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Baum Henry Kipling Doyle Henry Willis
Leslie Dumas Flaubert Nietzsche Nietzsche
Stockton Turgenev Balzac Vatsyayana Crane
Burroughs Verne Verne
Curtis Tocqueville Gogol Gogol Busch
Homer Tolstoy Tolstoy Gogol Busch
Darwin Thoreau Thoreau Twain Plato Scott
Potter Freud Zola Lawrence Lawrence Dickens Plato Scott
Kant Jowett Stevenson Dickens Plato Scott
Andersen Andersen Cervantes Burton Hesse Harte
London Descartes Wells Wells
Poe Aristotle Wells Wells
Hale James Hastings Hastings Cooke
Bunner Shakespeare Shakespeare Cooke
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Doré Chekhov Chekhov da Shakespeare Irving
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Wodehouse Wodehouse Wodehouse
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**A Treatise on Anatomy,
Physiology, and Hygiene (Revised
Edition)**

Calvin Cutter

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A
TREATISE
ON
ANATOMY, PHYSIOLOGY,
AND HYGIENE

DESIGNED FOR
COLLEGES, ACADEMIES, AND FAMIL-
LIES.

BY CALVIN CUTTER, M.D.

WITH ONE HUNDRED AND FIFTY ENGRAVINGS.

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PREFACE.

Agesilaus, king of Sparta, when asked what things boys should learn, replied, "Those which they will *practise* when they become men." As health requires the observance of the laws inherent to the different organs of the human system, so not only boys, but girls, should acquire a knowledge of the laws of their organization. If sound morality depends upon the inculcation of correct principles in youth, equally so does a sound physical system depend on a correct physical education during the same period of life. If the teacher and parents who are deficient in moral feelings and sentiments, are unfit to communicate to children and youth those high moral principles demanded by the nature of man, so are they equally incompetent directors of the physical training of the youthful system, if ignorant of the organic laws and the physiological conditions upon which health and disease depend.

For these reasons, the study of the structure of the human system, and the laws of the different organs, are subjects of interest to all, — the young and the old, the learned and the unlearned, the rich and the poor. Every scholar, and particularly every young miss, after acquiring a knowledge of the primary branches, — as spelling, reading, writing, and arithmetic, — should learn the structure of the human system, and the conditions upon which health and disease depend, as this knowledge will be required in *practice* in after life.

"It is somewhat unaccountable," says Dr. Dick, "and not a little inconsistent, that while we direct the young to look abroad over the surface of the earth, and survey its mountains, rivers, seas, and continents, and guide their views to the regions of the firmament, where they may contemplate the moons of Jupiter, the rings of Saturn, and thousands of luminaries placed at immeasurable distances, ... that we should never teach them *to look into themselves*; to consider their own corporeal structures, the numerous parts of which they are composed, the admirable functions they perform, the wisdom and goodness displayed in their mechanism, and the lessons of practical instruction which may be derived from such contemplations."

Again he says, "One great practical end which should always be kept in view in the study of physiology, is the invigoration and improvement of the corporeal powers and functions, the preservation of health, and the prevention of disease."

The design of the following pages is, to diffuse in the community, especially among the youth, a knowledge of Human Anatomy, Physiology, and Hygiene. To make the work clear and practical, the following method has been adopted:—

1st. The structure of the different organs of the system has been described in a clear and concise manner. To render this description more intelligible, one hundred and fifty engravings have been introduced, to show the situation of the various organs. Hence the work may be regarded as an elementary treatise on anatomy.

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2d. The functions, or uses of the several parts have been briefly and plainly detailed; making a primary treatise on human physiology.

3d. To make a knowledge of the structure and functions of the different organs *practical*, the laws of the several parts, and the conditions on which health depends, have been clearly and succinctly explained. Hence it may be called a treatise on the principles of hygiene, or health.

To render this department more complete, there has been added the appropriate treatment for burns, wounds, hemorrhage from divided arteries, the management of persons asphyxiated from drowning, carbonic acid, or strangling, directions for nurses, watchers, and the removal of disease, together with an Appendix, containing antidotes for poisons, so that persons may know what *should be done*, and what *should not be done*, until a surgeon or physician can be called.

In attempting to effect this in a brief elementary treatise designed for schools and families, it has not been deemed necessary to use vulgar phrases for the purpose of being understood. The appropriate scientific term should be applied to each organ. No more effort is required to learn the meaning of a *proper*, than an improper term. For example: a child will pronounce the word as readily, and obtain

as correct an idea, if you say *lungs*, as if you used the word *lights*. A little effort on the part of teachers and parents, would diminish the number of vulgar terms and phrases, and, consequently, improve the language of our country. To obviate all objections to the use of proper scientific terms, a Glossary has been appended to the work.

