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MEDICAL EDUCATION

MEDICAL education continues to be the subject of very lively discussion. In 1944 the Goodenough Committee issued its much-quoted report on the "Organisation of Medical Schools"¹. A year ago an authoritative sequel appeared in the form of the General Medical Council's "Recommendations as to the Medical Curriculum"². Newer and detailed proposals have now been published under the title "The Training of a Doctor" under the authorship of a Curriculum Committee that was set up in 1945 by the British Medical Association³. In the background, reaching far back over the years, are many other reports on the same subject. Before considering where the British Medical Association's proposals stand in relation to those of the Goodenough Committee and the General Medical Council, it is useful to consider for a moment why the medical curriculum is always under fire. For so it would seem to be if one compares medical with other university departments; there has certainly been no corresponding wealth of reports about the teaching of chemistry, physics or electrical engineering.

The underlying reason would seem to emerge from the fact that the medical sciences, which are part of the general field of biology, have not evolved very far in the hierarchy of science. The physical sciences are well to the fore, and in their present state of development conform far more closely to the pattern that is expected of a well-knit and properly based structure of scientific knowledge. This in turn allows a clear academic separation between the fundamental sciences of physics and chemistry and such applied subjects as mechanical and chemical engineering. Corresponding divisions of interest are quite impracticable on the biological side. As a result, to take an example, the student of zoology or of agriculture may find himself equally concerned either with fundamental or applied science. The same dual, and at times confused, purpose besets the medical departments of a university. Thus, the overwhelming task of a medical school is to train practising doctors. Its next task, but a task not second in importance, is the training of medical scientists and the advancement of medical knowledge. It is this division of purpose which is clearly the background for all educational difficulties in medicine.

Because the two objectives of a medical school are pursued in the same harness, the curriculum for 'applied medicine', if it can so be called, is always immediately affected by changes in fundamental medical knowledge. Unfortunately, however, the curriculum has never been automatically readjusted so that proper weight is given to new advances in relation to old-established knowledge. What has generally happened is that new subjects, as they grew in importance, have been added to the existing syllabus, the structure of which has thus been altered not by changes in its general configuration, but mainly by the process of discrete accretion. Not surprisingly, the medical course has in consequence increased over the past thirty years or so from four to six years. If the same

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process were to continue, and the strong claims of new interests were admitted, there is no saying how many years would have to be allowed for the training of a doctor in twenty years time.

Here lies the main driving force behind the constant stream of discussions about the reform of the medical curriculum. There is a second to which the British Medical Association Curriculum Committee directs attention—namely, that advances in medical knowledge over the past fifty years have not resulted in a "proportionate improvement" in the standard of medical practice. It is almost a truism that the practice of medicine is more up to date in relation to new biological knowledge than are most industrial and engineering undertakings in relation to advances in the physical sciences. But this is obviously no reason for complacency, and the British Medical Association is right in insisting that, without improvements in the system of education, little can be expected in the quality of our medical graduates. Allowing for the fact that the bulk of the sixty thousand medical men in Britain are in one or other kind of practice, and therefore circumscribed in the expenditure of their energies, it is a startling fact that over the past fifty years or so, most major and fundamental advances in medical science have come from the few hundreds who have kept to the research laboratory. This is all too painfully obvious when one scans the list of Nobel laureates in medicine, or lists of medically qualified men who have been elected to the Royal Society—or to corresponding bodies in other countries. One cannot suppose that more than a fraction of the best minds among medical graduates have dedicated themselves to the laboratory. It is tragic, therefore, to contemplate how circumstances and education have limited the potentialities for advancing medical knowledge which actual practice provides.

In the remedies it suggests, the British Medical Association is at one with the Goodenough Committee and the General Medical Council about such things as the need to eliminate unnecessary detail and specialities from the curriculum; about the desirability of 'integrating' its various parts; and about the fact that the time is ripe to introduce into the curriculum such subjects as psychology and social medicine. It takes an independent line about many matters of more detailed policy. For example, it opposes the Goodenough recommendation that chemistry, physics and general biology for intending medical students could be taught in schools; it holds that anatomy and physiology could be confined to four instead of the five terms recommended in previous reports—although in this recommendation, since its proposed terms are longer, all that is suggested is the curtailment of vacations; it disagrees with the Goodenough Committee that, in general, one can combine good teaching and research abilities in the same individual, and suggests that where the head of a department is a research man, someone else should be made responsible for the teaching.

