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We need to take a fresh look at medical research

'Most applied scientists are unaware of the significance to society of the tasks they perform' (1)

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Editor's note

Every human being has a vast store of knowledge about health and sickness and the ability to draw conclusions on the basis of this knowledge. Yet science research continues to be based largely on 'objective studies' conducted by academics and to look down on 'subjective' studies.

The belief that 'pure' objective science is highest and subjective information is lowest, inculcated by the way science is taught in schools, deters doctors from communicating information based on personal experience lest it be decried – as it certainly will be – as scientifically worthless.

Alternative medicine with its open, flexible approach to the whole person, has something to teach conventional medicine. And doctors must pay more attention to what their patients can tell them. There is no rational justification for accepting the factual information that people give (in a case history) while disregarding what they have to say about their condition.

Old-style science is particularly inept in helping doctors deal with psychosomatic problems. What is needed is a new 'science of the subjective' which would be truly appropriate to the subject of study, the whole human being.

There is a commentary on this paper by Sir Douglas Black, President of the Royal College of Physicians.

The British National Health Service is going through difficult times and there is a growing dissatisfaction with the nature of our health care system. Patients find fault with its impersonality, the shortage of time and attention and with the tendency for treatments to go for the symptoms rather than for the underlying causes. Health care workers are equally dissatisfied and complain of overwork, inhumane conditions of employment and other factors which prevent them from caring for their patients to the best of their ability.

Financial restrictions account for some of the difficulties but it is unlikely that the problem will disappear simply by pouring more money into the system. Many improvements in health care come as a consequence of scientific investigation and it is likely that a solution to the present difficulties will come about, at least in part, from a re-orientation of objectives in scientific medical research.

I shall be arguing that many of the current problems stem from a failure to develop a medical science which takes proper account of the subject of study which is the whole human being.

Various 'alternative' systems of medicine, for example acupuncture, homeopathy and herbal treatment are growing in popularity. One reason for this is their openness to new ideas and the flexibility with which they can be applied to the varied needs of individual patients. By contrast, advances in conventional medicine proceed slowly and they are often applied in an inflexible way which takes little account of the patient's lifestyle or background. Conventional medicine claims to be grounded in objective science while other systems, by implication, are regarded as having little scientific basis. My introduction to systematic healing came at an early age when I went on walks with my grandfather, helping him identify and collect various species of medicinal plants. At a time when conventional practitioners, for the most part, prescribed little more than aniseed-flavoured suspensions of chalk, my grandfather was treating his patients with effective preparations of plant drugs developed through his system of rigorous self-experimentation. Who, in this case, was the scientist and who the 'quack'? Confused ideas about what constitutes scientific medicine are now impeding the progress of research and this lack of clarity must be dispelled.

It has been maintained that, underneath its scientific gloss, Western medicine is based on empiricism and trial and error and that many forms of treatment are poorly understood from a scientific point of view. While this is partly true, there can be no doubt that the development of Western medicine has relied heavily on controlled laboratory observation and there has always been a move towards discovering its rational basis through the application of scientific method.

Moreover, it is incorrect to imply that an endeavour is only scientific if the experimentation and rational understanding precede the practical application. The notion that modern engineering has a scientific basis is indisputable, yet new developments in many fields, for example the aerodynamic design of motor vehicles and the construction of nuclear reactors, depend on some degree of 'trial and error' and the results are put to practical application in advance of a full theoretical

understanding. This follows the perfectly respectable principle that 'if it works it's scientific'.

Disrespect for the empirical, practically-orientated approach is fostered by our school system where many of the attitudes of old-style education in the 'classics' still survive. One of these is the model of ancient Greek science in which theoretical brain-work was respected while manual work, which is essential to experimentation, was regarded as fit more for slaves than true philosophers. Public schools nurtured this viewpoint since it was a way of maintaining the privileged position of the ruling classes over working-class people with their practical and scientific achievements. Science has suffered as a result.

We have improved, but not as much as we would like to think. In school much of our teaching in science remains abstract and the student is given little idea of the practical implications of what is being taught. I remember at the age of 13 being shown how to 'use' logarithmic tables – that is how to derive a log from a number and vice-versa, but it was not until about a year later that I learned that I could use this to help me solve complicated equations in physics.

Science teaching in school, moreover, takes virtually no account of the vast practical knowledge of the majority of the people concerned, namely the pupils. When I entered secondary school at the age of ten I already had a lot of first-hand experience in many areas of science: about the construction of solenoids and electric motors, about optical focusing of solar energy, about gunpowder and fireworks, about freshwater ecology and about astronomy. None of this valuable experience was called upon in science lessons at my school, and it was not until my third year at university that I interrupted a lecture on the mechanics of bird flight to give an excellent summary of aerodynamic theory based on knowledge gained from flying model aircraft when I was in my teens. I am sure that everyone has had similar experiences.

