

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

C. B. JORDAN—CHAIRMAN OF EXECUTIVE COMMITTEE, A. A. C. P., EDITOR OF THIS
DEPARTMENT.

The following short paper by Dean Spease presented in his characteristic way contains food for thought by all those who are called upon to teach pharmaceutical arithmetic. As one who has had considerable experience in teaching this subject, I want to say that I am indeed happy that the forthcoming Pharmacopœia will eliminate the difficulties we have had in the past in teaching the subject of "percentage solutions."—C. B. JORDAN, *Editor*.

SOME OBSERVATIONS AFTER TWENTY-FIVE YEARS' EXPERIENCE IN TEACHING PHARMACEUTICAL MATHEMATICS.

BY EDWARD SPEASE.*

(CONFERENCE OF TEACHERS OF PHARMACY.)

I have been asked to say a few words upon my observations of twenty-five years in the teaching of Pharmaceutical Mathematics.

This paper will be short even though I might make many observations and it will only be necessary to point out one or two things that are of interest.

Back in the days of the two-year course before students were high school graduates I always found it necessary to drill each class over and over again upon the tables of weights and measures before they were ready to begin any form of mathematics. After that they learned methods and principles and what they learned were largely memory feats. To-day this is not true and one lesson upon the metric system, one upon all others, and one upon conversion is sufficient.

Of course, there is continued use which furnishes repetition and that clinches the memory part, but to-day they are able to confront themselves with mental pictures and weights and measures mean something real to them though they are not as proficient in the multiplication tables as in olden times. This is explainable. May I add at this point, always show them a grain of wheat and point out the origin of the grain and that it represents 64.8 mg.

I read the other day that one of our deans found fault with the high schools. After visiting many high schools I cannot lay the blame at their doors. I find high school graduates to-day lacking in experience. They do not have the experience to draw upon that we older folk have who lived upon farms, in villages or had connections with shops and mechanical devices, if only through our friends. To-day they read of them but don't do them. Riding on a street car or in an auto to school does not furnish that rich background of experience. Shop courses provide much of it but not for all students. This observation also includes the fact that things learned in the grades may never recur until the student reaches us in college and for some, never again. How many of you now know your Latin conjugations and declensions, but review them once more and they will stick.

I enjoy the student of to-day and believe he is easier to teach, and especially since I have visited high schools, read teachers' magazines, talked to high school teachers and learned what they are trying to do.

* Dean, Western Reserve University School of Pharmacy, Cleveland, Ohio.

The subject of percentage solutions, happily, has been solved by a statement in the British Pharmacopœia and by a similar one to appear in our own next revision. Have you read W/W, W/V and V/V of the British Pharmacopœia?

I have only a few more points to mention. The first is the ever-present difficulty in teaching the student to apply what he knows. He always thinks that percentage or any other matter is different in Pharmacy from what it is elsewhere. This is one point at which the teacher's ingenuity is most taxed.

I should like to recommend to you never to accept an answer, either in whole or in part that cannot be weighed or measured. For instance, one cannot weigh odd fractions, have them expressed in weighable and measurable denominations. Our hospital manufacturing laboratory has done much to help us in this regard.

One principle I always follow is to make all first class room calculations with the utmost accuracy and then, later, give problems and teach when "round numbers" may be used. I tell them an educated person should know when to use judgment, and "round number" factors should not be memorized. I have them calculate the variations in dosage of strychnine in five gallons of a preparation by comparing 19 liters with 18.925 liters as the equivalent of 5 gallons.

Should we all "jump through the same hoop," and is it wise to have all our colleges of pharmacy placing the same emphasis upon all courses offered? We all agree that each college should have individuality. There should, however, be a maximum and minimum beyond which it would not be wise to stray. Several times members of the American Association of Colleges of Pharmacy have studied our college catalogs and offered criticisms. Your Editor believes that as we develop the four-year course there will be less and less reason for criticism. The following study by Dr. Burlage is of great interest and his general comments are worthy of careful consideration. I am sorry that space will not permit the publication of the chart that accompanies Dr. Burlage's paper. The faculty of every college of pharmacy should be interested in this study because it gives an opportunity to determine whether their institution is much out of line in the time devoted to and content of the curriculum.—C. B. JORDAN, *Editor*.