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The author makes no pretensions to new discoveries in physiological science. In preparing the anatomical department, the able treatises of Wilson, Cruveilhier, and others have been freely consulted. In the physiological part, the splendid works of Carpenter, Dunglison, Liebig, and others have been perused. In the department of hygiene many valuable hints have been obtained from the meritorious works of Combe, Rivers, and others.

We are under obligations to R. D. Mussey, M. D., formerly Professor of Anatomy and Surgery, Dartmouth College, N. H., now Professor of Surgery in the Ohio Medical College; to J. E. M'Girr, A. M., M. D., Professor of Anatomy, Physiology, and Chemistry, St. Mary's University, Ill.; to E. Hitchcock, Jr., A. M., M. D., Teacher of Chemistry and Natural History, Williston Seminary, Mass.; to Rev. E. Hitchcock, D. D., President of Amherst College, Mass., who examined the revised edition of this work, and whose valuable suggestions rendered important aid in preparing the manuscript for the present stereotype edition.

We return our acknowledgments for the aid afforded by the Principals of the several Academies and Normal Schools who formed classes in their institutions, and examined the revised edition as their pupils progressed, thus giving the work the best possible test trial, namely, the recitation-room.

To the examination of an intelligent public, the work is respectfully submitted by

CALVIN CUTTER.

Warren, Mass., *Sept. 1, 1852.*

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TO TEACHERS AND PARENTS.

As the work is divided into chapters, the subjects of which are complete in themselves, the pupil may commence the study of the structure, use, and laws of the several parts of which the human system is composed, by selecting such chapters as fancy or utility may dictate, without reference to their present arrangement,—as well commence with the chapter on the digestive organs as on the bones.

The acquisition of a correct pronunciation of the technical words is of great importance, both in recitation and in conversation. In this work, the technical words interspersed with the text, have been divided into syllables, and the accented syllables designated. An ample Glossary of technical terms has also been appended to the work, to which reference should be made.

It is recommended that the subject be examined in the form of *topics*. The questions in *Italics* are designed for this method of recitation. The teacher may call on a pupil of the class to describe the anatomy of an organ from an anatomical outline plate; afterwards call upon another to give the physiology of the part, while a third may state the hygiene, after 10 which, the questions at the bottom of the page may be asked promiscuously, and thus the detailed knowledge of the subject possessed by the pupils will be tested.

At the close of the chapters upon the Hygiene of the several portions of the system, it is advised that the instructor give a lecture reviewing the anatomy, physiology, and hygiene, of the topic last considered. This may be followed by a general examination of the class upon the same subject. By this course a clear and definite knowledge of the mutual relation of the Anatomy, Physiology, and Hygiene, of different parts of the human body, will be presented.

We also suggest the utility of the pupils' giving analogous illustrations, examples, and observations, where these are interspersed in the different chapters, not only to induce inventive thought, but to discipline the mind.

To parents and others we beg leave to say, that about two thirds of the present work is devoted to a concise and practical description

of the uses of the important organs of the human body, and to show how such information may be usefully applied, both in the preservation of health, and the improvement of physical education. To this have been added directions for the treatment of those accidents which are daily occurring in the community, making it a treatise proper and profitable for the FAMILY LIBRARY, as well as the school-room.

ANATOMY, &c.

CHAPTER I.

GENERAL REMARKS.

1. Anatomy is the science which treats of the structure and relations of the different parts of animals and plants.

2. It is divided into *Vegetable* and *Animal* anatomy. The latter of these divisions is subdivided into *Human* anatomy, which considers, exclusively, human beings; and *Comparative* anatomy, which treats of the mechanism of the lower orders of animals.

3. Physiology treats of the functions, or uses of the organs of animals and plants. Another definition is, "the science of life."

4. This is also divided into *Vegetable* and *Animal* physiology, as it treats of the vegetable or animal kingdom; and into *Human* and *Comparative* physiology, as it describes the vital functions of man or the inferior animals.

5. Hygiene is the art or science of maintaining health, or a knowledge of those laws by which health may be preserved.

6. The kingdom of nature is divided into *organic* and *inorganic* bodies. Organic bodies possess organs, on whose 14 action depend their growth and perfection. This division includes animals and plants. Inorganic bodies are devoid of organs, or instruments of life. In this division are classed the earths, metals, and other minerals.

