

A COURSE OF CORRELATIONAL ANATOMY

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During the first year and a half of study the medical student acquires a knowledge of certain aspects of the structure and function of the human body. Since these different aspects are studied in separate courses the tendency is for the student to acquire certain disjointed groups of facts which neither his ability nor the time at his disposal permit him unassisted to bring together. Such a mass of fragmentary knowledge falls far short of what the student is supposed to have acquired, namely, a reasonably good understanding of the structure and activities of the entire organism. It is true that in every good course the instructor brings the subject matter of his speciality into relation with that of other courses; this correlation in the separate courses is indispensable and serves as a foundation for further efforts in this direction, efforts made by the student alone, or preferably under suitable supervision. But in attempting in each course to correlate the subject matter with that of other courses the results obtained are inadequate, not only on account of the lack of sufficient time but especially because the knowledge of the student is as yet too limited. It therefore appears advisable, after the various courses involved have been completed, to renew in a special course the effort to help the student bring together certain important facts already learned piecemeal. This article deals with such a course introduced this year by the Department of Anatomy of the University of Cincinnati.

The course in correlational anatomy is the logical result of the method of instruction in the Department of Anatomy. The head of the department, Professor Knowler, has in all the work of the department constantly insisted upon the correlation of

structure and function. And accordingly those portions of the body which are of the greatest functional importance have in the courses of the department received the greatest attention. A further advance consists in the increasing correlation between the different courses of the department (gross anatomy, histology, neurology and regional anatomy). The work in gross anatomy and in histology is so related that the student studies the gross and microscopic anatomy of each organ simultaneously, as far as this is practicable; this is only one instance of the correlation of work within the department. In the second year the association of gross anatomy, histology, physiology, neurology and regional anatomy is much closer. This intimate relation between the separate courses within the department is maintained by the close association of the various members of the staff so that each member is familiar with the nature and progress of each course; this knowledge is attained not only by means of frequent conferences but also through actual experience in assisting from time to time in each course. On the other hand, such a correlation of courses within each department makes additional demands upon the staff, demands which are difficult to meet unless the department be supported in a more liberal manner than is customary. It is manifestly unreasonable to blame the student for regarding different courses as unrelated when the instructors themselves behave as if this were true, and it is also unreasonable to expect instructors to establish such a correlation if they be already overworked. It is upon this intimate association of the different courses within the department that the course in correlational anatomy is founded. While the author has designed this course and has conducted it alone, he does not claim the entire credit of originating it, since it is the result of the whole attitude which Professor Knowler has impressed upon the department.

In addition to correlating its own courses and introducing a considerable amount of general biology, embryology and physiology, the Department of Anatomy has repeatedly requested other departments to send students back for supplementary study whenever these departments demand special anatomical knowl-

edge which the student cannot and should not obtain during his regular courses in anatomy. Such supplementary work has proved of great advantage to the students, since it is undertaken by trained men who realize the need of the knowledge which they return to acquire, and they gladly accept the opportunity. The advantages which an anatomical laboratory possesses as against didactic teaching are evident. This arrangement is impossible if the student's time be completely occupied by required work; in addition it makes demands upon the time of the anatomical staff, and the question arises as to whether the institution is willing to pay for such advantages to the students or whether it will take the course of least resistance and of least expense.

The course in correlational anatomy is given at the beginning of the second semester of the second year. Before it begins the student has finished dissecting the body and has completed, beside other courses, those in histology, physiology and neurology; in addition, he has studied the various aspects of anatomy from a physiological standpoint. During this year and a half the student has amassed a large number of facts and has made some progress in bringing isolated facts together; moreover, he has attained to a considerable degree the ability to recognize essentials and to work problems out for himself. The course in correlational anatomy lasts eight weeks, and during the remainder of the second semester the student is at liberty to elect such work in the department as he may desire; he may take the course in regional anatomy, or he may spend the time reviewing the essentials of the body, working out for himself (with the assistance of the staff) certain important mechanisms not given in the course in correlational anatomy. This course is accordingly preceded by the study of the structure and function of the entire body, and is followed by a period during which the student has the opportunity of bringing together on his own initiative further disconnected groups of facts; in this manner the student is encouraged to form the habit of study outlined in the course just completed so that he may thus acquire a real knowledge of the human body. This result is aided by the fact that at the end of the second year he

must pass an examination which includes all the subjects studied in the department and in which a fair but real knowledge of the essentials of the body is demanded.

At this point the author would like to enter a protest against the unfortunate tendency in some institutions to complete the work in anatomy during the first year. The student can undoubtedly finish the courses in histology and neurology and dissect the entire body in one year, but even if the time should be sufficient to permit the student to finish his task without undue haste the result would still be unsatisfactory. For a real knowledge of anatomy cannot be acquired all at once, but only when the study is prolonged to such an extent that the student has the repeated opportunity of thinking of the problems which the dissection of the body merely makes possible to study. Moreover, the student's knowledge of physiology and his capacity for independent constructive thinking is too limited to permit him to obtain an adequate knowledge of the body during the first year. Finally, this excessive concentration and hurry encourages the student to regard each of the anatomical courses (and each part of each course) as a separate task to be gotten out of the way in a definite length of time, and not as aspects of one great problem to be correlated with one another and with those aspects learned in other departments.

