

# BRITISH PHARMACEUTICAL CONFERENCE NOTTINGHAM, 1952

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## CHAIRMAN'S ADDRESS

### AN EDUCATION FOR A PHARMACIST

I HAVE entitled my address "An Education for a Pharmacist," not, you will observe, Pharmaceutical Education or even Education for Pharmacy. I have chosen this title to indicate that I desire rather more latitude than an exact interpretation of the other two would permit.

If what I have to say appears to be provocative, I hope it will be provocative of thought and discussion rather than disagreement. An Education, then, for a Pharmacist.

The person I have in mind is a professional man who understands thoroughly what he is doing, who comprehends the scientific basis of drugs and drug action, who is able to evaluate critically the products he handles, who is competent to advise physicians concerning drugs and their uses, who works at his profession creatively and advances its service.

Education concerns two spheres, one has to do with the human spirit, the other with material requirements. Any profession to be long-lived must insist on education and on education in this sense. Merely to train competent practitioners is only part of our purpose, and not, I think, the most important part.

#### EARLY EDUCATION

The early education of the future pharmacist should be as broadly based as possible, designed to discover aptitudes and latent potentialities, and should seldom degenerate into formalised and didactic instruction. Making the necessary allowances for all generalities, I hold it true that you can only teach a man what he knows, which is only another way of saying that the word education means exactly what it says. We all have our proper gift of God, and it should be the purpose of early education to discover that gift and to help and encourage the possessor to make the most of it.

The last years at school should be spent in the study of exact sciences, where the discipline of attention to detail is cardinal, but room must be found for the pursuit of purely cultural studies. I would like to see Latin restored to its original place, but failing this, the wide sweep of world history will give that sense of the past and feeling of continuity that the study of Latin manages so subtly to convey. Language is basic to communication and young people who lack Latin have a hard road to travel to be completely literate or even to express themselves clearly in an examination paper.

It should be possible to determine before the end of a pupil's schooldays

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whether or not he is likely to succeed in Pharmacy. There is no lack of warning about this.

Burns:— What's a' your jargon o' your schools  
Your Latin names for horns and stools  
If honest nature made you fools  
What sair's your grammars?  
Ye'd better ta'en up spades and schols, or  
knappen hammers.

Schiller's cry from the heart:—

Mit der Dummheit kämpfen Götter selbst vergebens;

and the devastating statement in the Old Testament:—

Though thou shouldest bray a fool in a mortar among wheat with a pestle, yet will not his foolishness depart from him.

The test of a successful early education is not the amount of knowledge that a pupil takes away from school, but his appetite to know and his capacity to learn. If the school sends out young people with a desire for knowledge and some idea of how to acquire and use it, it will have done its work.

### PROFESSIONAL STUDIES

With young people who have had this type of early training and who have consciously selected pharmacy, we can now proceed. The whole field of training is too wide for my time and too long for your patience. I propose to deal in some detail with that aspect in which I am most interested, galenical pharmacy, but if we are to get this subject in proper perspective we must examine, however briefly, the basic sciences of pharmacology and pharmacognosy.

### PHARMACEUTICAL CHEMISTRY

Concerning pharmaceutical chemistry, I have little to say, partly because the ground covered by this subject is fairly clearly delimited, partly because the matter has been discussed by others from this chair, chiefly because the able persons who practise this section of Pharmacy occupy dominating positions; so that there is little likelihood of this aspect of training being inadequate. The danger is of quite a different order: the tendency for pharmaceutical chemistry to acquire parts of the training that logically belong elsewhere. This has two bad effects; it overweights this part of the syllabus and robs other subjects of the key points that would give them real significance. Let us now turn to the other subjects.

### PHARMACOLOGY AND PHARMACOGNOSY

Used in the broadest sense pharmacology and pharmacognosy mean the same thing, "Knowledge about Drugs," but each of these terms has gradually assumed an acquired meaning. What the pharmacist needs to know about drugs is their identity, their purity and their potency; especially their potency. This is what I understand by "Knowledge about

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Drugs" and our scheme of education must be designed to inculcate the theoretical information and practical techniques on which such knowledge is based. The historical background, the botanical or zoological origin, the geographical source, methods of cultivation and preparation, is knowledge that a well informed pharmacist ought to possess, both for its cultural value and its commercial importance.

Pharmacology is important because it provides the link in the chain of knowledge between pharmacy and medicine. A modern education for a pharmacist must be designed to strengthen this link and by bringing him into closer contact with the physician ensure his professional status. Pharmacology is the youngest of the preclinical sciences and the most important factors in its early development were the rise of biochemistry and the pursuit of research in pharmaceutical laboratories.