1. What is anatomy? 2. How is it divided? How is the latter division subdivided? 3. What is physiology? Give another definition. 4. How is physiology divided? Give a subdivision. 5. What is hygiene? 6. Define organic bodies.

7. In general, organic matter differs so materially from inorganic, that the one can readily be distinguished from the other. In the organic world, every individual of necessity springs from some *parent*,

or immediate producing agent; for while inorganic substances are formed by chemical laws alone, we see no case of an animal or plant coming into existence by accident or chance, or chemical operations.

8. Animals and plants are supported by means of nourishment, and die without it. They also increase in size by the addition of new particles of matter to all parts of their substances; while rocks and minerals grow only by additions to their surfaces.

9. "Organized bodies always present a combination of both solids and fluids;—of solids, differing in character and properties, arranged into organs, and these endowed with functional powers, and so associated as to form of the whole a single system;—and of fluids, contained in these organs, and holding such relation to the solids that the existence, nature, and properties of both mutually and necessarily depend on each other."

10. Another characteristic is, that organic substances have a certain order of parts. For example, plants possess organs to gain nourishment from the soil and atmosphere, and the power to give strength and increase to all their parts. And animals need not only a digesting and circulating apparatus, but organs for breathing, a nervous system, &c.

6. Define inorganic bodies. 7. What is said of the difference, in general, between organic and inorganic bodies? 8. What of the growth of organic and inorganic bodies? 9. What do organized bodies always present? 10. Give another characteristic of organized substances.

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11. *Individuality* is an important characteristic. For instance, a large rock may be broken into a number of smaller pieces, and yet every fragment will be rock; but if an organic substance be separated into two or more divisions, neither of them can be considered an individual. Closely associated with this is the power of *life*, or *vitali-*

ty, which is the most distinguishing characteristic of organic structure; since we find nothing similar to this in the inorganic creation.

12. *The distinction between plants and animals* is also of much importance. *Animals grow proportionally in all directions*, while plants grow upwards and downwards from a collet only. The *food* of animals is *organic*, while that of plants is *inorganic*; the latter feeding entirely upon the elements of the soil and atmosphere, while the former subsist upon the products of the animal and vegetable kingdoms. The size of the vegetable is in most cases limited only by the duration of existence, as a tree continues to put forth new branches during each period of its life, while the animal, at a certain time of life, attains the average size of its species.

13. One of the most important distinctions between animals and plants, is *the different effects of respiration*. Animals consume the oxygen of the atmosphere, and give off carbonic acid; while plants take up the carbonic acid, and restore to animals the oxygen, thus affording an admirable example of the principle of compensation in nature.

14. But the decisive distinctions between animals and plants are *sensation* and *voluntary motion*, the power of acquiring a knowledge of external objects through the senses, and the ability to move from place to place at will. These 16 are the characteristics which, in their fullest development in man, show intellect and reasoning powers, and thereby in a greater degree exhibit to us the wisdom and goodness of the Creator.

11. What is said of the individuality of organized and inorganic bodies? What is closely associated with this? 12. Give a distinction between animals and plants as regards growth. The food of animals and plants. What is said in respect to size? 13. What important distinction in the effects of respiration of animals and plants? 14. What are the decisive distinctions between animals and plants?

15. Disease, which consists in an unnatural condition of the bodily organs, is in most cases under the control of fixed laws, which we are capable of understanding and obeying. Nor do diseases come by chance; they are penalties for violating physical laws. If we carelessly cut or bruise our flesh, pain and soreness follow, to induce us to be more careful in the future; or, if we take improper food into the stomach, we are warned, perhaps immediately by a friendly pain, that we have violated an organic law.

16. Sometimes, however, the penalty does not directly follow the sin, and it requires great physiological knowledge to be able to trace the effect to its true cause. If we possess good constitutions, we are responsible for most of our sickness; and bad constitutions, or hereditary diseases, are but the results of the same great law,—the iniquities of the parents being visited on the children. In this view of the subject, how important is the study of physiology and hygiene! For how can we expect to obey laws which we do not understand?

15. What is said of disease? 16. Why is the study of physiology and hygiene important?

CHAPTER II.

STRUCTURE OF MAN,

17. In the structure of the human body, there is a union of fluids and solids. These are essentially the same, for the one is readily changed into the other. There is no fluid that does not contain solid matter in solution, and no solid matter that is destitute of fluid.

18. In different individuals, and at different periods of life the proportion of fluids and solids varies. In youth, the fluids are more abundant than in advanced life. For this reason, the limbs in childhood are soft and round, while in old age they assume a hard and wrinkled appearance.

