THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

The Publication Board

IF ONE basic field in pharmaceutical education can be said to have been neglected more than another, that field is the biological field. In this field pharmaceutical education has not kept pace with pharmaceutical practice and for that reason biologic assay went to the medically trained man and not to the pharmaceutically trained individual, where it, by the nature of things, belongs. The Commonwealth Study of pharmacy showed physiology to be a basic pharmaceutical science and it took the strong hand of the Director of that study to keep certain members of the advisory committee from eliminating physiology from the pharmaceutical curriculum. The same sentiment was evident in the committee that made the last revision of the Pharmaceutical Syllabus. With the inclusion in the Pharmacopœia of a number of biologic assays and with the whole field of medicine headed in that direction, for the Syllabus Committee to vote against making biologic assay a requirement in the curriculum, was nothing less than a tragedy, it was a pathetic calamity. It was all the more pathetic, not because the Committee did not see the vision, it was done for fear it would add to the expense of teaching in some schools which could not afford it. When a school reaches that point, it better give up trying to give courses in the pharmaceutical sciences and devote its energies to the teaching in elementary bookkeeping and penmanship. It is therefore tremendously refreshing to find a man like Dr. R. A. Deno of the School of Pharmacy of the Medical College of Virginia who is giving thought to the most basic of the basic biological sciences and is actually working out his thought in his own laboratory.

Forty years ago, or at an even later date, pharmacy was an isolated science. A College of Pharmacy was looked upon as a one-subject college. That condition is changed, no longer can we think of pharmacy in the terms of one subject, or in relation to physics and chemistry alone, it must also be thought of in its relation to botany, zoölogy, physiology, pharmacology, biologic assay, pharmacognosy and bacteriology. These subjects are just as rightfully called the pharmaceutical sciences as they are entitled to be called the medical sciences.

Not only the pharmaceutical educator, but the research worker and the practicing druggist will appreciate the stress Doctor Deno has placed upon a more basic teaching of biological science in the pharmaceutical curriculum.—RUFUS A. LYMAN, *Editor.*

THE TEACHING OF BIOLOGY TO PHARMACY STUDENTS.

RICHARD A. DENO.*

Courses in pharmacy almost always have included instruction in the science of botany. More recently, general work in zoölogy has been required in an increasing number of colleges. This requirement is logical when we consider the rapid development within recent years of gland products and other pharmaceuticals of animal origin, and the present-day emphasis upon courses that are cognate to the work in pharmacy proper and whose nature is biological. At the present time a few schools of pharmacy are requiring a year of biology in place of botany, or of botany and zoölogy. In view of these changes and of the present extensive discussion of the cultural aspects of professional education, it might be well to ask a few specific bio-pharmaceutical questions.

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Should beginning students in pharmacy be required to take botany? If so, what kind of course should be offered: the so-called pharmaceutical botany, the type-form life-cycle botany now taught in many colleges of liberal arts as it has been for several decades, or the principles-type wherein a considerable emphasis is placed upon subject-matter other than morphology? Should zoölogy be given a place in the pharmacy curriculum? If so, what nature should this work assume: the traditional one with its emphasis upon the dissection of type-forms, a survey course devoted to the study of principles, or a hybrid zoölogy which attempts to include the virtues of both of these types? If a semester of general botany and one of general zoölogy are found advisable, will it be more advantageous to combine them as a year of general biology? And if this is done, what lines should this follow: emphasis on morphology, or upon principles? Is it possible that the pharmacy curriculum would be strengthened by the addition of advanced courses in zoölogy designed to furnish a basis for a better understanding of physiology, pharmacology, biological assaying and biochemistry, and by advanced work in botany preparatory to pharmacognosy and drug analysis? If some of the pharmacists of the future are to be trained as plant chemists, or as scientists capable of rendering effective technical aid to hospitals and to other public health agencies, what specialized courses in biology would best fit them for this type of service? As a pharmacist and a biologist, knowing some of the problems of pharmacy and some of the contributions which biology has to offer, I humbly suggest a few possibilities in answer to these questions.

