members of their staffs, with as extensive and exact a knowledge of physiology as is feasible, and who will continually, by precept and by practice, impress on students their conviction that a complete diagnosis and one which will best aid them correctly to treat a patient, includes a recognition and understanding of the physiology of the case, i. e., of the extent and fashion in which the disease has resulted in perversion of function.

CORRELATION OF MEDICINE AND BACTERIOLOGY*

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In the latter eighties, bacteriology was just emerging into a distinct teaching entity in the medical colleges of America. While something like a score of bacterial agents had been accepted by the scientific world as the specific causes of important infections, the lay press and a considerable portion of the profession received each new discovery with incredulous levity and sometimes with open ridicule. "The germ theory" was then discussed with amazing ignorance and intolerance.

During the period from 1880 to 1890 it is interesting to record the large number of microorganisms successfully isolated by research workers and established as the conclusive, if not the sole, etiological factor of our most prevalent and important diseases. The following may be mentioned: *B. typhosus* in 1880; the streptococcus in 1881; the *B. tuberculosis* and the *B. Friedlander* in 1882; the *B. diphtheriae* by Klebs in 1883; the *B. diphtheriae* by Loeffler in 1884; the *B. cholerae* and the diplococcus pneumoniae in 1884; the *B. tetani* in 1885; and the diplococcus intracellularis meningitidis in 1887.

Neisser had reported the gonococcus as the cause of specific urethritis in the year preceding this decade.

While these organisms, among others, were referred to in the medical lectures

and demonstrations in class rooms during the period, only four or five were emphasized in the bacteriological course. The writer now recalls but three that were thoroughly taught to students in their staining characteristics for daily use. These were: (a) the tubercle bacillus, announced a few years before by Koch and stained by the Ziel-Nielson method; (b) the pneumococcus of Frankel, which disclosed to the astonished eyes of the students a capsule of different staining reaction; and (c) the gonococcus of Neisser, special stress being laid upon its biscuit shape and the intracellular location in conjugal or mass association.

The *B. typhosus* and *B. diphtheriae* required cultivation for certain recognition and were thus beyond the comprehension of ordinary students of medicine.

While since then the science has rapidly developed and added one triumph after another to the certainty of the etiology and pathogenesis of disease, the actual victories in prevention and cure have not materialized to the same degree.

A stupendous sensation was produced by the announcement of Koch's tuberculin as a curative treatment and disappointment was felt throughout the civilized world when it failed to meet expectations. Numerous other hopes suffered disillusionment in the same way. Recent advances, however, in immunology again serve to stimulate faith and further endeavor.

THE TEACHING

The differentiation of curricula and special courses of instruction in our medical educational institutions confessedly tend to a broadening of our knowledge, but do not increase our comprehension of medicine as a unit. Too often in actual experience it has provoked a tendency to go on splitting up general subjects into innumerable special subdivisions, favorable to the development of highly trained investigators and highly specialized teaching along advanced lines; but it is quite doubtful if a proper perspective and proportion have been maintained in undergraduate instruction. In other words, the swing of the pendulum from the meager instruction afforded students in the period above men-

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tioned to the present amazing amount of information literally poured into them has been too extensive. Students and teachers both have become burdened by this continual piling of Pelion on Ossa. This appears to be true of all departments and may in part explain the necessity for this symposium.

Is it not probable that these conditions have existed in histology, in pathology, in bacteriology and perhaps to a less extent in physiology and biological chemistry and pharmacology? Much has been said in recent years about the fundamental and clinical subjects and sharp lines of cleavage have sometimes been drawn, with unnecessary heat, by deans and other college authorities. Has not this differentiation gone too far? Is there any longer any necessity for such separation and absence of complete integration in the work of producing a trained physician? Why should bacteriology, dealing as it does in the exclusive causation of disease and remedies with which we are trained to combat it, be isolated and to a certain extent insulated from clinical medicine? Is it not one of the most important and necessary parts of clinical investigation? Why, then, is bacteriology not essentially clinical and in medicine why should not its association be of the closest possible character?

MEDICAL COLLEGE AND HOSPITAL

The separation of medical college and hospital in geography and in management and the inevitable elaboration and duplication of departments and the unsatisfactory liaison between them which is often present have been productive of unnecessary and harmful duplication of teaching and growing confusion among students.

