A SUGGESTED COURSE OF STUDY FOR MEDICAL TECHNICIANS

THE proper training of those who desire to fit themselves for various professional vocations is an ever-present problem, involving serious responsibility for those engaged in educational work. To this end institutions of learning are reaching out toward newer methods of teaching. The rapidly changing conditions in vocational fields are being recognized and with this recognition there is or should be a distinct and apparent necessity for thoughtful planning in order to direct those who desire to take up the various lines of vocational and professional work into their most logical channel of livelihood. Educational institutions are finding it necessary to provide instruction in new lines of endeavor and to arrange courses which will meet more recent economic developments.

To be specific, during the last several years there has been a constantly increasing demand for laboratory technicians in public health institutions and in the laboratories of specialists in medicine. Several factors have contributed toward this condition. The work of our army and navy during the World War required special training of the members of the Medical Reserve Corps. At the base hospitals, both at home and abroad, clinical laboratory examinations were continually recognized as having a very decided weight. So much so that the many thousands of medical men who were useful in service during the war returned to private practice and found themselves more dependent upon accurate laboratory diagnosis than ever before. Another important factor which has very greatly stimulated the demand for properly trained technical workers in laboratory medicine is the dependence placed upon the rating which is given to hospitals by the American College of Surgeons. Thus, in order to become recognized as class "A" institutions, hospitals must maintain clinical laboratory departments representing personnel trained in this line of work. Furthermore, it is becoming universally recognized not only by medical men but, due to popular educational methods, by the lay-public as well, that clinical laboratory tests are necessary for a safe and sound diagnosis.

At the present time practically every member of a community has access to clinical laboratory diagnosis and he is to a greater or less extent dependent upon these laboratories. To illustrate: there are few well-treated cases of typhoid fever, pulmonary tuberculosis, diabetes mellitus, blood diseases or cardiovascular-renal diseases which do not have, through the aid of the physician, the benefit of laboratory procedures, both in diagnosis and in treatment. Thus, in typhoid fever, blood cultures are made early in the course of the disease for diagnosis, later followed by agglutination tests. Blood examinations are frequently conducted not only as an aid in diagnosis but as an indication of the progress of the disease. The diagnosis and treatment of diabetes is dependent upon carefully conducted laboratory work. A really thorough study of any patient suffering from diabetes or cardiovascular-renal diseases calls for a comparatively extensive laboratory examination, involving studies of the urine and blood and a measure of basal metabolism.

All this means that the medical profession, and the public as well, are beginning to realize the great responsibility which rests upon the clinical pathologist and his corps of technicians. In carrying out work of this nature, literature must be consulted, experience and training must be called into action and good judgment must be exercised at all times. It is demanded that the physician's clinical diagnosis should be based upon thorough scientific observation resting upon a background of accurate laboratory data and a thorough knowledge of scientific medicine.

Realizing, therefore, that in many cases a portion of the data upon which the doctor depends for his diagnosis is furnished by the laboratory, it is vitally important to demand a most thorough training as well as conscientious work on the part of the laboratory technician. As Kolmer[1] and MacEachern[2] have recently pointed out, clinical pathologists and many physicians will admit that it is not an uncommon occurrence to find many so-called medical technicians scattered over the country, even in good laboratories, who exemplify lack of skill, scanty knowledge and gross inexperience. Such a condition of affairs should not exist. Indeed, they can not last for long if we judge the present trend of thought in our medical schools.

One reason for all this lies in the fact that the demand for well-trained laboratory technicians has increased at such a rapid rate that it has not been possible to fill the vacancies. Hence, it has seemed necessary to draw upon all types of available help. The laboratory technician is desired by physicians and surgeons in private practice, by groups of physicians, by large clinics, hospital laboratories, state and municipal institutions, private clinical laboratories and state and city boards of health.

The demand for this class of scientific help, being so wide, it is imperative that we give very serious

1 "Education as a cure for present-day evils in clinical pathology," *Journal of Laboratory and Clinical Medicine*, X, August, 1925, page 891.