The vast, ever enlarging, always changing field of therapeutic agents confronting the physician makes it imperative that he have assistance in finding his way through the labyrinth of complex and controversial materials. The need for an authentic and unprejudiced source of information increases daily and we must organise our training so that the pharmacist can be that source. Within recent years much publicity has been given to all scientific discoveries. This desire to keep the public informed of new developments is both commendable and dangerous. The danger lies in the fact that newspaper reports of scientific results are frequently garbled and never complete or adequate. This adds a further burden to the responsibilities of the professional man. Now it is his further duty to guide the public and keep people informed as to the merit of new therapeutic agents.

A knowledge of pharmacology is essential in the formulation of new medicaments. The preparation of solutions for the eye involving considerations such as the optimum *pH* for therapeutic action without loss of stability, the use of effective and non-irritant preservatives, and the adjustment of osmotic pressure; the preparation of injectable materials of every kind, the choice of vehicles for all types of preparations including ointments and creams—all these require a knowledge of pharmacology, if the work is to be intelligently performed.

The pharmaceutical curriculum includes many courses which contribute to a sound foundation for the study of Pharmacology and I share the opinion that true pharmacology may well find its fullest development in the field of pharmacy. An adequate background of the chemistry of natural products is essential in order to make possible the teaching of pharmacology on a high level and it is desirable that the pharmacognosy course be revised and modernised to contribute more effectively to this end.

We could probably all agree upon certain fundamental objectives. We have a right to demand of any course of applied science (1) that it will provide information that will be useful to the student in solving problems, not only of to-day but also of tomorrow, and (2) that the teaching of principles should be preferred to the communication of isolated facts. Facts are quickly forgotten and in any case can be found in hand-books ;

understanding is more difficult to acquire but once acquired becomes an integral part of the student's mind.

The use of drugs has a very long history but pharmacognosy as a science dates from the beginning of the nineteenth century (the term "pharmacognosy" was introduced by Seydler in 1815). Although the chemical knowledge of natural products was constantly increasing during that century, these developments had very little influence on the teaching of Pharmacognosy. Plant descriptions, morphological and anatomical studies of crude drugs continued to be the essential features of the courses. There is however an approach to pharmacognosy that would permit the integration of this important subject with pharmacology to the immense benefit of both. The pharmacological actions of natural products derive from definite chemical entities elaborated by living cells. These active constituents also provide the centre of interest for the pharmacognosist, since the existence of these substances is the very reason that the drug is included in pharmacognosy. These constituents however are not only of interest because of their effect on the animal body; they have a function in the body of the producing organism too. An alkaloid, a glycoside, a vitamin, should be considered as part of a living organism, as functional parts of the cells.

Doubts have been expressed about the necessity of pharmacognosy for the practising pharmacist. A reduction of the taxonomical, morphological and anatomical emphasis in the syllabus and modernising the training by taking a more chemical, biochemical and physiological approach would change it into a subject whose significance and importance would be evident to all. Pharmacognosy is pharmacy's specific and peculiar contribution to the cause of Science and it behoves us to esteem it well.

#### PHARMACY

Galenic pharmacy enables us to present trains of thought and methods of scientific manipulation which as yet lie outside the domain of equations and formulae. Many remedial agents have crept into existence and become established through empirical experimentation, and the teacher who makes light of this, and who allows the wealth that came into his hands from days gone by to sink out of sight, wrongs himself and the community of which he is a part. Who knows the inter-structural relationships that exist in the simplest galenic preparations? Consider the terms:—tinctures, syrups, infusions, liquid and solid extracts. These and such as these apply to a complex association of a whole mass of materials derived from the vegetable structures that contain or yield them. Processes such as those indicated have been employed since the beginning of man's historical record. It would appear that galenic pharmacy is, and always has been, based on colloidal complications, and inasmuch as the normal structure and juices of most, if not all, plants are colloidal, it follows that the study of pharmacy as applied to natural substances is that of colloidal research and colloidal manipulation.

