

the manual. The continent maps are preferable to a single world map in that crowding is eliminated. As each drug is considered its habitat is briefly discussed, taking into consideration the country yielding it together with its cultivation and commerce. The student enters the habitat in his notes, at the same time indicating its location by printing or writing the name of the drug on the proper map.

This method at once accomplishes several things. The maps give the student a graphical picture of pharmacognostical and ecological distribution over the various parts of the earth. His interest in geography is renewed as he sees its connection with other divisions of learning, particularly his chosen profession. He begins to accept a collective picture in which several relationships are orientated. His general knowledge is increased. His interest is stimulated. And finally, he retains his habitats with much less effort because he has diverged from the forceful mechanical association of terms which mean little more to him than combinations of letters, to a logical method of proper association.

The question naturally arises as to the value of habitats. They comprise but a minor part of pharmacognostical instruction and undue stress should not be placed upon them, especially at the expense of other more valuable instruction, yet, as has been explained, they offer a link in the association between pharmacognostical and other knowledge. They comprise, therefore, a division which the teacher should not overlook, in his effort to create interest in his subject. After all, when pharmacy goes before the public annually during Pharmacy Week, what is the center upon which the great majority of displays are built? The drug map.

Should students who have not had a thorough course in physiological chemistry be taught one phase of it, such as urinalysis? To-day the physician is not satisfied with urinalysis alone, but he usually wishes a more complete analysis involving blood analysis, gastric analysis, etc. However, there is still perhaps a demand in certain localities for the pharmacist who is able to do simple urinalysis. If so, then such a course should be offered in the college of pharmacy. The following paper by Professor Greene and a discussion by Professor Gershenfeld will be of special interest to the instructor who is called upon to offer a course in urinalysis.—C. B. JORDAN, *Editor*.

TEACHING URINALYSIS TO STUDENTS OF PHARMACY.

BY ANTOINE E. GREENE.*

Perhaps this paper should be prefaced with an apology. If the present and future curricula in pharmacy are to be governed by the stern mandates of the Fourth Edition of the Pharmaceutical Syllabus, there will be no place for a course in Urinalysis, and this paper will be but a reflection of the ancient history of the subject.

It is the prayerful purpose of this paper to utter a protest, to enter an appeal. There is always the fundamental need for the consideration of local situations. In this period of tremendous transition in our education methods, we should be governed by the rule of curricular elasticity. While, in the main, we should attempt a firm adherence to unified basic and professional subjects, we should have open minds to receive and understand a "theory of elasticity" in the setting up of elective

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courses for our student body. Cast iron courses in a cast iron curriculum, with little chance for change or diversion, for student participation or interest in the choice of electives, are to be deplored. These straight and narrow curricula sterilize the students' interest, enthusiasm and ambition. It is our high hope that urinalysis remain as an acceptable elective, perhaps fortified if possible by the addition of blood chemistry, to become the equivalent in hours and credit of the course in biochemistry as outlined in the current syllabus.

In our course we attempt to acquaint the student thoroughly with the modern technique involved in the routine examination of normal and pathological urines. The student learns by doing. He examines his own urine to acquaint himself with a normal urine picture. The instructor examines each student's urine to determine whether or not the urine is normal, for now and then, a case of an abnormal urine is discovered.

The preparation of diagnostic reagents for the use of physicians is emphasized. Since many physicians conduct chemical examinations of urine in their office laboratories, we feel that the pharmacist should be prepared to furnish the busy practitioner with those reagents which he needs and frequently calls for.

In those qualitative tests, where a reaction has a known chemical explanation, such chemistry is brought to the attention of the student by pointed illustration. Where possible, the reasons for adding this and that, and the explanation of the resulting color or precipitation are carefully outlined and elucidated. Each student is urged to make use of the library facilities, and the use of modern textbooks and journals is encouraged for there are assignments which can only be completed outside of class.

From the normal urine, the student is led to the examination of abnormal specimens. Samples of pathological urines are obtained from the laboratory of an associated hospital, and, occasionally, private physicians submit specimens for both qualitative and quantitative examination. Time does not permit any extensive consideration of microscopic or bacteriological urinalysis. It is the purpose of the course to ground the student in the chemical examination of urine, and to do that well.