The teaching of botany to beginning pharmacy students is so universal, and the relation of this discipline to the vegetable drugs is so obvious, that its inclusion needs no further justification. The question here is: what lines should botanical instruction follow? Many believe that students in pharmacy are benefited most by a course in pharmaceutical botany, where particular emphasis is placed upon plant parts used in medicines, their microscopic anatomy, and upon laboratory procedures designed to teach the student how to prepare these parts for study. In supporting the teaching of pharmaceutical botany in a recent thoughtful article the statement was made that, "For the pharmacist, however, it (botany) becomes more than purely a cultural attainment, for he is interested in applying his knowledge in specific cases in order to safeguard his reputation in business by being able to judge accurately his crude drug materials" (1). I cannot see how certain phases of botany can be emphasized while others are minimized or omitted, and the pharmaceutical botany which has been developed in this manner then spoken of as *more* than a purely cultural attainment. I believe it is *less* than a purely cultural attainment, a narrower, albeit more proficient, one. Such early specialization of the field means that pharmaceutical botany is really elementary pharmacognosy. If one believes that early and repeated emphasis upon this receding field in pharmacy is more important than a broader training in plant science, then pharmaceutical botany is justified. I cannot subscribe to this belief.

If general botany is given instead of pharmaceutical, the sort best designed to fit the needs of the pharmacy student should be considered. Traditional courses are of the type-form, life-cycle variety. This method of presentation magnifies some of the objections to general botany mentioned in the article referred to previously. Emphasis is placed upon typical life cycles of the various plant groups and

the balance of the time is devoted principally to morphology. Usually there is little time left for a consideration of other phases of the subject.

A number of colleges of liberal arts have recently adopted the principles approach to the subject. Courses following this procedure are in the nature of survey courses in which an attempt is made to enter as many of the fields of plant science as it seems practical to introduce to beginners. In addition to the cytology and histology of plant organs, classification and typical life-cycles, attention is given to plant physiology, ecology, heredity, geography and evolution. These latter phases are seldom dealt with in pharmaceutical botany and frequently receive slight attention in the type-form, life-cycle botany. Many believe that such phases have no place in beginning botany, but if the course is designated general, as most are, such topics are properly included. Others admit the logic of including these branches in the general course, but state that time does not permit their treatment adequately, that the full session is needed to present the elements of morphology and classification. Such courses should not be designated as general; they should be called what they are: elementary morphology and classification of plants. It is possible to cover the traditional fields, if one is content to omit certain details, and still find time for the other important topics. If botany is to be taught apart from zoölogy, I believe that for all students, including those in pharmacy, the principles method is the best approach.

There is no such unanimous agreement among pharmaceutical educators respecting the place of zoölogy in the pharmacy curriculum as is found for botany. Many still expect their students to master physiology and to learn in its applied branch, pharmacology, how drugs produce their effect in the body without even the rudiments of form and function given in general zoölogy. From a practical angle, in America the pharmacist is the dispenser of contraceptive merchandise, yet in most instances he has no scientific training in the anatomy and physiology of sex. In many schools pharmacy students are expected to understand biochemistry without any preliminary training in one of its basic subjects, zoölogy. The Pharmaceutical Syllabus requires instruction in public health studies with no biological requirement prerequisite. The same book suggests a course in biological assaying for students who may or may not know anything about the animal organism, and one in insecticides for those who very probably do not know the difference between a bug, an insect and a spider. Each of these instances is like expecting a student to do well in quantitative analysis without training in general chemistry. Such a procedure would provoke instantaneous disapproval, yet some of our best schools are following exactly the same fallacy in regard to the advanced courses which are grounded in zoölogy. The curriculum is top-heavy in this respect, and even those not trained in animal biology should be able to recognize this deficiency.

The kind of zoölogy which best meets the needs of the pharmacy student may now be considered. Here again, the traditional course is of the type-form variety, in which representative animals are dissected and their minute anatomy learned. Many of these are marine forms whose existence should be known but whose morphology is of slight concern to a practicing pharmacist. This older grasshopper-zoölogy does not give the pharmacy student what he needs.

