

**APPLIED PHYSIOLOGY: A
MANUAL SHOWING
FUNCTIONS OF THE VARIOUS
ORGANS IN DISEASE**

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Applied Physiology: A Manual Showing Functions of the Various Organs in Disease by
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FREDERICK A. RHODES

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APPLIED PHYSIOLOGY.

A MANUAL SHOWING FUNCTIONS OF
THE VARIOUS ORGANS IN DISEASE.

BY

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PREFACE.

I have attempted in this volume to present to the student of medicine, whether in school or in practice, an explanation of the most important and frequent symptoms of diseases met with. Much of the work is given in outline, as it is believed it will be more acceptable to the eye and hence more easily remembered. As far as possible a general introduction to each subject, mentioning some of the important physiological laws and their consideration from the standpoint of the practicing physician, is given.

The need of such a work as this has long been recognized by the profession. There is no American text on this subject so far as I can learn. Some European writers treat the subject in a general way; much of their excellent books being taken up in discussion of various theories of disease and symptoms. Prof. Winfield S. Hall, Northwestern University, Chicago, has written several excellent articles on the importance of such a book. He has embodied his ideas in his text-book on physiology, adding to each chapter a treatise of the various organs when their function is altered. The title, "Applied Physiology," was first suggested in an article by Dr. J. Madison Taylor in the *Medical News*, May 13, 1905.

The subject of Applied Physiology was made a part of the regular course in the Medical Department of the Western University of Pennsylvania three years ago; the reception given it by the faculty and the members of the pro-

65739

fession has been better than could have been anticipated. It teaches the student to understand why many a symptom exists; he does not take everything for granted and is the better able to use a drug when indicated. He will the more frequently endeavor to remove the cause of the condition rather than treat the symptom itself.

It seems profitable to add here some abstracts from a lecture on the blood delivered before the College of France in 1837, by Magendie. While he was an iconoclast, yet the statements contain some terse remarks which may stimulate thought at the present time.

"Are you not in truth convinced—you who have many a time ascertained the fact for yourselves—that the lesions found at our autopsies are frequently produced after death, and that, consequently, the plan hitherto followed in such inquiries is fallacious, and can only lead to vague information and error? * * * Devote yourself, on the contrary, to experimental study, see, touch for yourselves, take no one's word for anything, mistrust yourselves, mistrust me and you will manage to steer clear of the whimsical conceptions brought forward to explain, some way or other, the frequently inexplicable phenomena of organization. * * * But do you imagine that the nurse, provided she be habituated to her calling, does not know all that quite as well as he? Will he be able to tell me a whit more correctly than she why the case of variola before him will prove confluent or benign? Or why the skin, suddenly assuming a purple color, the sufferer is carried off in a few hours? * * * Be persuaded of this, gentlemen, that the truly scientific

mode of studying medicine lies almost wholly in investigating the manner in which morbid changes are produced. * * * Well, they ascribe the malady to these lesions, but they are wrong. These are consequences of the disease, the anatomical proofs that it has existed. But they are not its starting point, and it is manifest that with our present knowledge and with the present mode of studying pathology that starting point will never be discovered. * * * For my part, I declare loudly that I look on these ideas about vitality and the rest of it as nothing more than a cloak for ignorance and laziness. * * * The prevalent mode of treating disease harmonizes admirably with, and is quite as senseless as, this method of reasoning in pathology. The practitioner mixes, combines and jumbles together vegetable, mineral and animal substances; administers them right or wrong, without considering for a moment the cause of the disease, and without a single idea on the why and wherefore of his conduct. You may prove to him, as you will, that this or that substance is insignificant, useless, or even hurtful; little will he regard your expostulation. And why should he, when by readiness in prescribing a monstrous farrago of drugs, he knows he shall acquire the reputation of being profoundly versed in *materia medica*, of being a man of immense resources, etc. Such, gentlemen, has ever been empiricism."

In the effort to make this work as practical as possible I have gleaned thoroughly from the various writers on physiology, pathology, medicine, diagnosis, specialties, as well as the current medical literature.

I have attempted to give credit where credit is due,

and I append a list of the books from which I have taken much of the material. It has been found impossible to state from which book the various abstracts have been taken in many instances, as they were not made for the purpose for which I now use them. I am very greatly indebted to Prof. Hall of Chicago for his advice at different times, to Dr. C. H. Henninger for several pages on symptoms in nervous diseases and to Dr. C. B. McAbey, assistant in physiology, for valuable assistance.

Should the efforts spent in the production and in the study of this book lead to a better knowledge of disease, even though it be little, I shall be well repaid.

FREDERICK A. RHODES.

November 1, 1907.

CHAPTER I.

CIRCULATION.

The circulatory apparatus consists of the heart, blood, blood vessels and nerves, and is for the purpose of carrying blood to and from the various organs and tissues. In order that the functions of the body may be properly carried out it is necessary that not only the circulatory apparatus itself, but also the tissues to be supplied, be in normal condition.

The blood may be normal and contain all the substances in proper proportion for the supply of the tissues; the heart, vessels and nerves may be in perfect condition, yet if for any reason any tissue cannot appropriate the nourishment nor give up its waste products, harmony is lost, and the whole organism suffers to a certain degree in a short time. Theoretically and practically it is entirely wrong to state that the circulatory apparatus can long be normal, and the kidneys, liver, spleen, etc., be in a diseased condition. Chemically, it is often impossible to detect these secondary changes until after the diseased condition has existed for some time. In a like manner we cannot conceive of any important blood changes, either in alteration of the number of the corpuscles, amount of contained haemoglobin, or nutritive substances which are contained in the plasma, without the heart and tissues suffering in consequence of such changes.

These few remarks apply to any and all of the tissues

in the body, although it may appear that certain parts, as a limb, the spleen, ovaries, etc., may be removed without any apparent changes in the remaining tissues or alteration in the normal function in general. In those cases where no changes are noticed compensation is so well provided for by nature that the body may suffer but little. Thus, when a kidney is removed, the remaining one will hypertrophy and apparently do the work previously done by the two. But the loss of certain parts by disease or removal is not always followed by such negative results. The relations of one part of the body to the other parts are seen in what may appear to be a slightly diseased condition, when in reality the metabolism of the entire organism may be altered. Recent advances in our knowledge of internal secretions have assisted us much in the study of many conditions.

It will be important in our studying the altered action of the various parts of the body to bear in mind the close relation existing between the different organs, the tissues and the blood, i. e., to be ever mindful of the normal physiologic action and the tissue correlation.

THE HEART.

The heart is so situated and constructed that it will furnish the most kinetic energy with the least possible muscular exertion. Any alteration in the output of the heart requires either an increased activity, by a greater number of beats, or an increase in the size of the organ to perform the normal amount of work.

It is true that at times this relative amount of work