with respect to this dilemma. It would appear to us that there are many elements of criteria and method about which there is little disagreement. Thus, reasonable investigators might well conclude that the surrender of a modicum of individuality for the benefits that would accrue from some degree of uniformity would be well worth the effort involved in achieving consensus. In doing this, they would be following the precedent of investigators all over the world who have discovered that uniform protocols are essential to the success of controlled clinical trials.

On the other hand, it is clear to us that there are many areas where much more exploration is required. Without attempting to catalogue all of them, we would only note that they include the evaluation of nutritional patterns, and the measurement of physical activity, or of "stress." An attempt to secure complete consensus on criteria and method in these areas at this time would be premature although, even here, certain agreements might be achieved.

We believe that cardiovascular epidemiology will, indeed, have come of age when the investigators who have contributed so much to its development can reach agreement on those areas where uniformity is presently both achievable and desirable, and their decisions made available to the growing body of investigators in this field. The subcommittee's report documents a necessary first step in that direction. The stage is thereby set to take action on the lessons learned from this undertaking. It will be the subcommittee's next endeavor to attempt the pooling of data from several ongoing epidemiologic investigations in areas where no single study will accumulate adequate numbers in the foreseeable future. This will make it possible to assess with confidence the significance of known or suspected risk factors with respect to the appearance of specific manifestations of coronary and hypertensive disease. To give but one example: what is the influence of smoking, at various levels of serum cholesterol, blood pressure, weight, and carbohydrate tolerance level, on the development of "minor" electrocardiographic changes or angina pectoris? In this undertaking, individual investigators will retain full freedom to exploit and experiment with their own data while making available, for the common good, information most useful and appropriate for analysis of pooled data. Agreement to uphold the essential and traditional nonconformity in biological investigation while strengthening collaborative effort where it is needed, will realize the full potential of epidemiologic research.

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Reference

The Roots of Theory and Practice

Human knowledge and human power are coextensive; for ignorance of causes prevents us from producing effects. Nature can be ruled only by being obeyed; for the causes which theory discovers give the rules which practice applies.—Francis Bacon.
expressed to Dr. George E. Wakerlin, Medical Director, American Heart Association, for his whole-hearted and active support. Dr. Thomas Francis, Jr., generously provided space and facilities in his department for the central staff. Appreciation is also expressed to two former members of the Subcommittee, Dr. Ralph S. Paffenbarger, Jr., and Dr. James E. Banta, for their contribution to these activities.

References

Science and its Progress

Science now underlies all technological activities of today's world. But the rate of increase in scientific activity cannot be realized until one considers the estimate that this activity has doubled every ten years since the time of Harvey's great discovery. It has been calculated that there are about ten times as many scientists living in the world today as the total number, prior to our immediate time, in all recorded history. And yet the goal of our society is to increase even this number. Our scientists today live in the well-protected environment of universities and institutes, the expenses of their higher education are paid, and their laboratories are built and equipped for them. Like a nest of ants caring for their aphid "cows," our society cares for its scientists with great affection, hoping that from time to time a drop of ambrosial nectar will be exuded which can be lapped up to the benefit of the nest as a whole.—Introduction, EDWARD D. CHURCHILL, M.D. Listen to Leaders in Medicine. Edited by ALBERT LOVE and JAMES Saxon Childers. Atlanta, Tupper and Love, Inc., 1963, pp. 6 and 7.

Observations on Treatment

By Richard Bright—1827

One of the most important questions in the treatment of this class of dropsies, is the propriety of employing Mercury. It is consistent with the most successful treatment of many forms of inflammatory disease, that we should have recourse to the valuable combination of Calomel with Opium; and it is consistent with what is generally deemed good practice, that by the cautious use of mercury we should endeavour to produce more healthy action, and to promote absorption when there is reason to believe that disease has left any chronic morbid action tending to produce unhealthy deposit in glandular structures. Still however, the cases which have proved most successful in my own practice, have generally been those in which I have rigidly abstained from the use of mercury. In some cases I have seen the good effects of other remedies entirely interrupted by the mercurial action; and I have likewise seen several instances in which the cure, when mercurials have formed part of the plan, has been protracted to a great length; and a great many in which the full action of mercury has not prevented the regular progress of the disease, and its fatal termination.—Original Papers of Richard Bright on Renal Disease. Edited by A. Arnold Osman. London, Oxford University Press, 1937, pp. 74-75.
LIPID-BINDING CAPACITY

References

Limitations of the Experimental Method

Experiment is observation made in specifiable and controllable circumstances and it seeks to eliminate that dependence on the personal judgement, the tact, the intuition of the observer which is the weakness of the observational method. If we imagine a problem to be attacked and solved independently by experiment and by observation, the solution by the latter method, in addition to having taken longer and being less exact, will generally have demanded a more arduous and intricate intellectual exercise than the solution by the former.