While our classes are made up of students who have had preliminary courses in the biological sciences, we review in lecture the anatomy and physiology of the excretory system and briefly touch upon the metabolism of the fats, carbohydrates and proteins in the human body in order that biological activities be understood from the viewpoint of interpretative urinalysis.

While the class meets for sixteen didactic hours and sixteen 3-hour laboratory periods per semester, by rotation of samples, each student examines at least one hundred specimens. We consider it a good practice to have the students check each other's results. This makes for a wholesome rivalry. Some students bring in samples of the urines of their friends, and delight to "diagnose" the ailments of their friends. The first we encourage; the second, we condemn. The function of the lay analyst of urine is to report findings, not to diagnose disease.

There is also a good-natured rivalry with the medical students who are studying physiology and physiological chemistry, and it may be honestly said that our students in pharmacy possess a better understanding of the technique of urinalysis than their fellow students in medicine. In fact, we have had several medical students elect our course as a foundation for future work in junior pathology. Several of our graduates have written to the college wishing to pursue such work as we now give in urinalysis, although appending a desire for comprehensive instruction in blood chemistry.

We attempt to inject the elements of interest in the course from the very beginning. As our students check in their desks, we have them take an actual inventory of the supplies and materials furnished them. This gives them an appreciation of the approximate cost of the necessary apparatus for setting up their own laboratories. The cost of preparing diagnostic reagents is also estimated, so that the student may compare the actual cost of preparation with the list price charged by commercial firms. This, we believe, vitalizes the subject with an added interest. The student is inspired with the idea that he may capitalize his professional knowledge by meeting the professional demands of the medical practitioner. And so it should be.

If, in the new order of things, the young medical practitioner comes to realize that his fellow

pharmacy graduates in the after-graduation era can aid him in the service of the public health, an *entente cordiale* will be established for the mutual good of medicine and pharmacy.

Perhaps we may be deluded, but our students manifest an enthusiasm for the work which is most gratifying when many of the major and required courses are considered by them to be necessary evils along the scholastic path to a diploma.

A case in point might well be related. One student found that his urine contained a large amount of indican. He admitted to irregularity and a heavy protein diet. From this diet he changed to a vegetable diet containing much roughage. Evidently his experiment must have been very successful, for not only did his indicanuria disappear, but his entire physical appearance changed for the better. Often during the stress and uncertainty of examination time, we come across an emotional glycosuria. And with many other conditions of physical and psychic stress and strain we uncover temporary abnormalities by way of urinalysis. These cases are interesting as they point out conditions discussed in the lectures and recitations.

Some students exhibit a desire for the more advanced laboratory methods connected with the clinical analysis of urine. These students are assigned *first*, to library research, and *second*, the preparation of the more delicate reagents. Where possible, these students are given individual instruction in the use and care of instruments of precision employed in urinalysis. It is our policy to allow these students to prepare the reagents in quantity which are to be used by the class. Special meetings are held when discussion of any question pertaining to the subject matter of the course may be entered in by students and members of the faculty. We call these conferences—symposia, and they are most interesting and valuable to all those who attend and take part in them.

In our experience we have found two or three interested students who were fitted for these advanced assignments, and it has been our policy to encourage to the fullest extent such interest by a personal participation in the student's problems. In all work of this kind, we lay emphasis upon integrity, patience and accuracy.

It has often been said facetiously that a difficult test in a clinical laboratory examination becomes a "sink test." That slur upon the laboratorians of our hospitals is slowly dying the deserved death of unrighteous error. In the future, it will be forgotten because of the honest and efficient service of a group of trained men and women, wholly devoted to honest and efficient laboratory analysis as a fundamental and necessary aid to the diagnosis, treatment and prevention of disease.