A COMPARISON OF THE FOUR-YEAR CURRICULA IN PHARMACEUTICAL SUBJECTS.

BY HENRY M. BURLAGE.*

Beginning with the academic year 1932-1933, the member colleges of this Association entered upon a new phase of educational endeavor with the elimination of all short courses in Pharmacy by requiring the completion of four years of college training before a degree in Pharmacy might be obtained. As we all know this necessary advancement was attained only after years of struggle and effort on the part of educational leaders in pharmaceutical instruction with the hopes that this profession might be put on a higher plane than it has occupied in the past. The writer feels that such hopes cannot be fully realized unless a critical examination of the individual courses making up the new curricula is resorted to with the purposes of bringing about unification of such courses, the elimination of repetitions and obsolete material and a modernization of the same.

Unfortunately the fourth edition of the Pharmaceutical Syllabus, representing

* Professor of Pharmacy, School of Pharmacy, University of North Carolina.

the composite efforts of 21 individuals interested in pharmaceutical affairs and 30 or more teachers recognized in their respective fields, was not released until January 1932 and was, therefore, not available for study in the unification of course instruction.

In order to make a critical examination of the courses in so-called Theoretical and Operative Pharmacy which he offers, the writer decided to study the curricula of the various colleges of the Association to ascertain the position of Pharmacy in these curricula as to time, course content and compare these courses with those outlined in the Syllabus. Accordingly the catalogs for the session 1933-1934 of the member colleges were studied and the results to the best of the author's ability are tabulated in the accompanying table.

This study revealed such non-uniformities that it was deemed advisable to present these findings to the Conference of the Teachers of Pharmacy, to show the need of a critical survey of these Pharmacy courses as to content, time, year offered, etc., with the hope that this Conference might make some definite recommendations to the Association in order to bring about a greater uniformity of catalogs, valuations of didactic and laboratory hours, etc.

Arithmetic of Pharmacy (Syllabus Requirement (Lectures) 32 + 0 = 32).—Forty-five of 52 curricula offer this subject under the above title or similar titles. There is a probability, however that this subject matter might be offered in other courses. It is unfortunate that it is necessary for this to be listed in a four-year course. It appears that such a course is necessary since students are so poorly prepared in the fundamentals of arithmetic and algebra that they cannot handle the problems pertaining to pharmacy. The writer feels that the essential work in this subject can be offered without much difficulty in other beginning courses in Pharmacy of a more dignified title. It is pleasing to note that the majority of the schools offer in the Freshman year, only the Syllabus requirement.

Dispensing (including Incompatibilities) (Syllabus Requirement (Lectures) 64 + (Laboratory) 128 = 192).—Practically all of the schools offer courses under this heading; a few, however, list Dispensing under Manufacturing Pharmacy; some offering an unusually large number of hours of Dispensing, probably including other course material. A majority of the schools offer the hours suggested by the Syllabus, or more; 19 schools as far as could be ascertained offer less than the Syllabus requirement in hours. It appears that any school offering less than 192 hours is neglecting an important phase of Pharmaceutical education and that even more than this amount might be desirable. This subject has no place in the curriculum before the Junior year; the survey shows that a majority offer it in the Senior year.

History of Pharmacy (Syllabus Requirement (Lectures) 32 + 0 = 32).—Twenty-eight schools offer this course, which might be developed to be of great value in raising the professional morale; some, no doubt, include the subject matter in other courses. A majority offer 32 hours chiefly in the Freshman year. The proper time to offer this material is subject to discussion.