The principles-type of biology furnishes a broader basis for advanced work, and is better suited as a prerequisite for the pharmaceutical subjects based on

zoölogy. Here many aspects of zoölogy are noted: form, function, embryology, heredity, classification, ecology, geography and evolution. By omitting some of the details of anatomy it is possible to introduce many phases of the subject never covered in the older courses.

There have been attempts made to revise the older zoölogy. In these courses type-forms are still emphasized in laboratory and the other phases considered theoretically. This hybrid zoölogy is not very satisfactory to the champions of either method. Laboratory work is highly desirable for all phases studied in the recitation hall, and a compromise between the two methods is difficult to effect.

If one believes that general botany and general zoölogy are of value to the student of pharmacy, a logical query is: how much of each? Another pertinent question arises: could they be given better as one course, biology? To answer the first question, I believe that one semester of general work in each is adequate for our needs. There is at least one dean who feels that a year of each should be required. Instead of this, a semester of each and an additional semester of specialized work in botany and one in zoölogy would be more valuable in pharmacy.

The substitution of a year in biology for a semester of botany and one of zoölogy has much to recommend its serious consideration. For beginning students, the similarities between life processes in plants and animals are more important than the differences. Cell structure and function are alike in plant and animal. Reproduction in the two is a parallel study. The laws of heredity are identical in the two disciplines. The principles of classification hold true for both. Geography, paleontology and evolution are best learned when plants and animals are considered simultaneously. It is utterly impossible to discuss animal ecology without constant reference to plants. In fact, if one is to include anything other than the structural details of type-forms, plants and animals are studied better together than separately.

From what has been said it can be seen that in the writer's opinion the needs of a pharmacist can best be filled by an introductory course in the principles of biology given throughout the freshman year. If this is done, time will allow an adequate discussion of the neglected phases in addition to ample treatment of the conventional aspects of botany and zoölogy. From personal experience I believe that a gain in time of about one-third of the academic year can be made by treating the two subjects together in their many similar phases. This means that more free time is available for the neglected fields.

A year of general biology of such comprehensive scope cannot include sufficient details entirely to prepare the student for physiology, pharmacology and biochemistry on the one hand, and pharmacognosy and drug analysis on the other. Neither does general zoölogy nor general botany properly pave the way for these specialized courses. A semester of sophomore zoölogy and one of sophomore botany following a year of substantial work in general biology will, however, give a basis comparable to that now given for advanced work in chemistry.

The semester of advanced zoölogy should consist of a study of the gross anatomy and histology of vertebrates, with enough embryology included to give an adequate conception of the origin of the endocrine glands. The laboratory work might well be centered on the cat, with a preliminary study of the dogfish as typifying the vertebrate plan of structure. A histological study of the organs should

parallel the gross dissection. With the anatomy of the cat clearly in mind, the student would be prepared to understand the work given later in physiology, pharmacology and biochemistry.

The semester of advanced botany should consist of much of the morphology now given in pharmaceutical botany, and might well include enough plant physiology and ecology to furnish a background for work in drug analysis, plant chemistry and the culture of medicinal plants. This should equip the student adequately for advanced work in pharmacognosy.

The two years of biology that have been outlined are needed at the present time to give a biological basis for an understanding of the junior and senior courses now present in the pharmaceutical curriculum. If, as some believe, the pharmacist of the future is to be trained to give technical service to hospitals and other public health agencies, it may be necessary to require courses in microtechnique and parasitology. If some are to qualify as specialists in the field of drug plants, they should receive additional training in plant physiology and plant ecology. For the present, however, the needs can be met by two years of biological training along the lines suggested, but not by less.

Up to this point I have purposely avoided any reference to the cultural aspects of biology. No one denies the cultural value of botany and zoölogy, or of pharmacognosy and pharmacology for that matter, but few have attempted to tell what they mean by cultural value. At recent conferences attended by national leaders in the field of professional education, engineers, pharmacists, dentists, physicians and lawyers, there has been much thoughtful discussion of the need for a cultural approach to vocational education. Here again these men find it difficult to explain what they mean by a cultural approach.