Within recent years such reasoning has been more generously received,

partly because of the clearer views that now prevail regarding the value of "structureless" compounds, and, partly, because advanced thought in pharmacy more fully comprehends its inherited opportunity. Pharmaceutical effort in this field of colloidal structures, long dormant in its original home, has elsewhere been very active. Accepting that non-crystalline substances compose the major part of plant tissues, it becomes the pharmacist's duty to disentangle these complicated structures and, in doing so, to provide a product which has not undergone fundamental rearrangements. We must cease to teach that a simple macerate or percolate is anything other than a crude beginning. There is, of course, no Alkahest, no Universal Solvent such as was dreamt of by Paracelsus. In the process of extraction of natural colloidal groups, the most promising neutral liquids are included in the list of fourteen laid down by Uri Lloyd. By means of these solvents successively applied most plants may be virtually exhausted of their contents. Each saturate is, however, not an ultimate, but in itself may constitute a group of associated constituents, which by further subdivision is capable of yielding yet more closely related substances. By such manipulative processes and without the use of energetic chemicals, colloidal plant structures may be dissected and individualised to a degree of pharmaceutical satisfaction, even if not to absolute chemical perfection. A tentative beginning was made when ergot, colchicum and strophanthus seed were freed from inert material by extraction with a neutral liquid before percolation with alcohol. The use of a neutral liquid as an excluder is exemplified in ox bile and the manipulation of different strengths of alcohol to include and exclude at will is carried further in the extraction of liver. Another facet of this idea is shown in the piecemeal separation of certain of the alkaloids of opium and their reassembly to give the well known injectable products.

I am satisfied that given the right training and outlook there is practically no limit to what may be done in producing medicaments which evoke the precise therapeutic response that is desired, plus the synergistic effect that frequently accompanies this, and which are free from inhibiting or damaging reactions. Some of us have been making a study of the solanaceous group of drugs. We find that by the use of quite simple successive solvents, we can produce, in the form of colloidal scales, a substance miscible with every type of solvent and which appears to possess all the properties of the original drug. This is but a beginning. By varying the solvent or slightly shifting the *pH*, medicaments may be provided to give immediate or prolonged action. This is shown in the cinchona and ipecacuanha group. At one time we were inclined to look askance on the use of sherry as a vehicle but recent experience has sent us back to examine this problem with fresh eyes. Even such an allegedly simple drug as liquorice presents problems little dreamed of a few years ago. The presence of potassium citrate, syrup or glycerin as part of the vehicle not only gives, in many cases, a better preparation, but one that tolerates the addition of iron salts.

I have said that much of this type of work lies outside the realm of formulae and equations, but a beginning has been made in the case of glycerin and sugar in the stabilising of tannin-containing galenicals. It

has been shown that the effect is proportional to the molecular concentration and can be expressed :-

$$T = KM$$

where T is the time in days, K a constant and M the molecular concentration. As time goes on, no doubt what is obscure or empirical will be reduced to laws expressible in this form.

The discovery of the alkaloidal affinities of hydrous aluminium silicate has opened a new field which at last is being energetically tilled by young pharmacists. Although it is not yet possible to be certain, there seems little doubt that this also will provide a method of obtaining plant substances in a purified and active form. The process of dialysis, once official in the pharmacopœia, must again take its place as an important pharmaceutical process.

Colloidal chemistry is based upon the fact that quantity is but one factor that determines chemical or therapeutic action. The condition of a substance is of first importance in its therapeutic application. Consider the case of mercury, an over-simplification perhaps, but it illustrates the point I am trying to make. Five ounces of mercury have been swallowed without appreciable result, while a few grains finely divided forms an active agent. The same effect of physical state is true of the purgative resins. The condition of the active substances will thus determine to a large extent the quality of the galenical, and this brings into prominence the relation between strength and quality. The strength of a vintage wine is based on its alcoholic content but its quality is determined by quite other considerations. There is no difficulty in doubling the alkaloidal strength of a nux vomica galenical by adding a few grains of strychnine, but the question arises, has the quality been improved?

#### STANDARDISATION

The attempt to standardise a preparation by a single dominating constituent is but a struggle towards a pharmaceutical standard of excellence in which the therapeutic quality should be the ideal. Until we have a far greater knowledge of the chemistry of plants, not only of the constituents but of the manner of their occurrence, and a far clearer picture of the exact therapeutic action of these constituents considered separately or in groups than we now possess, we must in our scheme of training stress the importance of quality. In doing so we shall be dealing with one of our most important pharmaceutical problems for, in addition to finding new remedial agents, we must aim at giving to the users of medicines, the wealth that comes from manipulative pharmacy and balanced research applied directly to the study of qualities. It is impossible to tell what will be the course of the development of our knowledge but it seems likely that in a few decades we shall have a much clearer picture of the whole field. The details are likely to become ever more complicated but that should not worry us if we can adopt the natural historian's approach. We can be sure that new physical, chemical and physiological principles of very general importance will emerge from such new knowledge.