Medical practitioners, then, embark upon their professional studies fully indoctrinated to the viewpoint that science is about something other than ordinary practical experience. Professional scientists working in medical research often feel very strongly that their medical colleagues view 'pure' science with an elevated respect which they do not apply to their own work as practitioners. Medically-qualified people who plan to work for an MD degree frequently choose lines of investigation which have little connection with their interest in human patients, order experimental animals by the hundred and shut themselves up with microscope and centrifuge miles away from the hospital ward – all in the quest for 'scientific respectability'.

Publication of case reports, containing real information about human beings, used to be a very important part of medical research literature. Now it tends to be looked down upon as 'anecdotal' so that, although all practitioners have a wealth of original information gained from personal experience, they feel deterred from communicating it because of the implication that it is scientifically worthless unless the observation has been repeated and confirmed *n* times.

While devaluation of practical experience in science is inculcated through the school system it is perpetuated by the medical profession itself through all manner of tiresome quips, jokes and banter through which practitioners undermine their own pride in being scientists. Take the way in which they may introduce a non-medical colleague: 'This is Dr So-and-so – she's a *real* scientist'. It is embarrassing to be with people who do not take themselves seriously and medical people must really stop dragging each other down with this sort of jokey nonsense.

Another misunderstanding about what constitutes true scientific enquiry concerns the principle of cause and effect. In many fields of enquiry it is possible to predict the effect of a particular set of circumstances and yet to have an imperfect understanding of the exact sequence by which the cause is translated into the effect. The activity is no less scientific because of this limited understanding. Yet thinking on this point is often confused.

Acupuncture involves treating people by the stimulation of specific anatomical areas which in classic acupuncture theory are thought of as being well-defined points aligned along definite 'meridians'. Detailed investigation has failed to confirm the existence of such 'points' or 'meridians' in terms of conventional anatomical or physiological theory (2), and, because of this, acupuncture is often said to have no scientific basis. However, acupuncture can be said to be a truly scientific practice because the reproducibility of its results has been thoroughly researched and confirmed. Once the correlation between cause and effect has been established it is, of course, useful to investigate the rational basis of the phenomenon both because of the intrinsic interest of such knowledge and because it invariably leads to improvements in practical application.

Confusion on this point is again fostered by the school system. Consider the subject of domestic science in which young people (more often than not, young women) learn principles of cause and effect through first-hand experience in cookery classes. They may not know as much about the chemistry of sodium bicarbonate (an ingredient of baking powder) as does the chemistry student, but they know far more about what it can do. Yet a qualification in domestic science is regarded as 'non-academic' and rated lower than a qualification in chemistry when it comes to assessing relative merit for university entrance.

Such attitudes carry through into medical work where practitioners often feel that something else besides their practical knowledge of cause and effect is required before their work justifies being called scientific. The third and final area of confusion I want to discuss is the relevance in medical science of information gained directly from human subjects. Medical practitioners in general do not pay much attention to the patients' evaluation of their treatment or to their

hypotheses about the origin of their ailments. Once the symptom is presented, such information is largely ignored as being 'subjective' and further data are sought from clinical tests where tissues or body fluids from patients are subjected to analysis in the laboratory.

Medical treatment, however, relies heavily on the 'case history' in which patients are called upon to provide factual information. Such information may at times be inaccurate but without it medical practice would be virtually impossible. Imagine what it would be like if patients came into the consulting room and sat mutely without saying a word about their conditions or medical histories. There is no rational justification for accepting the factual information that people give while disregarding what they think about their condition and its treatment.

I gained personal experience of this when I was admitted to hospital for investigation of severe acute intestinal colic. I volunteered my view that it was due to my having returned home over-tired the previous evening after which I had hurriedly eaten a large meal before going out to a party where I did a lot of energetic dancing and indulged in yet more 'eats' in the form of salted nuts and slices of pizza. This information was dismissed as irrelevant (no-one even bothered to note it down) and I was subjected to a series of inconclusive (3) radiological examinations including a revolting barium meal. The problem recurred a few weeks later, following very similar circumstances (this time my indulgence took the form of several helpings of home-made gooseberry pie) but on this second occasion I acted on my own theory and have had no further trouble.

This failure to take adequate account of the valuable data supplied by patients themselves is most obvious in those conditions where the physical distress has no obvious organic cause but where some emotional or psychological distress may be present. Such conditions, if they are severe enough, may be treated with pain-killers but very often the condition is dismissed as 'psychosomatic' and no further action is taken. It is often maintained, as a justification for this, that in an overloaded health care service some priorities have to be set and that, since psychosomatic or 'hysterical' complaints (a pejorative term which should have been banished from medical terminology ages ago) are not 'life-threatening', any time spent attending to people with such conditions would mean less time for treating 'real' illnesses with an established organic basis.

