

sides of which are sealed and insulated from room temperature by a thick layer of cork board. The sixth side is a tight fitting refrigerator door with three spaced panes of glass. Since the door is opened only two or three times a day the air in the chamber is maintained at approximately the same temperature as the incoming water. From the sketch it can be seen that three pipe lines, for hot water (E), tap-water (G), and ice-cooled water (F), respectively, supply the tank. The refrigerator for cooling the water is located below the sealed chamber. The thermometer (A) shows the temperature of the water entering the tank.

The apparatus which controls the temperature of the water which enters the tank, is known as the Slyphon Tank Regulator and is made by the American Radiator Co. A bulb containing a liquid with a high coefficient of expansion is situated in a metal jacket (B) through which the final mixture of warm and cold water must pass. This metal jacket is connected by pressure tubing (C) with a needle valve (D) in the ice cooled line. The expansion or contraction of the liquid in the bulb controls the amount of cold water which is admitted by opening or closing the valve. A spring (H) connected with the needle valve can be tightened or loosened so that any desired temperature will be necessary to open or close the needle valve.

In summer the hot water is not used at all but enough ice-cooled water is let in by the needle valve to cool a small stream of tap water to the desired temperature. In winter the temperature of the tap-water is raised to a point a little above that required, by opening the hot water valve slightly, then the needle valve lets in enough water from the cold water line (which in the winter is equivalent to a tap-water line since no ice is placed in the refrigerator) to cool the stream to the desired temperature.

To comply with specifications in the U. S. P., frogs must be kept at  $15^{\circ}\text{C}$  until wanted for immediate use.

It has been found in this laboratory that this temperature ( $15^{\circ}\text{C}$ ) is well suited to the proper storage of normal frogs and with the apparatus described above and the arrangement of it in the sealed chamber we are able to maintain this temperature to within about  $1^{\circ}\text{C}$  throughout the entire year, if necessary. While very sensitive to improper handling it is equally susceptible to proper adjustment and has been found satisfactory for maintaining an even temperature at all seasons.

RESEARCH LABORATORY,  
PARKE DAVIS & COMPANY,  
DETROIT, MICH.

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## PHARMACEUTICAL EDUCATION AND OPPORTUNITIES.\*

BY HENRY J. GOECKEL.

The entrance of the United States of America into the "World War" no doubt, brought before the educators and other leaders in pharmacy the fact that our colleges have not prepared graduates along certain lines within the legitimate fields of the profession. The war requirements of the United States Army in particular have brought this to the fore.

To those who have looked upon pharmacy and practiced the same as an im-

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portant branch of medical science and art, the experience of the past two years is no surprise. For years past we have occasionally read in our periodicals discussions on "What is the matter with pharmacy?" and "Why is pharmacy declining as a profession?"

Has it declined? Or, has it failed to recognize part of its mission and legitimate field of growth?

The writer is, possibly, one of a decided minority who think it has failed to read and understand the signs of the times sufficiently and accurately.

The war experience has brought out very clearly that our medical colleges cannot load up the minds of their students with excessively detailed courses of instruction in the technical, biologic and chemical branches of medical science without impairing their grasp of the clinical or physical diagnostic phases, which are the most important and probably the most difficult. Without a correct recognition of the subtle lapses from normal and a resulting correct interpretation of the same, all else is valueless. A correct diagnosis is the most important thing in medicine.

It is the writer's firm conviction, based on his experience, that the clinical pathology or laboratory diagnosis, and pharmacology are pursuits which in their requirements or qualities come more appropriately within the realm of pharmaceutical medicine rather than in that of clinical medicine. These diagnostic methods and the understanding of the qualities of remedial measures are such as to require a more thorough pharmaceutical and chemical knowledge than is imparted in colleges of medicine.

The training given in the usual three years of pharmaceutical education and the experience of prescription compounding are a better preliminary than the pre-medical and medical courses as given at our colleges of medicine. It may, perhaps, be contended that medical students receive adequate training in their two years' pre-medical chemistry. Teaching a future physician chemistry from an industrial and engineering view, as is done in some university departments of science, is a very poor preliminary for one whose whole life's work will be in the realm of physiologic pursuits. From the writer's own experience, he believes that most of those who teach these subjects have no understanding of the requirements for such students.

Many of our colleges of pharmacy give a sort of a course in urine analysis, etc., and in bacteriology. It would, perhaps, be better if they failed to give any, as these courses certainly do not qualify their recipients, and account for the many failures among those attempting to branch out in medical laboratory work. Many of these courses at colleges of pharmacy are not as good as some of the leading training schools for nurses are giving to their students, whom they aim to qualify as office nurses or as laboratory technicians. Such graduate nurses will probably pre-empt the field for laboratory technicians, as they have a better understanding of hospital requirements than do others.

A thorough training in the field of laboratory diagnosis, etc., will better qualify graduates of colleges of pharmacy for positions in biological production and standardization, and as pharmacologists. Such training can probably only be undertaken by a limited number of our colleges of pharmacy, as part of the work must be given by the medical faculties. Such colleges of pharmacy can give all

the training for a Doctor of Pharmacy (Phar.D.) in biology and chemistry excepting a course in gross anatomy; courses in normal and pathological histology and neurology.