This economy of experiment in its demands upon certain of the less definable aptitudes of the mind is no doubt a contributory cause of its great success as a method, but probably it has secondary consequences which in the long run and on the large scale are not wholly advantageous. A science which is strictly limited to the experimental method is apt to favour in its workers a tendency to deprecate any great speculative activity and to regard an interest in the free play of ideas for their own sake as evidence of a lack of scientific stability and trustworthiness. Such a distrust of the intellect involves an unsound view of the function of ideas in science. It is a mistake to suppose, as it is so easy to do, that science enjoins upon us the view that any given idea is true or false and there is an end of it; an idea may be neither demonstrably true nor false and yet be useful, interesting, and good exercise. Again, it is poverty rather than fertility of ideas that causes them to be used as a substitute for experiment, to be fought for with prejudice or decried with passion. When ideas are freely current they keep science fresh and living and are in no danger of ceasing to be the nimble and trusty servants of truth. We may perhaps allow ourselves to say that the body of science gets from the steady work of experiment and observation its proteins, its carbohydrates, and—sometimes too profusely—its fats, but that without its due modicum of the vitamin of ideas the whole organism is apt to become stunted and deformed, and above all to lose its resistance to the infection of orthodoxy.—The Collected Papers of Wilfred Trotter, F.R.S. London, Oxford University Press, 1946, p. 120.
COMPLICATIONS OF CHRONIC ANEMIA


William Harvey: Unsolved Problems

Although there was no doubt in Harvey's mind concerning the circular movement of the blood, much remained to be clarified. He was still uncertain of many matters.

Each heart beat occurred within such a short space of time that it was impossible to observe its details. Yet he could only explain his ever-recurring questions if he could observe the series of details which made up the movements.

He saw that one movement was not a simple contraction or dilation, but rather a rapid snakelike writhing running through the heart, followed by the next one, just as rapid, so that he was never able to observe the whole and so very significant series of consecutive details one by one.

As he watched the animal during an experiment, he found that it inhaled the air increasingly slowly and that the heart, which to begin with beat so rapidly, became sluggish, then beat only intermittently. Anyone else would have left his victim at that point and gone to seek to prove his preconceptions on a fresh animal. But he waited, watched the paralyzed heart, which gave another twitch and then stopped once more. And then again another sluggish contraction took place.

Thus Harvey was given what he wanted. A slow-motion picture of the process of the heart function. The movement which in its lightning rapidity was incomprehensible was now quite perceptible at this slow pace, not only to the eye but to the touch. He could feel the heart lose intensity; it grew soft and loose, but when it beat, it was taut and hard. And the warmth of the finger could induce a few more contractions in a heart thought to be dead, until finally it lay still and limp, with all power of movement gone.

The First University Medical School

The narrow slit through which the Greek spirit finally managed to enter the fanaticism in Europe was opened by the Emperor Frederick II of the Holy Roman Empire (1194-1253 A.D.).

Frederick was born in Sicily, half of which at that time was Arab, the other half under the sovereignty of the Empire. His childhood surroundings enabled him eventually to learn Italian, German, Arabic and Latin. Orphaned at four years of age, he was removed from the stupefying effects of a society of courtiers and princely pomp. Every week he took his meals with another family of ordinary citizens, and in the afternoons he played with the street urchins of Palermo.

Frederick became acquainted with both Christian and Arab dogma and culture simultaneously. He became used to viewing Mohammedans with Christian eyes and papal pronouncements with those of an Arab. He became familiar with the virtues and shortcomings of both; and he did not commit himself to either side . . .

He founded a medical school in Salerno in Italy where Moors and Christians had an equal voice, where women could teach just as men, provided they knew their subject. And in order that the surgeons marching with the armies should not be as abysmally ignorant as he had found them to be, he made it a law that only those could be granted a diploma in medicine who had taken part in the complete dissection of at least two bodies.—Tibor Doby, M.D. Discoverers of Blood Circulation. From Aristotle to the Times of Da Vinci and Harvey. New York, Abelard-Schuman, 1963, p. 61.