There are two things wrong with this attitude. First, it is not the place of the individual practitioner, or of the health care system, to make value-judgments about the relative importance of different peoples' ailments. Second, it is untrue to say that the consequences of conditions with no organic basis may not be serious. For example, lower back pain, much of which has no obvious basis, costs the community £220m in lost output each year and a further £60m in medical services (4). These figures, of course, say nothing about the suffering that is caused. Such conditions also diminish awareness and attention, leading to physical accidents. For example, it is not safe to drive a vehicle with aching shoulders and a neck too stiff to turn. These various conditions, which together take up a sizeable proportion of a GP's consulting time, will never be understood by reference to 'objective' research and animal experimentation. This is one of the reasons why they are sadly neglected. It is essential that more attention be paid to 'subjective' information about the patients' states of mind and their life events.

Such information is essential also to the full understanding of many conditions in addition to those in which an organic cause is apparently absent. Many illnesses once thought to be purely organic in origin are now recognised as arising from the interplay of organic and psychogenic factors. There is, for example, strong evidence that predisposition to many forms of neoplasia is influenced by emotional factors (5) and the same is true of many other diseases (6). Even conditions whose origin is obviously organic, such as unforeseen physical accidents, come to have an emotional component since the distress caused by the condition, if unresolved, can impede the healing process and the will to recuperate.

While the importance of emotional factors in physical illness has been recognised since the dawn of medicine, too little progress has been made in putting this knowledge into practice. Attention to this would create a major breakthrough for modern medicine. However, when discussing the effects of the mind on the body I frequently hear medical practitioners say: 'But how can we be sure – where is the scientific proof?'. I'm sorry to disillusion such people but it is absolutely no use expecting science to come up with some answer, from a survey or an experiment, which gives us the 'objective truth' on this point.

We are talking about human experience and to understand this you have to try it out for yourself. To know what it is like to see the sun rise out of the sea you have to go down and sit on the beach in the grey dawn. No one else can do it for you. It is the common experience of millions of people that worry and distress hurt the body. To understand this medical people will simply have to start taking an honest look at themselves, their own health, their own lifestyles, their own conduct in relation to each other and their own states of mind. They need to make a few connections, come to a few conclusions, and then get down to putting this knowledge to work for the benefit of their patients. Old-style science is not going to solve this one.

What we therefore need is a new 'science of the subjective' which would be truly appropriate to the subject of study, which is the whole human being. The teaching of procedures more suited to biological and physical sciences should be discouraged and research students in medicine should be steered away from laboratory science and into fields of investigation which involve direct interaction with human beings. There is much new thinking on improved procedures

for interviewing patients (7) (8) and on ways of communicating these to student doctors (9) (10). The application of these ideas in the counselling of individual patients has been shown to be successful (11). More detailed correlation and analysis of this information, using modern data-processing systems, would lead to important general conclusions.

So far I have talked only about the function of medically-trained personnel in research, but a large amount of relevant investigation is carried out by scientists, particularly biologists, who have trained in specialties other than medicine. The present situation here is far from satisfactory. Non-medical scientists are usually employed as recent graduates on short-term contracts with no job security. They accept low pay on the inducement that they can work for higher degrees. A sizeable proportion of them, for reasons not of their own making, do not succeed in getting such promised further qualifications and those who do usually find themselves out of work after about three years with a PhD which is more of a liability than an asset.

Meanwhile their salaried medical colleagues, who direct the research, climb the ladder of promotion backed by publications based on 'collaborative' experimental work performed largely by their less privileged non-medical associates. This is unfair and furthermore it has an adverse effect on the quality of the research. Because they are, for the most part, employed on temporary contracts, the non-medical scientists tend to be treated as extra 'pairs of hands' and to have a limited say in the selection of topics for investigation or in the choice of experimental method. This is largely decided by the medical staff, most of whom have had little direct laboratory experience since the day when their MD theses were placed on the library shelf with a sigh of relief. This is not a recipe for success and it will not improve until non-medical scientific workers are given better conditions of employment and the freedom to participate fully in decisions about the nature of the work they do.

Many of the problems that non-medical scientists are called upon to investigate could be better approached by the application of simple common sense. It does not need high-powered science for us to know that addictions such as overeating, physical lethargy, alcohol and tobacco are dangerous and it is not for lack of scientific information that people continue to do self-destructive things. The search for yet more detailed knowledge of biochemical pathways, enzyme chemistry and carcinogenic action is not going to help them. What is badly needed is for humanly-concerned scientists to ask why people take up addictions in the first place.

It is difficult for them to do this when society as a whole accepts the idea that a wee bit of indulgence does nobody any harm. Thus the term 'overindulgence'. So we see advertisements such as 'Go on, spoil yourself' in which a national marketing board is allowed publicly to encourage people to swallow sticky cream cakes. Or, take 'Everybody likes a drink . . .' which is a national educational council's way of condoning its little indulgences in professional sherry parties at the same time as it hammers 'drunkards'. Meanwhile the research scientist is expected to come up with something that will help people carry on without doing anything radical about their lives.

