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## Whither India's medical legacy?

*It is not easy to distinguish medical from potentially medical research, but without underpinning by research, medical practice cannot advance, nor even hold up against the burgeoning medical problems of an overpopulated nation. Medical research must strike roots in our medical colleges. A properly placed force of young medical investigators exposed to the history, philosophy and methodology of research in parallel with their medical training can galvanize Indian medical research within a generation.*

FRANCIS BACON described four classes of idols that beset the minds of men—idols of the tribe, idols of the cave, idols of the market-place, and idols of the theatre. With apologies to Bacon, we might add a fifth, idols of numbers. If our minds are beset with the idols of numbers and they are regarded as the invariable attribute of the fundamental, medical research is less than fundamental. However, if one admits that the most fundamental aspect of the human condition is the universality of suffering, one might view medical research differently.

By definition, medical practice pertains to the art of healing. One can hardly consider medical research in isolation from the practice of medicine. The medical scene in India is, however, none too bright even after four decades of independence. Infant mortality exceeds 100, to say nothing of the subsequent mortality and morbidity in childhood; even though tuberculosis and leprosy stalk the land, we are obliged to import drugs that the multinationals are no longer keen to supply; a hundred years after Donovan, we are unable to control outbreaks of kala-azar; and the record in controlling parasitic and noncommunicable diseases is even less inspiring. The medical realities leave one with the impression that our research endeavour has touched many areas but adorned none. It has had no discernible impact on hospital practice or the control of diseases. The large superstructure of our medical practice would appear to be built on the sands of borrowed knowledge and not on the rock of experiment and medical research.

The weakness in our research effort is not surprising because the history of medical research reaches back hardly three centuries and its birth and development during the initial two centuries were largely European events. Even though the accurate description of human anatomy by Vesalius appeared within weeks of the publication of the classic of Copernicus, medical

research as we know it began with William Harvey. Harvey was a student at the University of Padua and the physician of Bacon. His discovery in 1628, based on experiments in animals and man, of the circulation of blood symbolized the spirit of the new century which broke with tradition and journeyed into the unknown on the wings of experimental science. His motto 'Not from books, but from dissections' was echoed by John Hunter in the following century. An experimentalist *par excellence*, Hunter's famous advice to Jenner, 'Why think? Why not experiment?', was instrumental in Jenner's historic discovery of vaccination. The spirit of new learning transcended medicine, and the cumulative effect of research in many disciplines during the seventeenth and eighteenth centuries found triumphant expression in the nineteenth in the form of a series of brilliant discoveries. These included the differential functions of the roots of spinal nerves, bacterial causes of diseases, electromagnetic radiation, X-rays, nitrous oxide, and others too numerous to list. Throughout these years of patient effort and slow triumph, medical research sought knowledge 'useful for man's life' and denied that the goodness of the search for knowledge is independent of its value for the betterment of the human condition. Indeed, the seventeenth-century vision of science did not exclude research useful to man's life, as the second charter of the Royal Society (1663) directed the Fellows to apply their studies 'to further promoting by the authority of experiments the sciences of natural things and of useful arts, to the glory of God the creator and the advantage of the human race'.

The remarkable record of the nineteenth century has been excelled by our own dazzling century, which has given voice to the call for health for all. Today, medical research has become a veritable ocean into which many rivers and streams flow and where waters from different lands and climes mingle. It is no longer easy to trace

the line of separation between medical and potentially medical research. The discovery of the bending of the path of the electron in a magnetic field gave birth to the electron microscope, which enabled medical research to penetrate the cell; disintegration of the atom by neutron bombardment produced radioisotopes, which advanced analysis, organ imaging and cancer therapy; synthesis of polyamide led to the advent of arterial prosthesis; and aerospace technology fathered cardiac telemetry. These examples of the unlikely impact of fundamental research on medicine remind one of Whitehead's remark, 'In our most theoretical moods we may be nearest to our most practical inventions.'

All this does not mean that medical research has no clear objectives or that it lacks a personality of its own. A classic example of an essay in medical research is the discovery of insulin. Toward the end of the nineteenth century, Langerhans, studying the microscopic structure of the pancreas, had noticed clusters of cells that were unrelated to the glandular cells. A few years later, Minkowski, while investigating the digestive functions of the pancreas, found that his experimental animals developed diabetes mellitus following removal of the pancreas. Soon, Scheff noted that the cells or islets of Langerhans were spared the general atrophy of the organ which followed ligation of the duct of the pancreas. Hedon found thereafter that the post-pancreatectomy diabetes in animals could be prevented by placing the islet cells under their skin. But all efforts to isolate a regulatory substance from the islet cells failed. It was in this scene that Banting appeared, with no prior experience in research after his discharge from the Royal Army Medical Corps. What he lacked in research experience was more than made up by his fierce determination to solve the riddle of diabetes. In a tiny laboratory in the University of Toronto he produced experimental diabetes in animals and treated them with extracts of islet cells, which he and Best, a medical student, had prepared. Several hot months and much tenacious effort later, they noted with profound excitement the colour of the sugar reagent fade and the animal's sugar level fall under the effect of their islet extract. Their excitement marked the birth of insulin, the substance that has given new life to millions of patients. What motivated Banting—the force behind his tenacity—was the intense concern for the suffering of diabetic patients. This is the central characteristic of medical research—it is medical only to the extent it treads on the hallowed ground of suffering.

