

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

Synthetic remedies are coming into greater use every year and colleges of pharmacy must take cognizance of them if they intend to instruct their students in modern *materia medica*. The following paper by Prof. A. H. Clark will be of interest to all teachers of pharmacy and pharmaceutical chemistry because it treats upon the important subject of synthetic remedies.—C. B. JORDAN, *Editor*.

SYNTHETIC REMEDIES. THEIR PLACE IN THE CURRICULUM OF A SCHOOL OF PHARMACY.

BY A. H. CLARK.*

It is the writer's opinion that the curriculum of a school of pharmacy should give to the student of pharmacy that which will make his service to the public safe and efficient. He should also have a general education in keeping with his standing as a professional man, and other qualifications in keeping with the special privileges he enjoys as one engaged in a hazardous occupation. He should also be able to use the knowledge, scientific and otherwise, which he acquires in college, to increase his income.

For many years synthetic remedies have been increasing in numbers and importance until to-day they are one of the greatest factors in scientific pharmacy. Their wide use, vast numbers, diversity of character both chemically and physiologically, etc., make their study vastly important. In order that a pharmacist's service to the public should be safe and efficient a knowledge of these synthetics is very essential. A study of them greatly increases his general knowledge of organic chemistry and adds vastly to his prestige as a professional man. This is true of his relationships to other professional men, in particular the physician. Such knowledge is bound to increase his income indirectly if not directly.

The study of synthetic remedies might be undertaken from any one or all of a number of viewpoints. Chemical constitution, methods of manufacture, physiological action, tests of identity and purity, chemical behavior, etc., are some of the things to consider in their study. The teacher must choose the viewpoint which he thinks the best adapted to the needs of his particular students. Methods of manufacture are very valuable because of the general knowledge of organic reactions involved. To the student of chemical engineering these are absolutely essential. To the student of medicine or the physiological chemist their action on man and animals is the most important. To the analytical or control chemist their chemical behavior is of the greatest importance. Since it is obviously impossible to consider all these various phases of the subject at once and thoroughly the writer has come to the conclusion that a study of the chemical constitution of these synthetics comes nearer than any other thing to giving the student of pharmacy what he needs.

If a student is well grounded in the important or significant behavior of the various groups and radicals which are present in an organic substance he knows very well what it will do from a chemical standpoint. He also knows much about its

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physiological action, although the writer holds that a pharmacist should not pretend to specific knowledge regarding the physiological action of drugs. A general knowledge, for example, of the physiological effect of local anesthetics, of the barbital derivatives, of the arsenic compounds, etc., is as far as he should pretend to go. To the average student of pharmacy a knowledge of all the reactions in the synthesis of, for example, antipyrine, phenacetine, stovaine, etc., is also not at all necessary. His course in organic preparations should include some of this kind of work, since it adds to his general training. The average student should know about the U. S. P. tests of purity and identity in so far as it is possible to give him these in a laboratory course. The structure alone will tell by far the larger part of the story in the above cases.

As far as the study of synthetics in a course in general or theoretical organic chemistry is concerned, then, a knowledge of structure is of prime importance. The question arises as to the best method of giving such a course. Many teachers would be inclined to consider synthetic remedies along with all the other organic compounds of any particular class to which the synthetic belongs. This manner of presentation scatters the study of synthetics over the entire field of organic chemistry with the result that their importance is entirely lost sight of and the knowledge gained early in a course is forgotten long before the course is completed. Furthermore, many of them are so complex that an understanding of their entire structure is impossible without a knowledge of the entire field of structural organic chemistry.

For the reasons given above the writer believes, and this belief is founded on many years of experience, that the best results are obtained by making the study of synthetics a separate and distinct course. It is also of great advantage to classify them according to chemical constitution, although this presents some difficulties. For the student of pharmacy, however, it is far better than a classification based upon physiological action, although the latter might be better for the student of medicine. One of the great advantages with this arrangement lies in the fact that, if a course in synthetics is given toward the end of a student's college work, and the classification outlined above is followed, it affords the best means for a general review of the entire field of theoretical organic chemistry that the writer knows of, and has the advantage over the usual tiresome reviews of combining something new with it. If, as has been already said, a good course in theoretical organic chemistry has been given, every principle and every class reaction embodied in such a course will be reviewed as the structure of these synthetics is studied. Since many of these synthetics are named according to the accepted systems of nomenclature, it is very important that a student be well drilled in the various schemes of naming organic compounds. Frequently the name indicates the structure, and always the structure shows the component parts of the molecule, and each one of these parts indicate certain properties and, therefore, the structure tells the entire story more fully than anything else can.