The course in correlational anatomy consists in the study of certain mechanisms of the body. New matter is introduced only when necessary, while on the other hand, unessential details are eliminated. The course therefore attempts to help the student rescue from the mass of details the really vital facts concerned in each mechanism, and by correlation of these facts to fix them firmly in his memory. Especial emphasis is placed upon the relation of the nervous system to the rest of the organism, and the various reflexes involved in the activities of each mechanism are studied thoroughly, the path of the impulse being followed throughout its entire extent. The course differs from one in physiology in that the anatomical structures upon which depend the activities of any mechanism become to the student realities; as far as possible the actual anatomical structures are

studied in the gross and in sections, and in the nervous system the actual location of nervous centers and the course of fiber tracts are reviewed not only in diagrams but also in the specimens themselves.

For the most part the student is expected to work out, with the aid of specimens and books, the various problems for himself. Since all anatomical and physiological facts involved have been previously studied it is possible to assign at each exercise a large field to be covered, and to expect the student, with a certain amount of guidance, to select the most vital points and to ignore nonessentials; the value of this training is evident. While lectures are necessary they are mostly informal, assuming the character of conferences, while at the beginning of each exercise the main results of the work of the preceding day are briefly summarized. Finally, the student is expected to hand in at the end of the course a complete account of the mechanisms studied, and to describe certain activities which have not been studied but with whose anatomical basis he is supposed to be familiar.

In selecting topics for study in a course in correlational anatomy the following points should be kept in mind:

1. The topics should be of importance.
2. They should necessitate the study of structures which form part of many other functional groups, and which thus involve a knowledge of large portions of the body.
3. They should involve functions which have a demonstrable anatomical basis.

The respiratory system meets these requirements in a most satisfactory manner. It is of great importance; it demands the study of the entire thorax, a part of the head and neck, the spinal cord and spinal nerves, the vagus and trigeminal nerves, the sympathetic system, and the main sensory and motor tracts and centers of the brain; and finally, the correlation between structure and function can be shown in a most satisfactory manner. The alimentary system also is satisfactory in most respects. Although the correlation of structure and function is not easily shown in the portion below the diaphragm, in the portion above the diaphragm this can be shown very successfully.

The study of the anatomical structures of the alimentary tract involves many important relations in the head, neck, thorax and abdomen. The relation of the nervous system to swallowing and to mastication (taken in a very broad sense and including prehension and other acts preparatory to mastication proper) involves many reflexes in which practically the whole nervous system is utilized; of course the regulation of secretion and of blood supply should be included. Among other mechanisms which suggest themselves as suitable for study may be mentioned the maintenance of the erect position (including the part played by the nervous system in receiving, correlating and sending out impulses), the heart beat, the development and mechanism of speech together with the different forms of aphasia.

The course in correlational anatomy this year was limited to sixteen periods of three hours each; next year it will be extended. An outline of the course follows:

I. Respiration

- 1 February 19 The thoracic wall and its movements
- 2 February 20 Relations of the thoracic contents. Diaphragm
- 3 February 26 Gross anatomy of nose, pharynx, larynx and trachea
- 4 February 27 Histology of respiratory system
- 5 March 5 Mechanics of respiration
- 6 March 6 Nerves and nervous centers
- 7 March 12 Nervous reflexes
- 8 March 13 Summary

II. Mechanisms of the alimentary system

A. Mastication

- 9 March 19 Gross and microscopic anatomy of the mouth
- 10 March 20 Nerves and nervous centers
- 11 March 26 Mechanism of mastication

B. Deglutition

- 12 March 27 Gross and microscopic anatomy of tongue, pharynx and esophagus
- 13 April 2 Mechanism of deglutition

C. Movements of stomach and intestines

- 14 April 3 Gross and microscopic anatomy of stomach and intestines
- 15 April 16 Movements and nervous mechanism of stomach and intestines
- 16 April 17 Lecture
 - (a) Sympathetic system
 - (b) Innervation of viscera and of overlying muscles and skin
 - (c) Theory of emotions

In order to make such a course a success the instructor should carefully avoid each of two extremes. In the first place, the course may degenerate into a feeble attempt at a review in physiology in which the student, neglecting to study in actual preparations the anatomical structures upon which the various functions depend, spends his time over a book or in theorizing. In the second place, the student may become lost in a maze of anatomical details, losing sight of really vital anatomical facts and failing to bring these into relation with the activities which depend upon them. The instructor should possess above all a thorough knowledge of the anatomy and physiology of the nervous system; in addition he should be familiar with the gross and microscopic anatomy of the entire body and with general physiology, while a knowledge of pathology, clinical neurology, psychology and psychiatry will be of much value. With such a background of knowledge he may be expected to guide the student in forming a real conception of the various mechanisms of the human body.