If by culture we mean what Mathew Arnold meant, the acquainting ourselves with the best that has been known and said in the world, we find ample reason for including the neglected aspects of biology in our principles course. A student who has finished biology should be acquainted with the work of Mendel and his modern successors in the field of genetics. To complete his course and know nothing of what the names Lamarck, Wallace, Darwin and Huxley stand for certainly is not acquainting himself with the best that has been known and said on a topic of vital interest.

If by culture we mean the training and refinement of mind, tastes and manners which comes from contact with persons of similar training and refinement, the problem is slightly different. The need here is for a more careful selection of teachers, for a finer regard for these qualities in those with whom our students come in contact. If a teacher is of such character that he inspires emulation of his personal traits and habits, it matters little in what discipline he instructs.

Whichever meaning is applied, the biological sciences are definitely cultural. None can be held conversant with the broad aspects of science who does not understand the workings of the animal body or something of the world of plants. In many phases of biology, a teacher of refined nature is essential if the facts are to be presented in their true light and seen in their relationship to the pattern of life as a whole. Perhaps still different meanings are implied by others in speaking of culture, but until a more specific application of the term to vocational training is given, many will continue to think of cultural aspects as here depicted.

To carry out a program designed to strengthen the pharmacy curriculum at one of its weakest points—deficiency in biological groundwork—there are certain specific needs. The courses required must be adequately given, not by professors of pharmacy, not by instructors in pharmacognosy, not by chemists, but by trained biologists, preferably with an understanding of pharmacy. The courses cannot be given adequately without a sufficient allotment of time for recitation and laboratory. For the two years of biology outlined, three hours of recitation and six hours of laboratory instruction each week are needed. They cannot be given without proper equipment and supplies. A principles course in biology requires more material for proper presentation than does the type-form dissection type, which may be one reason why some have opposed the adoption of the principles method.

To summarize briefly, one of the weakest points in our present pharmacy curriculum is the lack of adequate training in the biological sciences. Much of the rote memory work in certain advanced courses is traceable directly to this deficiency. What a student does not understand he must memorize if he is to pass the course. The remedy consists in the introduction of a year of general biology, preferably of the principles-type, followed by a semester of vertebrate anatomy and histology, and one of plant morphology and physiology. The arguments in favor of a freshman and a sophomore year of biology are of two types, the need of this groundwork for an understanding study of advanced subjects, and the less tangible but no less real cultural gains to be obtained from biology. Until pharmaceutical educators recognize the need for and are ready to introduce substantial work in biology, in many courses the upper-class students will continue to memorize rather than understand, and the curriculum as a whole will have a vital weakness in its foundation.

REFERENCE.

(1) Hiner, L. D., *A. J. Pharm. Ed.*, 1, 132 (1937).

PHARMACY WEEK RADIO TALK.

BY PROF. EDMUND N. GATHERCOAL.*

Good Evening Folks:

Pharmacy Week has returned again; does it have any meaning to you? Most folks think that a pharmacy is a high-brow drug store; perhaps you are right. But please remember this—every drug store is a pharmacy or contains a pharmacy within it; for a pharmacy is a place where drugs are prepared, sold and dispensed.

As we look at the usual corner drug store we know that much of its stock in trade and of its activities are not those of the pharmacy. We will admit that the soda fountain with its lunch counter must be excluded from the pharmacy. Surely the magazine and newspaper stands, the circulating library, the toy counters, the tobacco cases, the candies—all of these cannot be a part of the pharmacy. Oddly enough, however, quite a few medicines are dispensed over the soda counter. It is not unusual to see persons consuming fizzing headache remedies, doses of castor oil disguised in sarsaparilla soda, and mild laxatives such as citrate of magnesia and Seidlitz powders.

Please remember also that all drug stores do not have soda fountains. For example, there are listed in the 1930 national census some 1600 drug stores in Chicago, but 381 of these do not have soda fountains.

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* President of the AMERICAN PHARMACEUTICAL ASSOCIATION, over WEAF and network, Monday, October 18, 6:15 to 6:30 P.M. E.S.T.