If the college has a well-equipped department of biology it can perhaps give the course in embryology. If it has a well-equipped department of physiologic chemistry under the direction of a trained and experienced physiological chemist and clinical pathologist, it can give the courses in these two subjects, supplementing the same by experience in hospital laboratories as do medical colleges. Otherwise these, likewise, should be given by the medical faculty. The bacteriology can better be given under pharmaceutical auspices, as the course at medical colleges are too narrow. They dwell on the pathogenic organisms, and neglect the industrial, sanitary and agricultural phases. They give sufficient for a medical doctor (M.D.), but not for a doctor in pharmacy (Phar.D.).

With the rapid advance in biological and physiological research, the time is not far off when a trained pharmacologist will be one of the regular staff of every first-class hospital. His duties will be to advise the staff as to what remedies, and what particular form of the same and what method of application are advisable. Such a hospital or community pharmacologist will also need to see that the various preparations are correctly prepared by the supply house, hospital apothecary or nurse, as the occasion requires. In October 1918, there were in the United States 4,927 hospitals with from 10 to 100 beds, and 1518 with from 100 to 500 or more beds.

A few illustrations from the writer's experience will perhaps shed light upon the gap between clinical medicine and pharmacy.

Take the white lotion, or *Lotio Alba Comp.*, used extensively in the local treatment of acne. The success in the use of this lotion depends upon its correct pharmaceutical preparation. If the zinc sulphate is in excess, or if the sulphurated potash is of poor quality, instead of a bland lotion you will have a caustic and irritant due to the excess of zinc sulphate. No reasonable amount of manipulation of sublimed sulphur in a mortar, with or without the aid of alcohol, will reduce it to an impalpable powder. The use of precipitated sulphur is not as efficient therapeutically. I know of an instance where a physician noted the caustic action and thought to eliminate this danger by prescribing zinc sulphide in place of the usual interacting substances. A dried insoluble precipitate of this type is about as impalpable as pumice.

While an apothecary at one of the larger hospitals, the writer prepared this lotion so as to produce an impalpable precipitate. This was accomplished by saturating an aqueous solution of the sulphurated potash with sublimed sulphur, on a hot water bath. It was filtered while hot, and then precipitated in the usual manner. This was employed on hundreds of clinic cases without adverse comment. My successor prepared this lotion in the usual manner, and was promptly taken to task because of the marked difference in the results when applied. A knowledge of the therapeutic requirements was essential for the proper application of pharmaceutical knowledge.

I have seen a case where a compound zinc oxide ointment was prepared with a high grade oxide, on an ointment slab. A lot was then prepared by another prescriptionist with the usual cheaper grade of zinc oxide, and manipulated in a

mortar. The result, due to a gritty preparation, was an aggravation of the cutaneous symptoms, instead of the improvement obtained with the previous lots. It also resulted in some undesirable publicity for the pharmacy.

More recently (at an excellent clinic on burns, treated by the paraffin method), the chief of the clinic reviewed the various methods employed to treat burn cases. Among the methods was the use of warm water baths. He mentioned those claiming marked success and those reporting failure. To one with a pharmaceutical basis to a biological education it would immediately be patent that the success or failure will depend upon the temperature of the water and upon the length of time and frequency of application.

I recently saw a physician prescribe the Carrel-Dakin solution as a wet dressing on a bandaged hand. The result was an intense burn, as anyone with a good pharmaceutical and pharmacological knowledge would have expected from the group characteristics of the halogens.

These few examples tend to show that there is a gap between the physician and the pharmacist, and aid to locate the same. This is a gap which should be bridged by the pharmaceutical profession.

This is not presented as a criticism of our pharmacy graduate (Ph.G.) courses, which answer a definite need of the community. Nor to minimize the industrial and chemical fields of endeavor for which the colleges aim to qualify their graduates.

I would even urge that the commercial courses, as presented in the Ph.G. years, be made a prerequisite for such advance courses to teach value and methods, thereby to help eliminate the waste and extravagance which is so conspicuous in many hospital and clinical laboratories.

Bridging this gap will redound to the interest of pharmacy and the welfare of the community. The physician looks chiefly to the hospital for knowledge. Such training will also preëminently qualify pharmacists for success in the field of public health and sanitation. It will make untrue any charges that American pharmacy is not qualified to shoulder its responsibilities, be it in times of war or in times of peace.

CLINICAL AND PATHOLOGICAL LABORATORIES,  
MUHLENBERG HOSPITAL, PLAINFIELD, N. J.

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#### ABSTRACT OF DISCUSSION.

L. GERSHENFELD: The author has made two remarks in his paper which seem to be contradictory. He states that courses in urine analysis and bacteriology in schools of pharmacy should be optional, and then further on states that bacteriology should be taught in pharmacy schools and not in medical colleges.

H. J. GOECKEL: I said in the paper that some of our colleges of pharmacy give a sort of a course in urine analysis and in bacteriology and that it would perhaps be better if they did not give any of these courses because they did not qualify their recipients.

R. P. FISCHER: I must take exception with reference to some of the courses given in the institutions of Philadelphia. I know that the students who qualify in these courses are certainly fitted to do bacteriological work.

H. J. GOECKEL: I still maintain that the graduates of colleges of pharmacy, speaking from my experience, are not qualified properly for this work.

R. P. FISCHER: I must protest against such statement going out from this Association unless there is a basis for it. I know bacteriologists who are graduates of these very courses of