These and other like matters are, however, questions of detail. The real point is whether the British Medical Association's proposals regarding the direc-

tion and integration of the curriculum will achieve the "aim of the medical curriculum". The report takes the line that "the undergraduate medical course should be primarily concerned with the training in those basic principles of medicine which are a necessary foundation for all forms of medical practice". This in turn implies that the student should be trained over the whole field of medicine. "There should be no clash in outlook", the report reads, "between the practitioner and the research worker", since both use the same intellectual methods. And the British Medical Association Committee holds that a proper medical education would have the effect that the medical practitioner would continue to be a student throughout his postgraduate career.

Specialization in education is repeatedly attacked, and the report pleads for what is described as the "synoptic view". It argues for a "liberal and general" school education for intending medical students, and opposes early "vocational" concentration on science; "general culture", it states, should take the place of "premature narrow specialization in the basic sciences". In its insistence on the need for 'integration', it points out that the many subjects which come into the medical curriculum break the continuity of the student's career. For example, physics, chemistry, and biology should be taught in the first year of the medical course "as different aspects of general science". From this would emerge an understanding of the general principles of scientific method, which would be further laid bare in the syllabuses for anatomy and physiology. Continuity would be better assured by such measures as distributing the teaching of pathology and psychiatry throughout the clinical years, and integration would be helped by ceasing to break up the final examinations into the separate disciplines of surgery, medicine, gynaecology, and so on. The emphasis throughout the report is on re-ordering the curriculum to the end that the patient be seen as a whole. General medicine, the Curriculum Committee claims, is the 'linchpin' of the clinical subjects, and should be taught as the basic clinical subject from which the specialities have branched. "It must remain an integral study of human disease in all its facets, both physical and mental."

A number of these proposals are undoubtedly very sound. But on the other hand, the value of the report is not strengthened by obscure concepts, and in particular by what seems to be an undue allegiance to words such as 'unity', 'whole', 'fundamental principles' and 'general culture'. A synoptic view is clearly useful; but its over-emphasis seems to detract from rather than to enhance its importance. Man, we are told, must be regarded as a whole, and not as the sum of his component systems; "the sense of the unity of medicine is the special purpose of the teaching of general medicine". Instead of emphasizing excessive morphological detail, "the general truths of anatomy" should be inculcated. Students, we are also told, "must not be allowed to think that laboratory investigations are a substitute for personal observation. They should be trained to understand that the purpose of X-rays, pathological reports, and the like, is

to refute or confirm the practitioner's own findings, and that they must be regarded as servants, not as masters."

It is difficult to avoid feeling that these are mostly platitudes. It is undoubtedly true that a man with a general education is often more interesting and intellectually alert than one without. But as a class, are doctors any less 'cultured' than, say, an equivalent number of men who did not concentrate on science in school and the university? It is obvious also that a doctor should regard his patient as a whole, and "not as a collection of systems and organs corresponding to the specialities of medicine". But when a patient comes to a doctor, is he really regarded as such? It is perfectly true, too, that a man should not become the victim of the techniques of observation which he uses. But equally, is it correct to imply that pathological studies or X-ray methods are not just another form of personal observation?

Above all, it is dangerous to obscure the fact, which is what the Report does, that advances in medical knowledge have come about almost entirely out of increasing specialization, and through the fragmentation of the 'oneness' of medicine. The 'general physician' may be a disappearing species, but it has disappeared over a period in which the health of the people has been progressively improving.

How a deliberate avoidance of educational specialization, beginning at school and continuing through to the end of the 'intern' year spent after medical qualification, can materially improve the quality of medical practice is, therefore, difficult to see. More, not less, specialized scientific training would seem to be wanted if full advantage is to be taken in practice of advances in fundamental medical science. One wonders, therefore, whether the British Medical Association is not attempting the impossible, in so far as the verbal character it imposes on medical education is out of keeping with the trend of developments in medical practice. More and more the general practitioner is taking on the function of a sorting-machine which directs those sick whom it cannot help into specialized avenues for particular treatments. This fact the British Medical Association report clearly recognizes; but nevertheless it consistently seems to write down the importance of the specialities. The trend cannot be condemned because specialization can be carried too far. That danger will be there whatever form medical education takes. Nor can the trend be stopped, for the simple reason that advances in knowledge, not only in medicine but also in every other field of science or applied science, inevitably mean greater and greater specialization.

