What shall we teach?, or, Physiology in schools : being an attempt to advocate instruction in the laws of life as a branch of general education / by Edwin Lankester.

WHAT SHALL WE TEACH?

OR,

PHYSIOLOGY IN SCHOOLS:

BEING AN

ATTEMPT TO ADVOCATE INSTRUCTION IN THE LAWS OF LIFE AS A BRANCH OF GENERAL EDUCATION.

BY

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PREFACE.

"What shall we teach?" must soon become a more general question than it has ever been in this country. Our legislature, expressing the voice of the country, has determined that every child in the United Kingdom shall go to school, and, at least, be taught to read, write, and cipher. But these things are but instruments of education. The child is taught to read, that he may acquire information, to write, that he may communicate knowledge, to cipher, that he may calculate the facts he acquires by means of his senses. Mere reading, writing, and ciphering is not education. What then shall we teach? In the following pages I have put in a claim for imparting to children, everywhere, a knowledge of the structure and functions of the human body. Mr. Ruskin somewhere says that the great objects of education, and which are neglected in

all our schools, from our dame schools to our Universities, are the questions, "Where am I? What am I? Where am I going to?" I claim that our children should be taught first what they are. This knowledge obtained as the basis of all other information, there is not much danger of their going subsequently wrong in whatever direction they go. The present Chancellor of the Exchequer has very properly said, "I think it is more important for a man to know where his liver is seated and what its functions are, than to know it is called *jecur* in Latin and ἧπαρ in Greek."* It is the immeasurable importance to the community of understanding the simple laws by which health is maintained, and disease and death restrained, that have induced me to throw together the following remarks for the thought and consideration of those now occupied in framing new plans of education for our old schools and introducing a fresh curriculum of study in our new schools. I know I am not the first to draw attention to this field of study, and am only following the leading of such men as the late Mr. George Coombe and others, who have advocated

* See 'Times,' Nov. 4th, 1867.

the introduction of the study of the laws of life into our primary and elementary schools. I am glad to know that I have the support of men like Dr. Rumsey, of Cheltenham, Dr. W. Farre, of London, Dr. Parkes of Netley, Dr. Symonds of Bristol, the Rev. Canon Kingsley, and others, who have devoted themselves to the subject of improving the physical condition of the people. It is impossible that this can be done at the present day without the direct instruction of the people. It is precisely in those communities that are instructed in the elementary laws which prevent disease and secure health that the largest amount of productive labour is secured and the greatest longevity is attained. A short-lived community is an unhealthy community; and where the laws of health are least obeyed, there disease and poverty must prevail.

The following pages were originally written with a view to being read as a paper at the Social Science Association at Bristol, in 1869. They, however, reached a length that rendered them too bulky either for being read at the meetings or published in the annual volume of the 'Transactions.' Accordingly I submitted an abstract to the Educational Department of the

Association. I was not able to be present on the day it was brought before the Association, and it was kindly read to the meeting by the President of the Education Department, the Rev. Canon Kingsley. The subject produced a discussion, in which the speakers admitted the importance of introducing a knowledge of elementary physiology into all schools. At the request of the President of the Section, and several other friends, I have been induced to publish separately the whole paper. Whilst aware of all the deficiencies presented by the paper arising from want of leisure to submit it to thorough revision, I hope the argument will be understood by the general reader, and that it will be the means of producing an impression in favour of introducing the study of at least the "rudiments of physiology" into all our schools.

MELTON HOUSE, HAMPSTEAD;
February 28*th*, 1870.

ON

PHYSIOLOGY IN SCHOOLS.

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1. Whilst all are agreed that the mental powers which man possesses, as distinguishing him from the brute creation, are susceptible of improvement and development by what we call education, there is not a little difference of opinion as to the method of conducting this education. For the male children of the more favoured classes of society it seems not to be doubted in certain classes that instruction in the dead languages and mathematics is the most desirable training they can undergo. For the sons of the less opulent, and the male members of the working classes, it is taken for granted that a knowledge of any language except their own is useless, and that writing, ciphering, geography, and history is all that ought to be required. With regard to the education of girls the general opinion is that the education of their minds does not demand dead languages, that mathematics

are useless, and that a training in music and singing, with the acquirement of one modern language, is amply sufficient.

2. It is not my object here to enter into any controversy as to whether boys should be educated differently from girls, or as to whether the training of the mind of the son of a rich man should be different to that of the son of a poor man. I wish, however, to state my conviction as a physiologist that there is no anatomical distinction between the brains of men and women, or those of rich and poor people.

3. With regard to education, it appears to me that whatsoever is of advantage to the rich man is also of advantage to the poor man, and that, in so far as it can be afforded, the same training of the mind is of the same advantage to the poor as to the rich man. I would even go further, and say that what is good for the male is good for the female, inasmuch as there is no essential difference between the mental powers of men and women.

4. But leaving this great question, on which so much controversy exists, I am anxious to show that whatever difference of opinion there may be as to how far the human mind should be drawn out or educated in certain classes of society, that there are certain common facts or truths that should be communicated to all minds, whether rich or poor, male or female.