Pharmaceutical Jurisprudence (Syllabus Requirement (Lectures) 32 + 0 = 32).—Thirty-three schools offer this material in courses ranging from 11-96 hours; 14 offer the Syllabus requirement; 20 offer the course in the Senior year. It seems appropriate to offer this course only in the Senior year devoting *not more* than 32 hours; also rather than provide for another course of low credit hours, this material might well be covered in a course in Dispensing or Commercial Pharmacy.

Latin of Pharmacy (Syllabus Requirement (Lectures) 32 + 0 = 32).—With many students offering several years of Latin as entrance credit, this subject in the writer's opinion is over-emphasized and the necessary instruction might be introduced in beginning Pharmacy courses and later in Dispensing when the prescription is studied. Hours range from 16-48 with 22 curricula out of 27 offering 32 hours. It seems appropriate to offer this work in the Freshman year and a majority recognize this fact.

Manufacturing Pharmacy (Syllabus Requirement—Optional— + (Laboratory) 96 = 96).—Twelve catalogs offer courses under this title with hours varying from 80-192 in the Junior or

Senior years; lecture work is offered in most cases. There seems to be some confusion as to the content of the course. According to the Syllabus, Manufacturing Pharmacy is "quantity production of pharmaceuticals," or production on a semi-commercial scale and does not mean the preparation of pharmaceuticals in small quantities.

Following Manufacturing Pharmacy, the Syllabus lists in order, Operative Pharmacy ((lectures) 64 + (laboratory) 128 = 192), Pharmaceutical Technique (0 + (laboratory) 64 = 64) and Theory of Pharmacy ((lectures) 192 + 0 = 192) totaling 256 + 192 = 448 hours. The subjects are outlined to include subject matter of the greatest basic and fundamental importance in pharmaceutical training and should receive the greatest study and attention of teachers of Pharmacy. These subjects, no doubt, as outlined in the Syllabus, have and will receive criticism as to content, time allotment, etc. It is unfortunate that these sections were not divided more strictly, stating a time requirement for the various subdivisions, thus avoiding a certain amount of confusion that is evident in a study of the curricula of the schools. This condition has made the tabulation of these vital subjects difficult. In order to simplify this task somewhat the following subdivisions of the three subjects of the Syllabus are adhered to: Pharmaceutical Technique, Galenical Pharmacy, Pharmacy of Inorganic Chemicals, Pharmacy of Organic Chemicals (including New and Non-official Remedies).

Pharmaceutical Technique.—Fifty-one schools offer this subject matter under the above or similar titles with hours varying from 32–320; those offering a large number of hours, however, also include other subject matter. Thirty-four offer the work in the Freshman year; 13 in the Sophomore year; 3 in both years; in most cases lecture work accompanies the laboratory work. It appears that the course in catalogs should be more clearly defined. From the writer's experience, a satisfactory division of hours appears to be ((lectures) 48 + (laboratory) 64 = 112), offered as a Freshman or early Sophomore subject employing in the laboratory work official examples of the processes wherever possible.

Galenical Pharmacy.—While many individuals object to this title, the writer feels it to be distinctly pharmaceutical, indicating a phase of the so-called Operative Pharmacy involving the classes of the official preparations and their manufacture especially those which do not involve chemical reactions. This phase of the work should be regarded by the teacher of Pharmacy as one of the most important of pharmaceutical training. In no other course can the theories of the basic courses be so applied as to develop technique, professional pride and interest. Under no conditions should it be neglected in organization and time.

Fifty catalogs list courses which are distinctly galenical pharmacy; in some cases, technique, inorganic pharmacy, manufacturing and commercial pharmacy are also included. Clock hours vary extremely from 53–544; the subject matter is offered in the majority of cases in the Sophomore year but the spread extends from the Freshman to the Senior years. It appears that a course of 160 hours ((lectures) 64 + (laboratory) 32 = 96) offered not earlier than the Sophomore or Junior year is satisfactory and desirable.