If medical education is to undergo the fundamental overhaul which the British Medical Association Committee rightly describes as necessary, it is surely essential to safeguard the education of the specialist, and the specialist approach, as well as that of the general practitioner. The problem is whether the two aims can be satisfied by the same curriculum. The period of medical training is already very long in relation to the years of a doctor's service, and if

several more years have to be added to a general medical curriculum for gaining experience in a speciality, the burden of education becomes almost too great. Sooner or later the question will have to be faced whether the approach to reform should not be the opposite of that advocated in most recent reports, including that of the British Medical Association Committee. What may be wanted is the division of the curriculum into specialized 'sectors' that cut right through the clinical and pre-clinical subjects. In such a vertical organisation, the cardiovascular 'sector' or 'department', or the neurological 'department', or the infectious diseases 'department', would embrace their relevant anatomical, physiological, pathological and clinical aspects. The medical student, after an initial year or so in which he became familiar with the language of the subject, and, in general terms, the layout of the body and the nature of its mechanisms, as well as the broad character of the most frequently used techniques of medical education and practice, could move from sector to sector, becoming educated in all aspects of each in the integrated way demanded by the British Medical Association Committee. Teachers would be sufficiently experienced to indicate the interrelations of different sectors, and so to impress the 'wholeness' of medicine in its most useful sense. The time spent in different sectors, and the emphasis of instruction in each, would be varied according to the needs of general practice. But no more time would be spent in all than would be deemed necessary to train a man for the declared purposes of general practice. After his first qualification, the would-be specialist would then concentrate in the sector or sectors of his interest, in an atmosphere where basic science and applied knowledge form an interrelated pattern, and in which either one or the other could become the central interest. A synoptic view over the whole field of medicine seems impossible to attain. A synoptic view within a sector of, say, the problems of digestion and nutrition—all the way from their anatomical to their biochemical aspects—or of the locomotor system, is far more within the bounds of educational possibility. In short, horizontal may have to give way to vertical integration if the medical curriculum is to be materially improved. At the moment the preclinical subjects of anatomy, physiology, and biochemistry supply the normal picture of the whole field that is later split up into the variety of specialities that make up clinical medicine. No amount of horizontal integration or of reference back during the clinical years to the preclinical subjects is likely to achieve as useful an interrelated pattern of education as would a vertical division of interests.

It is in these major matters that the British Medical Association report is least convincing. On the other hand, it contains many useful suggestions that could be immediately applied in medical schools, to the betterment of present educational methods. Very useful, too, is its suggestion that there be formed an "Association of Teachers in Medical Schools" to discuss alternative possibilities for the curriculum—for the British Medical Association Committee has wisely recognized that all proposals are in the nature

of plans for experimental action, and that plans must necessarily change with the changing content of medicine itself.

¹ Report of the Interdepartmental Committee on Medical Schools. (H.M. Stationery Office, 1944.) (Reviewed in *Nature*, 154, 322; 1944.)

* Recommendations as to the Medical Curriculum. General Medical Council, April 1947. (Reviewed in *Nature*, 160, 481; 1947.)

* The Training of a Doctor. Report of the Medical Curriculum Committee of the British Medical Association. (London, Butterworth and Co., Ltd., 1948.) 7s. 6d. net.

FERN PHYLOGENY

Genera Filicum

The Genera of Ferns. By Dr. Edwin Bingham Copeland. (*Annales Cryptogamici et Phytopathologici*, Vol. 5.) Pp. xvi + 247 + 10 plates. (Waltham, Mass.: Chronica Botanica Co.; London: Wm. Dawson and Sons, Ltd., 1947.) 6 dollars.

A Revised Classification of Leptosporangiate Ferns
By E. E. Holttum, *J. Linn. Soc. London*, 53, pp. 123–158 (1947).

BY a curious coincidence two independently compiled reclassifications of the ferns have appeared in print almost simultaneously but from different parts of the world. Both are of very considerable botanical interest, since the phylogeny of ferns is a topic of wider evolutionary significance than the taxonomic context alone might suggest. The phyletic views of the late Prof. F. O. Bower, based largely on anatomical and developmental data, are well known to all morphologists and have for long been the basis of teaching in many universities. The phyletic views of the pure systematist in pteridology have, however, been only imperfectly available. Christensen's phyletic scheme published in 1938 was regarded by its author as only tentative, though unfortunately he did not live to develop it more fully. This scheme has, however, been kept vividly in mind by both the authors under review and both can, in a sense, be read as commentaries on Christensen as on Bower.