If it could be possibly arranged, a well-constructed course in clinical laboratory methods might well be substituted for the present optional course in biochemistry as outlined in the syllabus. This course should be carefully organized, with a view to pointing the lectures and recitations to the utilization of facts in the laboratory. This course should consist of lectures, recitation, conferences and laboratory periods to be equivalent to the number of hours assigned to biochemistry and to receive equal semester hour credit. Blood chemistry, as well as urinalysis should be included in the laboratory schedule. The lectures could be so formulated as to include those essential phases of biochemistry of particular value to the content of instruction. This course to consist of 32 didactic and 96 laboratory hours would be an elective to be chosen by those pharmaceutical, medical and special students who had the necessary preparation in the basic chemical and biological sciences.

The writer wishes to give an outline of the course as given at present, with a sample examination based upon the lectures, recitations and laboratory work.

1. The Definition and Classification of Urine Examinations.
 1. Physical. 2. Chemical. 3. Microscopic. 4. Bacteriological. 5. Clinical.
2. The Normal Urine Picture.
3. The Pathological Constituents of Urine.
4. Glossary of Terms.
5. Qualitative Examination of a Normal Urine for: Indican; Creatinine; Dextrose; Urea; Uric Acid; Bile; Blood; Acetone; Diacetic Acid; Chloride; Sulphate; Phosphate.
6. Qualitative Examination of a Pathological Urine for: Glucose, Creatinine, Blood, Bile, Uric Acid, Indican, Acetone, Diacetic Acid.
7. Eight Tests for Reducing Sugar, Differentiation of Glucose, Levulose, Lactose and Pentose.

8. Eight Tests for Urinary Albumin.
9. Quantitative Examination of Urine for Urea:
 1. By Hypobromite Method.
 2. By Urease Method.

Ammonia:

1. By Schiff-Malfatti Method.
2. By Aeration Method.

Chlorides:

1. By Mohr's Method.
2. By Arnold-Volhard's Method.

10. Total Sulphates. Total Solids. Total Acidity (by Folin's Method). Ethereal Sulphates.

11. Qualitative and Quantitative Examination of a Sample of Pathological Urine for: Blood, Bile, Acetone, Sugar, Albumin, Diacetic Acid, Total Acidity, Indican, Chlorides, Urea, Uric Acid, Total Solids, Total Nitrogen.

12. Collection and Preservation of Specimens—Refrigeration; Toluene, Chloroform, Thymol, etc.

13. Clarification and Decolorization of Specimens: Talcum, Pumice Stone, Magnesium Carbonate, Lead Acetate, Potassium Permanganate, etc.

14. The Form of Report.
15. Questions and Problems.

EXAMINATION IN URINALYSIS FOR PHARMACY STUDENTS.

1. Outline the normal urine picture.
2. What is the significance of a 24-hour urinary output of 4000 cc. with a specific gravity of 1.035?
3. Calculate the total solids in the above sample.
4. How would you definitely detect glucose in a sample of urine?
5. Briefly give three tests for urinary albumin.
6. What is the composition of: Esbach's Reagent? Benedict's Solution? Obermayer's Reagent? Fehling's Reagent?
7. How could you determine the amount of urea in urine?
8. Give a test for bile in the urine.
9. How would you clarify a turbid urine?
10. Give the test for urinary indican, and the chemistry involved.

Those who sit for these lectures, who work in the laboratory on many samples, and who pass successfully the examinations given at the end of the course, are fit, we believe, to begin a more advanced excursion into the field of clinical chemistry.

Although we may have been unduly negligent of our responsibilities, there comes to us a great comfort, even in our feeling of uncertainty as to the real value of our efforts in teaching a depised and rejected subject.

Comes to us the poignant realization that on the front lines of the public health defensive, there are young men and women working quietly and efficiently in the hospital laboratories in the service of medicine as it ministers to the needs of an underhospitalized and underprivileged minority. These servants of the national health received some little training in urinalysis at our hands. Our task in teaching goes on.

COMMENTS ON PAPER BY PROFESSOR ANTOINE E. GREENE ON

"TEACHING URINALYSIS TO STUDENTS OF PHARMACY."

BY LOUIS GERSHENFELD.*

It is difficult to offer a critical discussion of instruction of the kind you have just received from Professor Greene. To do justice to the subject would require more time than is at our disposal. It is, however, possible to offer certain suggestions and even to ask a question or two in the hope of all of us receiving more instruction.

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