

# MEDICINE— MOTHER OF THE SCIENCES\*

*by*

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FEW announcements and invitations have given me such deep satisfaction as the proposal to create this Faculty for the study of the history of medicine and pharmacy and to associate me with the inauguration of it. During the past twenty-five years, in which my studies have been increasingly devoted to the records of biological and medical progress, I have become profoundly convinced of the eminent importance of the subject and of the need for fuller and, dare I say, more far-reaching research and interpretation of it. Not that medicine has lacked many and outstanding historians, some of them present with us today; but that by the very fact that they were themselves of the profession they were debarred from claiming for it the unique place which it deserved, not only in the story of science, but from its contribution to the whole civilization, culture and development of the Western world.

Had it not been for the Hippocratic Oath setting aside the art of healing as the first dedicated profession, and for the Hippocratic College binding together the members, equipping them for lives of service, embodying their accumulated experience and inspiring their new adventures, there would, humanly speaking, have been no such institutions as the great universities, and no such schools of sound learning as Greece and Alexandria in the classical period and Salerno and its descendants in the medieval. To write the history of science or of mankind, and to omit this contribution to it, is to miss an essential element from the record and to pervert the whole story. This, of course, is precisely what has in fact happened. The conventional history of science has made this great omission and the result has given rise to a strong but gravely erroneous tradition.

The legend of Grosseteste and the apostolic succession of astronomers and mathematicians—Copernicus, Tycho Brahe, Kepler, Galileo, Newton—which is accepted still by most annalists involves a complete travesty of the Greek and Hellenistic contribution. Hippocrates, Aristotle, Theophrastus, Dioscorides and Galen are ignored. The limitation of science to mathematics, physics and chemistry has produced a consequent distortion of fact and of history, and the present disastrous result is that science has been deeply committed to an out-worn materialism, and to the absurdity of treating the organic and human as if life were identical with electronic gadgets and calculators. The plain fact is that the history of science has seldom been studied by trained historians, and

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the scientists who first described it were men of a time when weight and measurement were the sole criteria, who limited their task to physics, chemistry, astronomy and mathematics and thought only in terms of mechanistic abstractions. The result is still dominant in the text-books.

The role of medicine and indeed of all biological studies thus came to be ignored, although in fact, it is obvious that the study of human health and of the vegetable and animal environment on which it so largely depends produced the scientific method millenia before astronomy or even chemistry had any scientific existence at all. Observation and experiment—the familiar sequence ‘collect your data, examine them, test them by actual trial, frame a hypothesis, explore its range, experiment with it, recast it, and relate it to general convictions and ideas’—are not the special prerogative of the so-called scientists, but universal to man and traceable among his animal ancestors. Gastronomy not astronomy was the first science, and the first woman to cook a meal for her man was its pioneer. Yet we are told that Aristotle knew nothing of the method which Grosseteste discovered or formulated in the thirteenth century, a legend surely arising from people who have never appreciated the greatness of Greece or read Aristotle in the original, and who assume that the interpretation of him current in the thirteenth century was an authentic expression of his ideas and teaching. Aristotle was a doctor’s son and a great scientist as well as a great taxonomist and (*pace his critics*) a remarkable observer; and Theophrastus and the Greek doctors were the heirs of his greatness.

It is, as we have stated, to the creation of a medical profession held together by the Hippocratic colleges, oath and tradition that the world owes its university communities and its standards of public loyalty and specialized devotion. During the ages when moralizing, allegorizing and teratology almost eliminated the sound science of Greece, it was in these colleges, and to a lesser degree in the monasteries, that a true care for human individual and collective welfare, and a careful preservation of the methods and lore of the ancient wisdom were cherished. From their example at the Renaissance when this ancient wisdom was rediscovered came the spread of practical and joyous researches and the discovery of the zest and adventure of exploration and experiment. Medicine by its obligation to the cure of human disease, though it had been fettered like all other fields of activity by conventions, convictions and practices stereotyped by some ten centuries of tradition, now broke loose into high adventure. The opening up of classical civilization and literature, the discovery of new lands and peoples, the enthusiasm for the study of this world and its resources, and the sheer joy of living produced a sense of novelty and excitement that transformed and revolutionized man’s whole outlook.