2 "The rôle of the clinical pathologist in hospital efficiency," *Journal of Laboratory and Clinical Medicine*, X, August, 1925, page 898.

thought to some immediate means of correcting this condition. It is only fair to the community at large, the medical profession and the individual patient that the scientific group, commonly designated as laboratory technician, be organized upon a more definite and thorough plane.

Among the methods which have been followed in attempting to train medical technicians, individual training has been by far the most widely practiced. This has resulted in an entire absence of standardization of training. An individual who has had no high-school work and who has been located for a week or two in some laboratory may be rated as a medical technician. On the other hand, an equally poor worker may be found who possesses a bachelor's degree. Grant and Wilson[3] state that within a year they had occasion to employ at least thirty technicians, all of whom had had various opportunities for experience and training. Some had bachelor's degrees, some had M.D. degrees, but not two per cent. of this number, according to the authors, could do efficient work. This is the usual experience of the majority of laboratory directors, and the condition will not improve until proper courses of study are provided for those who desire to take up medical technology and laboratory medicine.

It is suggested, therefore, that educational institutions should give serious thought to provision for the adequate preparation of those who desire to become trained laboratory workers. The bachelor's degree in general science does not suffice, even though the course includes chemistry, physics, biology, bacteriology and other sciences directly concerned with laboratory medicine. Such courses, together with certain cultural courses, offer the proper background but do not furnish the technical training which is necessary. The work which medical technologists pursue is at least as exacting and as highly professional in nature as that of the registered pharmacist or the registered nurse. The medical technician needs a strictly professional course, involving not only knowledge of the subjects related to the work, but also a clear viewpoint of medical technology as a profession. The student should secure a broad foundation, learn well the many different methods of technique, become proficient in scrutinizing newer developments, understand the interpretation of laboratory findings and learn to appreciate the problems of the clinician. Adequate preparation for this work involves strictly professional scientific training.

At the last meeting of the American Society of Clinical Pathologists a course of training for medical technicians was submitted by the writer. It was stated that the ideal course for medical technicians should consist of four years of study leading to the degree of B.S. in medical technology. Experience has shown that such a course can not be secured advantageously by selecting subjects here and there from different departments of the university or medical school. This course should be strictly technical, in which a large portion of the work is that specifically involved in medical technology. The course which was submitted could be undertaken without difficulty at any well-organized educational institution. Thereby a distinct service to the medical profession and to humanity would be performed. It was suggested that in undertaking such a project the initial step should be the institution of a vocational course. Such a course was first suggested in a paper read in 1922[4] and was applied by the writer in a practical manner for a period of three years.

In the beginning, this course might consist of one year, thirty-six weeks of didactic training followed by sixteen weeks of apprenticeship or practical training in an accredited hospital or public health laboratory. Such a course might be arranged as follows:

Subject[5]	Lecture hours	Laboratory hours	Laboratory periods (4 hours)
Clinical bacteriology	48	136	34
Clinical analytical methods	48	120	30
Hematology	30	120	30
Serology and immunology	34	148	37
Blood chemistry	20	40	10
Urinalysis	30	80	20
Parasitology	15	8	2
Tissue technique	5	40	10
Functional and sensitization tests	3	28	7
Anatomy and physiology	40	.....	.....
Medical terminology	40	.....	.....
Interpretation of findings	10	.....	.....
Autopsy demonstrations	10	.....	.....
Special lectures	27	.....	.....
Total	360	720	180
Apprenticeship (16 weeks, 8 hours per day)		704	
Total		1,424	

By the beginning of the second year the course of

[3] *Journal of Laboratory and Clinical Medicine*, June, 1922, page 562.

[4] King, "The Training of the Laboratory Technician," *Minnesota Medicine*, April, 1923, page 233.

