume's result, which effectively shows that inductive inference cannot be part of empirical science, is not the only difficulty from which traditional inductivism suffers. Other problems abound. For example, modern psychological studies into the processes of perception make it quite clear that there is no such thing as the unprejudiced observation required by inductivism. Observation is always permeated with hypothetical, or theoretical, elements—for example, the perceptual phenomenon of size constancy requires the implicit assumption that objects do not get smaller as they move away from us.

For another example, the traditional requirement that inductive inference should be used only after we have collected a sufficient body of unprejudiced observations raises the crucial question of when our collected body of evidence is sufficient. It is clear that, in principle, we can go on observing for ever and that the observational evidence can never itself inform us of its own sufficiency. It follows that the inductivist can begin the process of learning from observation (by using inductive inference) only if he is willing to subscribe to the hypothesis that the observations already collected are sufficient for the purposes of inductive inference. But inductivism itself requires that such a hypothesis be rejected as an unscientific superstition, as it must be a mere anticipation or speculation because it could not possibly have been reached as a result of inductive inference. It follows once again that inductive learning from observation without hypotheses—that is, without preconceived ideas—is impossible, while learning from observation with such hypotheses is anathema to the inductivist. Next week I shall discuss a way of reconciling Bacon's and Hume's views that allows us to distinguish doctors and witchdoctors.

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MATERIA NON MEDICA

Mary Celeste

1987 is the tenth anniversary of the British Shipping Federation's ban on the keeping of animals such as dogs or cats as pets on British registered vessels. In 1977 the keeping of a dog or cat as a pet on board ships of the home fleet was also banned by the Royal Navy, (apart from HMS *Belfast* which is moored permanently in the Thames). From time immemorial ships have had cats and/or dogs on board, not just as pets but also to keep down vermin and occasionally to act as guard dogs; but the fear of introducing rabies into Britain brought about the ban. I wonder if rabies could have played a part in one of the great sea mysteries of over 100 years ago?

On 7 November 1872 the *Mary Celeste*—a two masted sailing ship—left New York for Genoa with a cargo of whale oil, fusel oil, and methylated spirit, and 10 persons on board including the captain's wife and 2 year old daughter. On 9 November she exchanged signals with another ship about 300 miles south east of New York. The next time she was seen was by the *Dei Gratia* on 5 December when she was about half way between the Azores and the coast of Portugal. The *Mary Celeste* was completely deserted, even though two of her sails were still set. Two other sails which apparently had also been set had obviously blown away. The only things missing were the ship's papers and the ship's boat. The last entry in the log book was dated 24 November and showed that the *Mary Celeste* had then been about 100 miles south west of San Miguel Island in the Azores. Alongside the log were notes by the captain that on the next day, 25 November, at 8 am the ship had passed approximately six miles northward of Santa Maria Island. At that time it was not common practice to write up the log daily and indeed although the *Mary Celeste* had been at sea for 18 days before sighting the Azores, there were only seven entries in the log.

Sir Arthur Conan Doyle wrote a fictional version of the mystery in the *Cornhill Magazine* for January 1884 entitled "J Habbakuk Jephson's Statement," which unfortunately has given rise to incorrect statements being quoted as fact concerning the *Mary Celeste*'s abandonment. Many statements quoted are pure fiction with no evidence at all to support them. There was no clock still ticking in the cabin; there was no half eaten meal on the table or food still cooking in the galley; there was no evidence of blood stains; there were no signs of struggle on board; the ship and the cargo were insured; the ship was the *Mary*, and not—as Doyle has called it—the *Marie, Celeste*; and so on.

The true details are given in the report to the Board of Trade by the Admiralty Proctor at Gibraltar. This report makes it plain that there was no trace of an explosion or a fire and no injurious marks either outside or inside the hull, the ship was seaworthy and well found, her cargo well stowed and not touched, and there were ample provisions on board. (In 1967 Gibraltar depicted the *Mary Celeste* on a £1 stamp.)

Over the years countless solutions have been offered to the mystery, including, among others: that the crew either drank the alcohol or were overcome by fumes from it—but the cargo was methyl alcohol and not ethyl alcohol; that ergot in the bread drove the crew insane—yet if this had been the case traces would still have probably been found in the provisions and there would have been evidence of marked disturbances on board ship, but everything was in its place; that the ship was abandoned in a mad panic in the mistaken belief that she was going to sink. This third solution would be appropriate only if the captain, who was very experienced, had already died and been buried at sea so that his calming influence was absent. If this had been the case a note of such tragic importance would have been immediately written in the log by the next in command as required under the rules for dealing with a death at sea.

Many other, frequently more bizarre, explanations have been given, but to the best of my knowledge the possibility of rabies in the ship's pets has never been mentioned. Like all ships at the time the *Mary Celeste* would have had a cat or dog on board and probably more than one, particularly as there was a small child present who would find a pet a playful companion. If there were several animals on board it is just possible that should rabies have occurred they would all have become rabid at the same time, and this could have so terrified the crew that they immediately took to the lifeboat, possibly even hoping to make it to land in the Azores. The evidence of the sails shows that a storm occurred after the ship was abandoned and this could well have swamped the lifeboat and drowned everyone on board. If rabid animals were on the *Mary Celeste* it is highly probable that in their diseased state they jumped overboard, leaving an apparently insoluble mystery. Can you suggest a better answer?—the trouble being that so many "solutions" are incapable of proof.—JAMES M DUNLOP, district medical officer, Hull.