If medical research advanced the practice of medicine in less than three centuries to the present astonishing level in the West, what was its history in our own country? The oldest references to illness are found in the *Atharva Veda*, which dates back to 1500 BC. It contains much demonology (*Bhutavidya*), clear descrip-

tions of symptoms alternating with incantations, and brilliant passages such as that on the 'wonderful structure of man'. It would not be wrong to characterize the medicine of the *Atharva Veda* as magico-religious. A thousand years later, one finds that *Ayurveda* had been elevated to the status of an *upaveda*; *Bhutavidya* had been eliminated and new disciplines such as *Salya* (surgery), *Salakya* (head and neck surgery) and *Kumara britya* (paediatrics) added to the corpus; Taxila and Kasi had emerged as outstanding centres of medical learning and training; and Sushruta and Charaka had produced a brilliant, systematized version of the medical knowledge of the time. The evolution of medicine over a thousand years was characterized by excellent observation, analytical thinking, innovations and catholicity of outlook. But alas, this triumphant march of medical science came to an abrupt end in the early centuries of the Christian Era for reasons that are unclear at the present time. For the next thousand years, one looks in vain for a Charaka or a Sushruta or for brilliant innovations; instead one is greeted by commentaries and redactions. When European observers entered India in the eighteenth century and studied local practices before Indians were regarded as a conquered race, they acknowledged that excellence continued to exist here and there like bright patches in a tattered garment. Holwell, who studied the Indian practice of variolation very closely and sent a detailed account to the President of the Royal College of Physicians in 1747, concluded his letter as follows: 'When the before-recited treatment of the inoculated is strictly followed, it is next to a miracle to hear that one in a million fails of receiving the infection, or of one that miscarries under it. . . . Since, therefore, this practice of the East has been followed without variation, and with uniform success from the remotest known times, it is but justice to conclude it must have been originally founded on the basis of rational principles and experiment.' But we had no Jenner to validate the Indian practice of *tikka* or variolation.

The following quotations are from yet another observer, Scott, who was reporting to the President of the Royal Society in 1792 from India. 'In medicine I shall not be able to praise their science very much. It is one of those arts which is too delicate in its nature to bear war and oppression and the revolutions of Governments. The effects of surgical operations are more obvious, more easily acquired, and lost by no means so readily. Here I should have much praise. They practise with great success the operation of depressing the crystalline lens when become opaque [*sic*] and from time immemorial they have cut for the stone at the same place which they now do in Europe. These are curious facts and I believe unknown before to us.' Again: 'You will think the paper on putting on noses on those

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who have lost them an extraordinary one. I hope to send you by the later ships some of the Indian cement for uniting animal parts.'

When European medicine with experiment as its engine of progress entered India in the eighteenth and nineteenth centuries, we adopted their practice of medicine but ignored the philosophy and method of experiment which could have enabled us to validate what was precious in our medical inheritance and given us a powerful tool for medical advancement. The neglect of experiment obliged our practitioners of medicine to adhere to Indian or Western texts depending on whether they practised *Ayurveda* or allopathy. It also ensured that India's impact on the concepts and practice of global medicine would be negligible. This was a tragedy of far-reaching importance, which is comparable, strangely enough, to our import of technology in more recent history with no attention being paid to its indigenous generation. It was forgotten that building on the sands of imported knowledge is an invitation to disaster, for ruin is the destination of a nation that lives on borrowed knowledge.

As the mismatch between our medical practice and medical research is serious and the malady of medical research is chronic there is no instant remedy. But a remedy we must find and work for even if one can indicate no more than the elements of a remedial strategy. In the first place it must be recognized that medical research cannot strike roots or become a creative force unless it flourishes in our medical colleges. And our colleges are nowhere in the picture today. Given the fact that they number over 120, admit our best students, and graduate over 12,000 physicians a year, it is clear that they must become the home of investigative medicine and the nursery for a new generation of medical scientists. If 20% of the colleges are selected across the nation and granted fully funded research departments in preclinical and clinical sciences on appropriate terms such as full-time staff, non-transferability, promotion on merit, etc., we would have taken the first and essential step in enfranchising the medical colleges in a national research endeavour. Secondly, at least 50 medical students must be selected on the basis of a talent test every year for a research career and given appropriately tailored courses in basic sciences and exposure to the history, philosophy and methodology of research. It should be open to them to spend electives with research groups anywhere in India.

The entire programme for the scholars should run in parallel with the medical course, much like the National Cadet Corps programme in the professional colleges. The best among them must be given career investigatorships on par with medical teachers, or offered faculty appointments in the newly set-up research departments or other institutions of learning. If we succeed in raising a force of three hundred young medical investigators and placing them optimally, Indian medical research will be on the move in a generation. Thirdly, medical teaching must emphasize that while we are more than our forefathers we are yet nothing without them, and what is regarded as new may have been conceived or practised in a rudimentary form many hundreds of years ago. For a young surgical trainee, the realization that cataract removal, rhinoplasty and cystolithotomy had been done and over a hundred surgical instruments used in India as early as 500 BC is a heady experience that will restore his confidence in himself and his society. Lastly, total support should be given to research efforts that seek to control or remove the misery of large numbers rather than dividing the funds on the basis of fundamental and applied research. Investigating the opacification of the lens may pass for fundamental research and the development of an implantable lens may be classified as applied, but both efforts assume significance only in so far as they enable the blind to see. Just as the principles of hotness and coldness of matter have been superseded by the single concept of temperature, the duality of fundamental and applied tends to dissolve against the background of compassion that pervades the field of medicine. By nothing is medicine as glorious as by its quality of compassion.

Demographers estimate that India's population may stabilize at 1.5 billion by 2050 AD. The success or collapse of hospital services for so massive a population will depend in no small measure upon a self-generating base of research and development in medical science and technology. If we succeed in building such a base, we will not only serve our people better but will also create an Indian identity in medical research and influence the march of global medicine for the benefit of all.

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