This scheme for the study of synthetic remedies consists, then, of presenting a course in theoretical organic chemistry in which the properties of each class of compounds is presented in a thorough manner and from the standpoint of the influence of structure on their properties. A thorough understanding of nomenclature should be acquired by the student as the course proceeds. After this

ground has been covered the synthetics are then grouped in exactly the same order as the other organic compounds have been, and their properties and uses studied from the standpoint of the general knowledge already obtained of the behavior of organic radicals. No better or more profitable review of the entire field of organic chemistry could be conducted than this scheme affords. Furthermore, the opportunities afforded the teacher for enlargement of the subject, such as the discussion of the history, commercial preparation, relationship of chemical constitution to physiological action, etc., is unlimited and the entire subject can be made most interesting and profitable to the student. The knowledge gained in such a course will surely further, to a high degree, the aims of a curriculum of a school of pharmacy as outlined in the opening paragraph of this paper.

A brief outline of a course such as advocated above and amounting to two semester hours of credit or about 32 clock hours of lectures and recitations would be something like the following:

Hydrocarbons used in pharmacy and medicine would include as much of a general discussion as the teacher desired to include. Some of the specific articles considered might be the following: benzine, kerosene, the liquid petrolatum, semi-solid petrolatum, ambrine and like substances, ethylene, acetylene, benzene and all the ichthyol-like substances.

Halogen derivatives might well include all the substitutes for the inorganic hypochlorites such as the chloramines. The various chlorine compounds used as solvents and anesthetics. The chloral substitutes. The brominated and iodized fats, oils, proteins, etc. The various forms of iodine medication both internal and external. Iodoform and its substitutes. Thymoliodide and similar products.

Phenolic substances used as antiseptics and germicides. Guaiacol, creosote, betanaphthol, etc., and their modifications.

The various alcohols such as amyl alcohol and derivatives. Methyl and ethyl alcohol and their physiological action. Benzyl and salicyl alcohol.

Aldehydes would include formaldehyde and its modifications. These afford a very interesting field of study.

Ketones would include camphor and its substitutes, which are rapidly growing in importance and interest.

Of the acids, salicylic acid and its modifications are so numerous and varied that there is almost no limit to the time that might be devoted to their consideration. Some of the most important medicaments in use will be found in this group. Esters of it, aspirin and its modifications, the amino derivatives, etc., are examples.

Esters such as the nitrites of the various alcohols, benzyl alcohol esters, amyl alcohol esters, the esters of borneol, santalol, etc., ethyl chaulmoograte, tannic acid esters and many others offer an interesting field for review and the study of the action of alcohols on the body.

Among the amines and amides are some very important medicaments. Acetanilid and phenacetine and their modifications are a wonderful field. The urethanes are scarcely less important. The consideration of the barbituric acid derivatives could alone be made a semester's work.

The quinolin and anthraquinone derivatives—including as they do cinchophen and related substances, chinisol, iodoxy-quinolin compounds, emodin and similar bodies—are of extreme importance.

The consideration of dyes as medicaments could be extended without limit by introducing the general discussion of dyes at this point in the course. The time at the teacher's disposal is the only limiting factor to this subject. What could be more desirable to the pharmacist than a general knowledge of indicators, for example? The wide use of certain halogen derivatives of phenolphthalein as diagnostic reagents should be familiar to every pharmacist. The antiseptic value of the acridine dyes, as well as of others, should be known. In a general way the structure of dyes should be discussed along with the above.

As organo-metallic compounds the vast importance of the arsenicals and mercurials cannot be overestimated. The pharmacist should certainly know something about these. The field is unlimited. Other organo-metallic compounds, notably the silver protein compounds, should not be overlooked in this classification.

SUGGESTION TO OUTSIDE LECTURERS—COURSE: BUSINESS ECONOMICS.

BY W. BRUCE PHILIP.*

The suggestions which follow have been prepared at the request of persons who were asked to address the classes of the College of Pharmacy and who have had little or no experience in this kind of talking. "If you will forget that you are delivering a lecture and talk to the class, you will make your lecture hour a success.

"Lectures are scheduled for 45 minutes; therefore, try and stick to your subject. Knowledge is one of the fundamentals of salesmanship. You are requested to address this class because you have special knowledge of the merchandise that your firm manufactures or sells. Therefore, try in the time allotted, to give all the information you can that deals directly with your line of merchandise. Discuss, very briefly, other kinds of merchandise, as allied lines, for time thus taken shortens your opportunity to discuss your own line. If you wish to make a historical background of your product or describe how your merchandise fits into the drug store, I suggest you use for this part of your talk not over 10 minutes. If you have samples of your merchandise to show the class, try to have these arranged on your desk ready for display before you start talking. Hold each article up and forward so that all members of the class can see; turn each sample around slowly so that all sides can be seen; name the article—common trade name and size—*twice*—once when you show the article and repeat as you replace the article on the desk. If it is desirable to take a bottle out of the carton, do not take the time to replace until after the lecture—leave it on the desk until then.

- "(1) Divide your time between the gathering of the crude drug or material.
- "(2) Manufacture of products for sale.
- "(3) Distribution of product and drug store display.
- "(4) Selling of your line of articles only.

"If you use a trade or unusual name, repeat the name and spell slowly. If desirable, define the word.

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