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Is it fanciful to believe that there is some analogy between the elaborately processed "foods" and the substitution of synthetic chemicals in medicine for the naturally occurring substances in the plant and animal kingdom. No one really believes that sodium *cyclohexylsulphamate* does in fact replace cane sugar and honey in human metabolism or that glyceryl monostearate or polyoxyethylene compounds are not a very poor substitute for natural fats and oils. I am not here discussing the synthetic carcinogenetic substances that were added to foods, azo-dyes, butter yellow or the nitrogen trichloride that "improves" our bread and is toxic to dogs. To carry the point even further from our present discussion, I was once sufficiently close to agriculture to look with misgiving on the use of chemical substitutes for the natural fertilisers of the soil.

We are now upon the threshold of an era in pharmacy in which the crudeness of the past will rapidly disappear and in which our medicines will be known and valued in accordance with their actual conditions. In these circumstances it behoves us to look again at our pattern of research and the following quotation from a lecture recently delivered by Dr. R. L. M. Synge at the Royal Institute of Chemistry, seems to be very pertinent to this matter.

"I will end by pleading for a change of emphasis in research in these fields. Glancing through Chemical Abstracts (which is a fair summary of *published* work), one gets the impression of an enormous misdirection of scientific effort. People are so keen to sell a new wonder drug or vitamin, or discover 'the cure' for cancer, that relatively few are studying naturally occurring substances in their natural environment. Detailed chemical analysis of biological material is exacting work. Most of these numberless dreary papers on 'The interaction of synthetic analogues of antibiotic W and vitamin X on ABC having a Y-induced requirement for Z' are getting us nowhere at great trouble and expense. The end observation is growth or failure to grow. More detailed and painstaking analysis of biological systems may not help anybody rapidly to create a market for W, X, Y, or Z. It may be three times more difficult and lead to writing only one-fifth as many papers, but in the long run the time spent will be vastly more productive both of real wonder drugs and real cancer cures. We shall also gain a new depth of understanding of the beauty, the simplicity and the complexity of living things."

### THE FUTURE PHARMACIST

It has been stated by knowledgeable persons that the future pharmacist will be chiefly occupied in counting tablets, mostly phenobarbitone, and dissolving a sterile substance in sterile water. I see a very different picture: I see the future Pharmacognosist and the future Pharmacologist working together to find and prove new remedial agents from biological sources that will be as different from our present galenicals as a spiders web is from a modern hæmostatic. I see remedial agents that will require for their preparation all the knowledge and all the skill that a pharmacist can acquire. It may be true to-day as when it was written in mediæval times that "Contra malum mortis non est medicamen in hortis." But we are

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the prisoners of hope, we must take Voltaire's advice and continue to cultivate our gardens.

### THE TEACHER

With permission, I would like to end by addressing directly the men and women engaged in my own section of pharmacy. I am well aware that what I have been saying will call for exertions and adaptations that may at first be resented. It is one of the compensations of a teacher's life that he is using his mind on valuable subjects. All over the world people are spending their lives at work where their minds must be kept numb all day, or else on highly rewarding activities (monetarily), which are tedious, or frivolous or worse.

Greatly daring we have elected to join a famous company; some of the most important men in history have been teachers. Many of the biggest advances in civilisation have been the chief work, not of politicians or inventors, not even of artists, but of teachers.

We must, therefore, have courage equal to the responsibilities we have undertaken. That we have difficulties to overcome goes without saying; lack of adequate accommodation is general in most institutions to-day. Storr Jordan's famous dictum "Have your university in sheds, have it in tents, but have the masters there" is not so helpful when you are relying on accurate laboratory work as your teaching method.

If however the early training follows the line I have suggested, and if, in particular, the young people who are ill equipped are diverted to other paths our work will become more rewarding. Not perhaps in a financial sense; that cannot, and in my opinion should not, be the inducement to become a teacher. We have Ruskin's assurance that pay alone never made a better soldier, a better artist or a better teacher.

We are the servants of reality, our responsibility is to the young and through them to the future, a future we can envisage but may not be able to share. The race that we are asked to run with patience is not a hundred yards individual sprint but a relay race that began long before us and will continue long after. The idea has been well expressed in the noble words of Havelock Ellis:—"For a brief space it is granted to us, if we will, to enlighten the darkness that surrounds our path. . . . We press forward, torch in hand along the path. Soon from behind comes the runner who will outpace us. All our skill lies in giving into his hand the living torch, bright and unflickering, as we ourselves disappear in the darkness."