Of the specific influence of medicine and the medical colleges and tradition any student of the development of education in the fifteenth and sixteenth centuries will have abundant evidence. Salerno and a few other centres had given prestige and training to doctors since much earlier times but with the Renaissance their influence became acknowledged and widespread. Probably no two classical writers have exercised so strong an influence as Dioscorides the

Greek pharmacist and Galen the Greek anatomist. From the medical schools where they had always been the standard authorities, their works spread with the invention of printing all over the civilized world; and their importance can be testified by the number of commentators upon them. Ruel of Montpellier, Mattioli the Italian, Valerius Cordus the brilliant young German, and Amatus the Portuguese all produced volumes upon Dioscorides—attempting with diligence to supplement the traditional identification of his herbs (often with little success) and producing what was in effect the first botanical literature. Supplemented by the herb-gardens which spread from Italy all over Western Europe, and in the first half of the sixteenth century by herbaria of dried specimens they stimulated an enthusiasm for plant-study which found constant and increasing support all through the period from Brunfels, Fuchs and Turner to the great Histories of Plants by the Bauhins and other forerunners of John Ray. Botany, thanks to the energy, ability and numbers of its early adherents, had become a real science long before Copernicus had attracted enough attention for his book to be put on the Index.

Such botany was inevitably concerned first with accurate identification and nomenclature and then with taxonomy and classification. It is easy to dismiss such studies as elementary. In fact for Western students the precise discovery of the plants named by Dioscorides or even by Pliny was hard and precarious. Turner on the dunes of his native Northumberland or the fens of Cambridgeshire had little chance of discovering Pontic Wormwood or indeed any others of the herbs of Asia Minor and the Mediterranean. His woeful description of his quest for 'laus tibi' and of the widely varying species suggested to him for it, hardly helps us to realize how impossible would have been his confidence if he had known the restrictions imposed upon species by climate, soil and difficulties of distribution. But at least he and his contemporaries could and did collect and scrutinize and compare every definition which they could find in literature, and in doing so overcame one of the earliest problems, the lack of any standard vocabulary to describe the structure and parts of their specimens.

Fortunately they were aided by the amazing skill and accuracy of the artists who illustrated their books. Probably no one has ever pictured plants better than Dürer, and the school of wood-engravers who supplied the magnificent portraits printed in the earliest herbals was worthy of him. When the great house of Plantin at Antwerp gathered together and made available their treasury of plant-pictures, it was relatively easy for any student to name the majority of European species even if they were not always those of the traditional pharmacopoeia.

Such minute study inevitably led to conclusions of high scientific value. By tradition flower-colour had been a primary ground for specific distinctness; botanists soon discounted it, and by the time of Ray had insisted that only structural differences mattered. By tradition the doctrine of signatures prescribed that the particular use of each plant was announced by some notable feature in its form—such indications as are still preserved in our popular names,

lungwort for example, where the spotted leaves suggest diseased lung-tissue; this ancient superstition did not survive when once clinical investigation of effects, poisonous or otherwise, began to replace folklore. By tradition, occultism and astrology had a powerful part in pharmacy; Culpeper was not alone in his belief in such influences; they did not count when gradually plant physiology took the place of fancy. By tradition spontaneous generation and change of species by deterioration were universally accepted; Redi's experiments and Ray's observations challenged and generally prevailed over such beliefs. There is, in fact, no field in which the change from the haphazard world of Shakespeare, the world of Ariel and Caliban, of mythology and magic, to the world of law verifiable by science, took place more rapidly than in botany, and the men responsible for this change were almost all of them doctors or pharmacists.

We can see from a century of evidence how ignorant and fraudulent were the purveyors of drugs until late in the seventeenth century; we know how difficult was the establishment of true medicines when the whole chemistry of digestion and of disease was unknown: but if it was very long before science could prescribe remedies with any accurate knowledge of dosage or exact effects, it was clear that by the end of the seventeenth century, and long before physiology or hygiene had been securely founded, there was real knowledge of the practical uses and dangers of very many plants and a valuable insight into matters of relationship, hybridization, and distribution. Botanical studies by the end of the seventeenth century had reached a point which they could hardly hope to pass until physics had been freed from belief in the four elements and chemistry from subservience to white magic and planetary influence.

