

examination of drugs is studied in pharmacognosy; the determination of  $p_H$  values in bacteriology; sugar determinations in urine analysis; and gravimetric assays, and volumetric assays involving neutralization, precipitation and oxidation and reduction are studied in quantitative analysis.

With all these exercises disposed of, there is still a wealth of material, such as: iodine and saponification values; ester number; the chemical analysis of vegetable drugs; proximate alkaloidal assays; the examination of volatile oils, resins and waxes; turbidimetric tests; the determination of unsaponifiable matter; ash determinations; and gasometric, electrometric and biological assays; the use of the colorimeter, polarimeter and refractometer.

Much of this work will not be completed in a first course. Shall a second course be given, possibly as an elective in the fourth year? Such a course might well include the more difficult and unusual determinations; further work on the alkaloids; electrometric assays; the biological assays for cod liver oil, and for aconite, digitalis cannabis indica and the other drugs for which the Pharmacopœia directs biological assays; and other work of interest to the analytical and control chemist rather than to the retail pharmacist.

*Should Work on Nostrums Be Included?*—One school lists an elective course in the assay of nostrums. There is plenty of work to be done on official drugs and preparations. Shall trade-marked preparations be analyzed? Will a few such exercises be profitable? Would they give a special interest to the course?

The following questions are submitted:

1. *Is the work of drug assay worth while?*
2. *If it is, how much time shall be devoted to it?*
3. *Shall the work be given as a separate course?*
4. *Where shall such a course be placed in the curriculum?*
5. *What shall be the general content of the course?*
6. *Shall there be both an elementary and an advanced course?*
7. *Shall only official drugs and preparations be examined?*

## THE PLACE OF PHYSIOLOGICAL CHEMISTRY IN THE FOUR-YEAR CURRICULUM.

BY T. R. LEIGH.\*

About fifty per cent of the colleges in the Association, now offering the Bachelor of Science Degree in Pharmacy, require physiological chemistry, the amount varying all the way from 54 to 396 clock hours, seventy-two being the most common. This nearly equal division of opinion as to the advisability of having that subject a requirement for the degree is a cogent argument for its discussion. Since the majority of the chemicals and drugs commonly handled by the pharmacist and the prescriptions compounded by him are for the human body, physiological chemistry is beyond cavil an important branch of the science to him. A glance over the questions asked by the state Boards of Pharmacy will often disclose a leaning toward physiological chemistry. That a knowledge of this subject is valuable and desirable would hardly be denied by any one who has considered its relation to pharmacy. But there are many other subjects of prime importance, so many, in

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fact, that all of them cannot be crowded into the curriculum. A cursory survey of the curricula of the colleges in the Association leads me to estimate that at least twenty years would be required to complete the various subjects required by the different colleges and leading to the Bachelor's Degree. Therefore, to say that any specific branch of learning, except those generally recognized as essential shall be required by all the colleges in the Association will generally arouse discussion or even argument. Personally, I believe that physiological chemistry is a very important subject to the pharmacist, especially to him who proposes to pursue the scientific side of the subject.

My ideal course, therefore, would include it in the four-year curriculum and let it come in the fourth year so that it would rest on a strong foundation of chemistry. I should like to give it as a so-called "separate" course, but in the teaching of it I should continually correlate it with its physiological and pharmaceutical relationships. The student is now ready for such a correlation for, strictly speaking, he is not a beginner. He understands the principles of several divisions of chemistry, he knows how to use advantageously journal articles, reviews and monographs. In the course of his physiological chemistry I should have him profit by much collateral reading. This reference study would not only broaden his knowledge of the fundamental principles, but would impress him with the developmental state of the subject. It would also help him to understand more clearly the chemical basis of immunology, and bacteriology. In short, he should soon realize and appreciate the coöperation of the bio-chemist with the pathologist, the pharmacologist and the physiologist in the revealing of the chemical phases of life. I believe that at least three semester hours could profitably be given to physiological chemistry without infringing upon the time of other desirable subjects.

I shall mention only a few things which the course might include to great advantage for I feel that a detailed account of its scope would be out of place to this audience: (1) A consideration of the composition and chemical properties of protoplasm based upon a thorough study in the class room and laboratory of the colloidal state; (2) a fair understanding of the constituents of living tissue; (3) the three main food stuffs—fats, carbohydrates and proteins, and the chemical processes that render them assimilatable and their products of hydrolysis including the influence of the saliva, the gastric and pancreatic juices and the small-intestinal secretions and the effect of the hydrogen-ion concentration; (4) digestion and the mechanism whereby the end-products of digestion pass through the walls of the intestines into the blood and lymph; (5) tissue formation and the production of energy; (6) blood and lymph; (7) metabolism, catabolism and oxidation changes, urine, etc.; (10) nutrition, including vitamins and mineral requirements; (11) animal calorimetry; (12) pathological conditions and the value of bio-chemical methods of diagnosis.

### "PHARMACEUTICAL" BACTERIOLOGY.\*

BY E. N. GATHERCOAL.<sup>1</sup>

Bacteriology as a technical science possesses a distinctive and marked pharmaceutical side:

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