19. The fluids not only contain the materials from which every part of the body is formed, but they are the medium for conveying the waste, decayed particles of matter from the system. They have various names, according to their nature and function; as, the blood, and the bile.

20. The solids are formed from the fluids, and consequently they are reduced, by chemical analysis, to the same ultimate elements. The particles of matter in solids are arranged variously; sometimes in *fi`bres*, (threads,) sometimes in *lam`i-næ*, (plates,) sometimes homogeneously, as in basement membranes. (Appendix A.)

21. The parts of the body are arranged into *Fi`bres*, *Fas-cic`u-li*, *Tis`sues*, *Or`gans*, *Ap-pa-ra`tus-es*, and *Sys`tems*.

17. What substances enter into the structure of the human body? Are they essentially the same? 18. What is said of these substances at different periods of life? 19. What offices do the fluids of the system perform? 20. What is said of the solids? How are the particles of matter arranged in solids? 21. Give an arrangement of the parts of the body.

22. A FIBRE is a thread of exceeding fineness. It is either cylindrical or flattened.

23. A FASCICULUS is the term applied to several fibres united. Its general characteristics are the same as fibres.

24. A TISSUE is a term applied to several different solids of the body.

25. An ORGAN is composed of tissues so arranged as to form an instrument designed for action. The action of an organ is called its *function*, or use.

Example. The liver is an organ, and the secretion of the bile from the blood is one of its functions. [1]

26. An APPARATUS is an assemblage of organs designed to produce certain results.

Example. The digestive apparatus consists of the teeth, stomach, liver, &c., all of which aid in the digestion of food.

Fig. 2.



Fig. 2. Represents a portion of broken muscular fibre of animal life, (magnified about seven hundred diameters.)

27. The term SYSTEM is applied to an assemblage of organs arranged according to some plan, or method; as the nervous system, the respiratory system.

22. Define a fibre. 23. Define a fasciculus. 24. Define a tissue. 25. Define an organ. What is the action of an organ called? Give examples. *Mention other examples.* 26. What is an apparatus? Give an example 27. How is the term system applied?

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28. A TISSUE is a simple form of organized animal substance. It is flexible, and formed of fibres interwoven in various ways; as, the cellular tissue.

29. However various all organs may appear in their structure and composition, it is now supposed that they can be reduced to a few tissues; as, the *Cel'lular*, *Os'se-ous*, *Mus'cu-lar*, *Mu'cus*, *Ner'vous*, &c. (Appendix B.)

30. The CELLULAR TISSUE, [2] now called the *areolar tissue*, consists of small fibres, or bands, interlaced in every direction, so as to form a net-work, with numerous interstices that communicate freely with each other. These interstices are filled, during life, with a fluid resembling the serum of blood. The use of the areolar tissue is to connect together organs and parts of organs, and to envelop, fix, and protect the vessels and nerves of organs.

Fig. 3.



Fig. 3. Arrangement of fibres of the cellular tissue magnified one hundred and thirty diameters.

28. What is a tissue? 29. What is said respecting the structure and composition of the various organs? Name the primary membranes. 30. Describe the cellular tissue. How are the cells imbedded in certain tissues? Give observation 1st, relative to the cellular tissue.

Observations. 1st. When this fluid becomes too great in quantity, in consequence of disease, the patient labors under general dropsy. The swelling of the feet when standing, and their return to a proper shape during the night, so often noticed in feeble persons, furnish a striking proof both of the 20 existence and peculiarity of this tissue, which allows the fluid to flow from cell to cell, until it settles in the lower extremities.

2d. The free communication between the cells is still more remarkable in regard to air. Sometimes, when an accidental opening has been made from the air-cells of the lungs into the contiguous cellular tissue, the air in respiration has penetrated every part until the whole body is so inflated as to occasion suffocation. Butchers often avail themselves of the knowledge of this fact, and inflate their meat to give it a fat appearance.

31. "Although this tissue enters into the composition of all organs, it never loses its own structure, nor participates in the functions of the organ of which it forms a part. Though present in the nerves, it does not share in their sensibility; and though it accompanies every muscle and every muscular fibre, it does not partake of the irritability which belongs to these organs."

32. Several varieties of tissue are formed from the cellular; as, the *Serous, Dermoid, Fibrous*, and several others.

33. The *SEROUS TISSUE* lines all the closed, or sac-like cavities of the body; as, the chest, joints, and abdomen. It not only lines these