Pharmacy of Inorganic Chemicals (Inorganic Pharmacy).—A course with one or the other of these titles is subject to much controversy as some individuals feel that this material falls in the realm of so-called Inorganic Pharmaceutical Chemistry or that it is adequately covered in basic Chemistry courses. To a certain degree the writer concurs with these opinions. A course seems highly desirable which deals with the official inorganic compounds, studying them from the angle of their periodic classification accompanied by laboratory exercises performing the necessary tests and preparing and studying the official preparations involving chemical reactions of these inorganic substances.

Twenty-nine schools offer courses which might be construed to include this course material with a wide variation of hours offered chiefly in the Sophomore and Junior years. A course of 80–96 clock hours ((lectures) 32 + (laboratory) 48 = 80) or ((lectures) 32 + (laboratory) 64 = 96) offered in the Sophomore year seems desirable.

Pharmacy of the Organic Chemicals (Organic Pharmacy).—Such a course is also subject to discussion especially as to course content since it might be included in so-called Organic Pharmaceutical Chemistry. The writer does not agree with these contentions especially if the Pharmaceutical Chemistry courses are of a basic nature since the fundamentals of organic chemistry cannot be stressed and at the same time a study of the official organic compounds be made; some knowledge of the more complex substances of natural origin and especially the ethical new and

non-official remedies which are becoming more and more important should be stressed. A course of 48-80 hours ((lectures) 48 + 0 = 48) to (lectures) 48 + (laboratory) 32 = 80) offered in the Senior year would be especially valuable.

Commercial Pharmacy.—Thirty-four catalogs listed courses which vary greatly in hours and offered chiefly in the Junior or Senior years; such courses are not offered by some schools since the commercial subjects are offered in service departments as Economics and Commerce.

GENERAL COMMENTS.

1. Of the 54 catalogs studied, 53 offer curricula for the four-year course.
2. Eleven of the 54 colleges are on a quarter basis.
3. The curricula of 11 schools offer too many courses of small credit evaluation. This weakness can in part be corrected by uniting the didactic course with the laboratory course in the same subject, rather than offering two courses. This has been an outstanding weakness of Pharmaceutical curricula for years and presents a condition which is open to much criticism by educators. A course requiring only one lecture hour a week should be increased in credit value or incorporated with a suitable major subject where it might be treated appropriately.
4. Four curricula offer Seminar courses which is of questionable value for under-graduates unless they have unusual ability.
5. Five institutions offer Assaying in pharmacy courses. This instruction seemingly and more properly should be offered in Quantitative Pharmaceutical Chemistry.
6. Considerable variation as to the number of laboratory hours equivalent to 1 credit hour is apparent. Nine curricula listed laboratory courses with no credit for this work to 1, 2, 3 and 4 clock hours equivalent to 1 credit hour.
7. Three colleges offer courses in the Use of the Library and Literature; such subject matter might well be offered in History of Pharmacy.
8. A course entitled Research and Thesis offered by 3 schools is of a commendable type but it appears that it should be offered as an elective only to those undergraduates who possess unusual investigative ability.
9. Pharmacy courses are distributed throughout the four years by most of the institutions with the following exceptions: one school with no work in the Junior year, two with none in the Senior year, and six with no work in the Freshman year.
10. Twenty-three curricula list one or more courses which to all appearances are review courses preparatory to the State Board Examinations. Such review seemed advisable when 2- and 3-year curricula were offered but in the new curriculum seems unnecessary with the additional time allowed and if the courses offered are of such a calibre and so distributed as to allow more intensive and thorough study. The time consumed by review courses might well be devoted to courses elective for the purpose of broadening the training of the student.
11. Curriculum Outlined and Course Descriptions.
 - (a) In 9 catalogs didactic and laboratory hours not stated in whole or part.
 - (b) Eleven offer vague or confusing course descriptions and outlines; 5 of which were difficult to study intelligently.
 - (c) Two outlines of study with no course numbers.
 - (d) One with credits poorly defined.
 - (e) Credits in 2 curricula outlines did not correspond with those in the course description.