The circumstances of composition of the two works are very different. Holttum's explanation of his own is that it was a sequel to the compilation of a Fern Flora of the Malay Peninsula which had been carried out at Singapore between 1942 and 1944, that is, during the Japanese occupation. The step from this to a reclassification of the leptosporangiate ferns seems, therefore, to have been in a sense unpremeditated and the outcome of close acquaintance with the very rich fern vegetation of that country. By being confined to a limited section of the ferns the ground covered is that contained in vol. 3 of Bower's classic work, all of which was, until quite recently, included in the spacious but unnatural family, the Polypodiaceae.

In Holttum's view the Polypodiaceae *sens. lat.* should be replaced by five families, namely, Polypodiaceae *sens. strict.* (including *Polypodium* and *Dipteris*), Grammitidaceae, Thelypteridaceae, Dennstaedtiaceae and Adiantaceae.

To a British botanist the chief interest of these innovations is likely to lie in the third and fourth families. By placing the male fern (*Dryopteris Filix-mas*) as a derivative of *Dennstaedtia*, Holttum departs from, and perhaps undermines, one of the central tenets of Bower's phylogeny by which the Dryopteroids are thought to derive from an ancestor with superficial but not marginal sori.

Further, by separating the marsh fern (*Thelypteris*) not merely into a different genus from the male fern but also into a different family, the Thelypteridaceae, Holttum endorses and extends a long-considered view of Christensen's that the genus *Dryopteris sens. lat.* is polyphyletic. With this latter view, it may be said in passing, some recent cytological work of the reviewer is in complete agreement. An independent statement of somewhat similar views had previously been published by Ching¹, though this could not have been known to Holttum at the time.

Copeland's book is a work of greater scope, since it sums up the views of a life-time primarily devoted to the study of ferns and is intended as an authoritative work of reference, an intention which is on the whole excellently fulfilled. It includes the whole of the ferns and is preceded by a few pages of highly instructive historical introduction in which the taxonomic views and practice of the author are briefly discussed. Of the 305 genera recognized and described, only six have not been personally accessible to him, while 33 have been created by him and 69 others revived. Some familiar genera have, on the other hand, been suppressed, and a British botanist will perhaps be surprised to note the submergence of, for example, *Scolopendrium* in *Asplenium*. The treatment of the Polypodiaceae (which is split into twelve families) differs in many ways from that of Holttum—a divergence which is easily understandable in the light of Copeland's introduction; but both authors endorse the views of Christensen in his treatment of *Dryopteris* and in other ways. Of the new or revived genera a large proportion occur in the Hymenophyllaceae, the 600-odd species of which are distributed into thirty-three genera instead of the two unwieldy groups of *Trichomanes* and *Hymenophyllum*. Pedantic as this may at first appear it is clearly an essential preliminary to the attainment of clarity on phyletic trends within this large and interesting group.

The weakest part of the book is the treatment of anatomy. This is clearly not the centre of the author's interest, though he is compelled to make some use of it in his treatment of the Polypodiaceae. It is perhaps scarcely his fault that comparisons with Bower will be more consciously made by some of his readers than they may have been by himself; but the extreme compression of the allusions to anatomy makes their inclusion of doubtful value in certain cases. The very well known and complex stem structure of the bracken (*Pteridium*), for example, is merely referred to as a solenostele without further qualification—a degree of simplification which amounts almost to distortion.

On the positive side, a point of unusual interest to a northern reader is the stress which is laid on the southern hemisphere as the putative place of origin for a large proportion of existing fern genera. This view had been strongly impressed on the author by his earlier studies of the Hymenophyllaceae and other groups, which still have a predominantly southern distribution, and also by his long residence in the Philippines and familiarity with their flora. According to Copeland nine-tenths of all tropical fern genera are of southern origin, and that the Antarctic continent itself may have been the centre of this evolutionary development is an idea which is less familiar to northern botanists than its importance deserves. For this reason alone the book deserves close and critical study by students of vegetation as well as by students of ferns. It should also perhaps be mentioned that the potential value to pollen analysts