Clinical Medicine, the Science of Probabilities

In the present state of medical knowledge, little of absolute certainty or demonstration can indeed be found. The science, however, is not merely speculative. It often demands the most prompt and vigorous exertion, the prize of which is ease or life. On many of those occasions, probability is all which the nature of the case will afford, and happy is he who is furnished with that which is highest and best.—Preface. Collections from the Unpublished Medical Writings of the Late Caleb Hillier Parry, M.D.F.R.S. Vol. I., London, Underwoods, Fleet-Street, 1825, p. 53.
ble for the early neonatal death of the infants. The longer asymptomatic survival of one infant suggests that therapy may be possible.

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References

Principles of Medical Sciences and Clinical Observation

Clinical observation has given to medicine very long and very honourable service. There is a certain melancholy in recognizing, as we must, that it has never been, except in the hands of an occasional genius, a very effective instrument for penetrating the fundamental secrets of health and disease, and in recognizing that we now possess far more effective instruments for this purpose. To recognize these facts is, however, by no means to acquiesce in the view that clinical observation has no longer important functions to fulfil in progressive medicine. In the first place it is still a valuable method of scientific research. At the same time it must be admitted that the method is, in some respects, far less general and far less simple than that of experiment; that it lends itself to the solution of only a limited class of problems, and that it demands, at any rate for its great strokes, a somewhat special aptitude of mind. Moreover, if it is to make itself less dependent on special aptitude, a wider interest in the need for and the means of proving its propositions will be necessary. It is possible that the increasing knowledge of experimental methods may bring this about and stimulate a renewed vigour in purely clinical work. In the second place, as successful clinical observation demands a certain special aptitude, and the unresting contemplation of a very large and rich material such as we find at its highest in, for example, a Hughlings Jackson, it should be the source and reservoir of that flow of ideas which alone can maintain the fertility of the whole field of medical science.—The Collected Papers of Wilfred Trotter, F.R.S. London, Oxford University Press, 1946, p. 126.
vascular communications between the coronary arteries and the chambers of the heart. Am. Heart J. 9: 143, 1933.


The Scientist's Perspective

Who does not recognize today that the impact of science on society is truly overwhelming in importance, and that the future welfare, if not the very existence, of human society will depend increasingly upon the public understanding of science—not so much of the facts or even the concepts of science as an understanding of what science really is and how it yields its result? Scientists deplore the popular image of science as a benevolent genie who will provide any gift the Master of the Lamp may demand, or the popular conception of scientific method as a sort of "intellectual machine that inevitably grinds out ultimate truth in a series of orderly, predictably sequential 'steps,' with complete accuracy and certainty" (H. K. Schilling, in a paper presented at a meeting of Section L of the AAAS in Atlanta.) Nevertheless, few scientists care to undertake the labor of explaining the real nature of science; in fact, but few of them take time to think the matter out for themselves. The philosophy of science and the history of science are glaringly neglected by the very practitioners of science itself.—Bentley Glass, Johns Hopkins University.
Pathology of Angina Pectoris

The association of coronary disease with angina was first recognized by Edward Jenner from post-mortem examination, though it is possible that John Hunter, on whose account, as his anginal symptoms dated from 1773, Jenner kept silence, knew or suspected it in 1776 when John Fothergill published a fatal case of angina in which at the post-mortem Hunter found that "the two coronary arteries from origin to many of their ramifications on the heart were become one piece of bone." Jenner, who is said to have diagnosed angina in Hunter in 1777, never directly published anything on this subject, but he communicated his opinions to C. H. Parry, who in 1788 read a paper, "An Inquiry into the Symptoms and Causes of the Syncope Anginosa, Commonly called Angina Pectoris; illustrated by Dissections," to a small medical society in Gloucestershire of which Jenner was a member, and came to the conclusion that coronary disease was the cause. In this paper, not published until eleven years later, he quoted the case of ossification of the coronary arteries published by Black of Newry in 1795 and pointed out that he and Jenner had independently come to the same opinion in 1788.—Sir Humphry Davy Rolleston. The Harveian Oration. Great Britain, Cambridge University Press, 1928, p. 88.