The importance of the other great Greek, Galen, was less concrete because more authoritative. When John Caius, as President of the College of Physicians, decided that if an aspirant for their licence had really accused Galen of making mistakes he would not only be rejected but under their special privileges punished as a charlatan, he indicated how oppressive the authority of Galen's teaching had become. For Caius had been a friend of Vesalius in his student-days and must have known how the Belgian anatomist had criticized and corrected the Galenic tradition. Yet in an age when the authority of the past was sacrosanct, it was no small contribution to science that men for whom Galen's wide and in the main sound and relevant lore was the ground of their teaching should still be ready to recognize its defects and free to explore the truth of the evidence. Caius himself, despite his pedantic insistence on tradition, was yet able to produce the earliest clinical study of the sweating-sickness, and set an example both in medicine and biology of exact observation and faithful interpretation. When in the next century Thomas Sydenham and his friend Boyle returned to the freer and more confident principles of Hippocrates, and insisted that the *Vis medicatrix naturae* was the basic source of healing, he found the medical profession ready not only to criticize, and where necessary revise the findings of its pundits, but eager to explore and experiment with unconventional drugs, methods of diagnosis and techniques.

It was indeed out of the enquiries of doctors like Van Helmont and Sylvius

to provide medicine with a truer picture of respiration, digestion and fermentation that the strongest incentives came to the study of chemistry as distinct from metallurgy and mineralogy. 'Air' had long been the most mysterious of the elements, and the first discrimination of gases was derived from observation of human processes. When Stephen Hales began measuring blood-pressure and enquiring into carbonic oxides he was opening up a realm of chemistry as yet hardly recognized, and it is largely the work of Boerhaave and of Haller, one of the greatest of medical scientists, that prepared for Black and Priestley and Lavoisier. The study of the human organism in health and disease, of its diet and functioning, has provided science with knowledge which neither mathematics nor its application to astronomy and cosmology could have suggested.

It is a curious illustration of the ignoring of biological and medical science noticed in the first paragraphs of this paper that in a popular history of chemistry<sup>1</sup> almost no recognition is made of such influence—Hales, Boerhaave and Haller, for example, are barely mentioned—and organic chemistry is treated as a novelty originating only in the nineteenth century! Fortunately another popular writer, Mr. H. T. Pledge,<sup>2</sup> is prepared to assert that historically physiology is a science of central importance; and this verdict is assuredly right. It is not merely that in the formative period when modern man was emerging and the scientific method was establishing itself, the number and the importance of medical men was greater than that of any other profession, but that throughout the whole story, from the Greeks to the present day, the doctors by the character of their professional activities have constantly kept the progress of science at once wide in scope and practical in quality. Too often at critical points the 'pure' scientists have been concerned with abstractions, and the 'applied' scientists with gadgets so that both of them treat men as if they were robots and the world as if it were an engine-room. At such times the physician and apothecary have protested that their patients are neither machines nor ghosts but people, and that a psychosomatic philosophy is the only basis for their work which is verifiable by experiment and justified by its results. Some day we shall realize that Conrad Gesner, the great physician, naturalist and polymath of Zürich, has a far stronger claim to being the founder of modern science than Copernicus or even Steno. No man epitomizes more richly the emergence of the new world from the old: no man did more to foster and to promote the arrival of modern man.

If I may close on a more personal note, it was a conviction that medicine had not only contributed much practical knowledge to the whole development of modern science, but had kept the movement on broad and wise lines that has been responsible for my recent work on the history of science, and for the small book that I produced last year.<sup>3</sup> There had been, of course, very many records of the early development of various sciences and several examples of histories of medicine; but very few authors seem to have ever linked the two subjects together. Of course, it had happened that very many doctors were mentioned in the biographical notices which so often take the place of history among scientists, but the eminence and the characteristic quality of their contribution never seemed to attract attention. Yet plainly their age-old profession has had a far

larger effect on human thought and welfare than any of the great achievements of the particular sciences and techniques which have accompanied them. To do justice to it will, in fact, involve something like a rewriting of the history of Western Science—that will be the scale of the task to which your new Faculty is committed.

In this Hall to-night we are inaugurating a great and very appropriate adventure. There is much work, much varied research, to be undertaken. By it we shall be led from the study of our inheritance in the past to the tasks of the present and the visions of the future.

#### REFERENCES

1. PARTINGTON, J. R. *A Short History of Chemistry*, 1948.
2. *Science since 1500*, 1939.
3. *Medicine and Morals*, 1959.