Because non-medical scientists, who do the bulk of the research, are not properly included in the decision-making process there is a failure to incorporate the best results of recent scientific thinking. One manifestation of this is the outdated reductionism of most medical research. In the latter part of the 19th century the Germanic school of medicine, headed by Virchov, formulated the concept of 'cell pathology' (12). This idea of looking at disease in terms of disordered cell function has led to some outstanding advances in medical theory, but the concept has continued to dominate medical research – to a degree which has become counterproductive.

'Scientific research should only be conducted where it doesn't damage morality' (13). So, faced either with their own conscience or with the pressure of public opinion, many investigators are becoming even more reluctant to do research on experimental animals. Failing this they usually turn in the direction of tissues, cells and culture systems. Despite the persistent advocacy of 'humane alternatives' in research, for many types of investigation there is no satisfactory alternative to the whole organism and, if the use of other species is restricted, we shall have to do more work on human beings starting, as my grandfather did, with ourselves.

This brings us to the real crux of the matter. Every human being has a vast personal store of experience concerning health, well-being, distress and sickness and has a brain and sensory system to monitor these states and to draw conclusions. Yet science research is still based largely on 'objective' studies performed by a small minority of academically-trained people to the exclusion of 'subjective' studies done by people who draw upon the extensive resources of their own personal experience (14).

Decades ago Einstein exploded the idea of objectivity by showing that the observer must be included in the system which is the subject of study. It is now high time that medical biology brought itself up to date by recognising the importance of the principle of relativity.

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Commentary

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This paper expresses a number of loosely-related discontents, not all of them, in my view, divine. Conventional medicine is criticised as being less open to new ideas, and less concerned with 'the whole patient', than 'alternative' approaches to therapy, such as acupuncture and herbal treatment. Certainly, it is possible to find examples of ill-founded dogmatism, and of concentration on the part rather than the whole, in the day-to-day practice of medicine. For the most part, these are the blemishes of bad conventional medicine, and they are rare in the best medical practice, in which, however, they may represent a reasonable response to the desire of many patients for certainty where none exists, or for concentration on what they themselves see as a mechanical fault.

A second criticism is that medicine leans too much on theory, and too little on practical experience – a defect which the author traces back to over-emphasis on principles, as opposed to observed detail, in the scientific curriculum at school. Again, this seems to me at variance with the empirical fashion in which the majority of clinicians work – leaning certainly on relevant science, but conscious of the vast areas of medicine where our understanding of causes and mechanisms remains inadequate.

Doctors are criticised for paying too little attention to what patients say in general, and in particular to the views of patients about the nature of their own illnesses. Had we but world enough and time, this would be a legitimate criticism; but again it lacks understanding of the time constraints under which doctors have to work.

Another familiar criticism is that doctors concentrate on the rare and interesting, neglecting common conditions such as backache, and conditions in which there is a strong psychological element in causation. There is, of course, no excuse for lack of sympathy with a confused sufferer; but actual tangible help from a doctor is more likely when the presenting condition is itself tangible.

The final section of the paper claims lack of understanding by the medical profession of the important role of the science graduate in medical research, a particular reflection of this being the difficulty in obtaining a post-doctorate post with tenure. Outside the clinical field, and quite often even within it, the scientist with no medical qualification is a major contributor in any team; the doctors in the team are very foolish if they do not recognise this. Nevertheless, it is my belief that a clinical training is also capable of adding an important dimension to investigations which have relevance to disease; partnership with mutual respect is the most productive relationship within a research team. Perhaps some day a far-sighted and well-endowed university may offer laboratory scientists a one-year MSc course in clinical medicine, as a sort of mirror image of the intercalated BSc in a medical course.

Having worked a good deal in the past with laboratory scientists, and more recently with social scientists, I have long thought that people with a strong interest in medicine, but who for some reason do not wish actually to practise, might benefit from a short course, say of a year, leading to a qualification which would attest some real experience of clinical work, but would not confer the right to practise.

The first three months of such a course could be supplied on the same lines as the introductory courses given in many medical schools to students entering their clinical years. There would also be lectures and seminars dealing with inborn and environmental determinants of illness, with major patterns of disease, and with the main methods of diagnosis and treatment. Concurrently, there would be attachments to clinical work both in hospital and in the community, the exact topic of the attachment being a matter of choice.

I believe that such a course, following on a science or social science degree, would be a better preparation for a laboratory career, or for medical sociology, than the conventional 'B Med Sci', which generally lacks a clinical component. Actual experience of practical medicine might make people less prone to the errors of either romanticising or trivialising medicine.