[5] Space does not permit description of the subjects. It may be assumed, however, that all routine laboratory diagnostic procedures are included under the various subjects listed. For instance, the complete examination of spinal fluid is included under "Clinical analytical methods," "Serology," "Hematology" and "Special lectures."

instruction for vocational students should be increased to full two years, consisting of two periods of thirty-six weeks of didactic training and two periods of sixteen weeks each of apprenticeship or practical training in an accredited hospital or public health laboratory. The subjects offered in such a course and suggested balancing of subjects might be as follows:

Subject	Lecture hours	Laboratory hours	Laboratory periods
Clinical bacteriology	72	200	50
Clinical analytical methods	72	200	50
Hematology	48	180	45
Serology and immunology	60	220	55
Blood chemistry	32	80	20
Urinalysis	32	88	22
Parasitology	20	20	5
Tissue technique	18	80	20
Functional tests	10	20	5
Anatomy and physiology	72	8	2
Sensitization tests	6	4	1
Roentgen ray	120	240	60
Basal metabolism	26	100	25
Medical terminology	72	.....	.....
Interpretation of findings	10	.....	.....
Autopsy demonstrations	10	.....	.....
Special lectures	40	.....	.....
Total	720	1,440	360
Apprenticeship (32 weeks, 8 hours per day)		1,408	
Total		2,848	

At the beginning of the project, provision should be made for a course leading to the degree of B.S. in medical technology. It should consist of the two-year technical course preceded by two years of college work. The college work should consist of the accepted pre-medic courses, of sixty semester credits including: English, six credits; chemistry, thirteen credits; physics, eight credits; biology, six credits; and French or German, six credits. Subjects suggested or advised are Latin, English, mathematics, psychology, sociology, physiology, comparative anatomy and drawing.

Every leading medical institution maintaining extensive laboratory facilities is besieged by those who desire to secure training in medical technology, but at the present time those who desire to enter this line of work seek almost in vain for any recognized courses of training. Hundreds of students drop out of our universities annually, not so much because of failure, but rather because of lack of objective.

It would seem, therefore, that present conditions warrant and demand that well-recognized educational institutions take the initial step toward carrying out a project of this nature. Surely, a distinct opportunity is presented.

WALTER E. KING

DETROIT, MICHIGAN

SCIENTIFIC EVENTS

PRESENTATION OF THE ROYAL SOCIETY MEDALS

As already noted in SCIENCE, the Royal Society medals were presented at the anniversary meeting on November 30, by the retiring president, Sir Charles Sherrington. The following citations, in addition to that with the Copley medal to Professor Einstein (SCIENCE, January 1), were made with the award of the medals:

A ROYAL MEDAL: PROFESSOR WILLIAM HENRY PERKIN

The science of organic chemistry owes a debt to Professor Perkin, as instanced in recent years by his monograph on cryptopine and protopine, a record of chemical research rarely equalled in experimental skill and precise reasoning. He has revealed the constitutions of the alkaloids harmine and harmaline; he is nearing the solution of the structures of strychnine and brucine, two alkaloids which have hitherto resisted all attempts to determine their structural formulae. His work on berberine has left few questions unanswered concerning the constitution of this important substance. He has developed new methods of attack on the chemistry of these natural products, and has faced many problems in structural organic chemistry. He succeeded, during a period of twenty years at the University of Manchester, in building up there a notable school of chemical research. During the past twelve years, in the University of Oxford, he has again organized and developed a similar research school.

A ROYAL MEDAL: PROFESSOR ALBERT CHARLES SEWARD

Professor Seward's work has been conspicuous on account of the way in which he has extended and reduced to order our knowledge of the paleobotany of Gondwanaland, especially in India, South and Central Africa, Antarctica and the Falkland Islands. The lower stages of the Gondwana system are characterized by evidences of a glacial climate; and in order more completely to understand the conditions of life that existed, Professor Seward has visited Greenland and otherwise paid special attention to the effect of climate and light in explaining the rise and luxuriance of the Glossopteris flora in the Southern Hemisphere. In addition to its direct stratigraphical value to geologists, his work has added greatly to our knowledge of plant migration, and especially of the way in which the Glossopteris flora invaded the Northern Hemisphere previously occupied by the groups familiar to us by our Coal Measure plants.

THE DAVY MEDAL: SIR JAMES IRVINE

The constitution of the simpler sugars (monosaccharoses) was based on a sure foundation by the classical