If there be only three great divisions of medicine, viz: medicine, surgery and obstetrics, why not regard them more as a unit and less as separate entities and cease to encourage divorce between these three great fundamentals and really subordinate and dependent subjects? Instead, let them be more closely correlated and coordinated.

Not presuming to speak as a bacteriologist and avowedly not suggesting the content or the character of bacteriological courses, but as a teacher of medicine, en-

deavoring to secure the best collaboration between medicine and bacteriology, the writer suggests that bacteriology must come back to medicine. There is no sound reason why it should be arbitrarily classed as a fundamental science and in any way separated from the three active subjects of surgery, medicine and obstetrics. For much too long a time have we been obsessed with the idea of the medical college in medical education as being substantially the principal, if not the sole factor in the important work of medical education. As a matter of fact and of practice, the hospital where men are trained to recognize and treat disease must be recognized as the highest expression and culmination of medical teaching and training.

The time has passed when the best teaching and training can be obtained in colleges and hospitals under different management and located in different portions of the city, carrying on independent and wholly unrelated activities in the same fields.

The writer believes in the medical college, but he believes more in the hospital as the proper place to make doctors of medicine. He is confident that the medical colleges of the future must own and operate their own hospitals and so interweave the energies and activities of these two educational agencies that much greater efficiency will result, and considerable decrease in the burden, now growing intolerable to teacher and to student.

The brains of students must no longer be crammed with heterogeneous assortments of information from separated departments of bacteriology and medicine; and the same thing is equally true of pathology and other subjects. They must be correlated in such a way that a clear and continuous picture of morbid phenomena and their relation to microorganic invasions may result from the combined and not the separated activities of two interdependent departments.

Teaching hospitals should have their laboratories entirely under the direction and control and operation of the heads of college departments, and should constitute a clinical staff in the hospital just as other

clinical staffs are constituted. In this way the teaching function of college and hospital can be harmonized and coordinated, and daily contact assured between the directing heads of investigation and research in hospital wards and laboratories.

Different groups of workers in related subjects will find helpful and correctional collaboration in this association. Bacteriology lends itself peculiarly to such close association and its teachers should not regard themselves as anything but clinical teachers and investigators.

In the primary work the teachers of clinical medicine should be as nearly fundamental as possible. They must be full-time and must be prepared by training and experience in ward laboratories to detect all the ordinary relations of microorganisms to disease; to secure, culture, stain and exhibit the common bacterial and parasitic agents of disease in their daily class, while the unusual and difficult problems must be referred to advanced workers in the general laboratory or to special research laboratories.

By some such close cooperation and responsibility, pathology in the same way would enhance its usefulness to medicine, surgery and obstetrics and the whole plan of study in these subjects could be unified and enlarged in usefulness and attract large numbers of enthusiastic and ambitious men who would be inspired by this larger opportunity to perfect themselves in the real science of medicine.

Separate, disjointed and frequently conflicting courses could thus be largely eliminated, the number of incompetent or un-

trained so-called research workers could be reduced, an integrated and efficient organization maintained at our teaching hospitals for the study of every clinical problem and a teaching efficiency thus secured that is impossible under present methods.

If all clinical teachers were more fundamental and all fundamental teachers decidedly more clinical, much less and much better teaching could and would be done.

The writer has no disposition to underestimate or belittle the great work done in many of our medical colleges not fortunately associated with hospitals. But nevertheless he feels that neither states nor communities, nor well informed citizens—and he fears to this group must be added some medical college authorities—have yet grasped the compelling and even overwhelming importance of the owned, the well equipped and the properly operated hospital as the center and not the adjunct or accessory of the teaching institution.

When this fact is generally recognized and known and read of all men: that doctors can be trained only at the bedside and that the culmination and success of all teaching must be demonstrated at the bedside and that a great altruistic purpose and plan animate all this labor and expenditure, then will we be able to secure ample financial support and great teaching hospitals will arise throughout the South.

In such institutions, bacteriology, integrated and correlated with the three great fundamentals, medicine, surgery and obstetrics, may yet fulfill its original hope of demonstrating both the cause and ultimate cure of many diseases.