5. Those who write on education speak of the distinction in educating children between *training* and

*information.** It is agreed that certain subjects should be adopted in schools for the purpose of *training* the mind, of giving it habits of observation, reflection, and reasoning, which can be applied under all circumstances. The subjects which are thus recommended are classics, mathematics, and certain branches of physical science. But as an English child must read English and write English, it is considered that, whilst being thus trained, certain facts in the external world may be imparted, and the facts of geography, history, and natural history are recommended. Such subjects are recommended for scientific *information* as distinguished from *training*.

6. Amongst the subjects suggested for imparting information to schools by a committee appointed by the British Association for the Advancement of Science, are the "Rudiments of Physiology." It is to the importance of this subject as a branch of elementary and general education that I now wish to call attention.

7. The other subjects recommended by the committee, to whose opinion, on account of their scientific pre-eminence, the greatest deference is due, are "a general description of the solar system; of the form and physical geography of the earth, and of such natural phenomena as tides, currents, winds, and

* See 'Report of a Committee appointed by the British Association on Scientific Education in Schools.' Parliamentary Paper. March, 1868.

the causes that influence climate; of the broad facts of geology; of elementary natural history, with especial reference to the useful plants and animals." Now, of all these subjects it appears to me that the "rudiments of physiology" is the most important. By physiology is meant the science which explains the laws that govern the life of man and animals. Surely if there be one subject of information of more value than any other to an intelligent being, it is that science which teaches him the laws by obedience to which he may live.

8. Every one recognises the importance of teaching to every human being the obligations of the moral law, and the child is taught both by its family and the nation that it may not steal, covet, lie, or commit murder. In the same Divine record in which the moral law was given to man for the guidance of his social life, we find a code of physiological laws given him for maintaining his body in its health and integrity. It may be satisfactorily shown that where man is negligent of his physical welfare, and invites by his ignorance the invasion of disease, that there he is morally impotent and incapable of obeying the spiritual laws of his nature.

9. It is not only amongst the Jews that we find that physiological laws were laid down for the guidance of the people, and even severe penalties attached to the voluntary breaking of these laws; but we find amongst the enlightened Greeks and Romans at

various periods, the laws of life were recognised, and the importance of obeying them enforced by penalties.

10. In modern Europe the physical laws of existence seem to have been almost entirely ignored. The history of the great plagues which have from time to time visited the eastern and western hemispheres afford a melancholy indication of how entirely man has forgotten his dependence on physical laws for his health and existence.

11. Even the history of modern physiological discovery is barren till the end of the eighteenth century of any attempt on the part of those who professed a knowledge of the laws that govern the life and existence of man, to apply that knowledge to the saving of life. It is curious that the first great triumph of physiological knowledge over disease was not gained by a physiologist; but we may fairly give the credit to Captain Cook, the great circumnavigator, who took a crew round the world with the loss of but a single man. The significance of this fact can only be understood when we know that in long voyages, even in the best appointed ships, it was a common thing for a half or two thirds, or even more, of the crew to be lost in a single long voyage. Cook solved the great problem of how it was possible to keep man alive under circumstances which had hitherto been considered impossible. This is the great problem for society to solve at the present day, to keep people in health where they have hitherto perished of disease. This can only be done

by obedience to the laws of life. What Captain Cook did for his crew, society must do for itself if it would be delivered from the disease and death which now oppress it.

12. In order to obey the laws of life it is not necessary that every individual should be profoundly acquainted with the structure of the human body and the intimate nature of its functions, but it is necessary that every one should so far understand these matters that he may avoid the most common causes of disease, and submit with alacrity to those laws which the government may impose upon him for the health and salvation of the community.

13. As an objection may be urged to the teaching of physiology on the ground of the subject being too complicated for laying before the minds of children, I would here indicate those "rudiments" of the subject which I think might be taught in every school.

14. In the first place, the human body is subject to the same laws as all other matter. It is composed of solid, fluid, and gaseous matters, which are identical with substances having the same qualities out of the human body. A knowledge of this fact should precede all others in teaching laws governing the existence of the human body.

15. In the second place, the pupil should be taught that these substances are composed chemically of the same elements as exist in other bodies, outside the human system. The most common elements in the

human body are carbon, hydrogen, oxygen, and nitrogen. The chemical properties of these elements play a very important part in the life of the human body, and their principal properties must be understood to appreciate their influence in life.

16. In the third place, the human body is composed of various organs, each performing a special function. These organs have all a definite relation to each other. By their agency the chemical substances in the form of food enter into the body, and this food supplies the materials which, being distributed by the heart and blood-vessels to the various parts of the body, enable them to perform the actions which we call life. The great laws by which this life is maintained in its integrity, and disease kept at bay, are not difficult to understand, and it is by a knowledge of these laws that the nature of disease and death can be explained, and their occurrence be prevented.

17. That disease and death can be prevented is a well-known fact; and certain diseases are called "preventible" by sanitary writers because their causes are well known and can be removed. It is not, however, possible by mere authority to prevent these diseases. The law can do much to remove those causes of disease in which individuals are incapable of acting. It can compel a town to have a supply of water, but no law can compel people to use water. Unless individuals are instructed in the necessity of using water for the benefit of their health the law is

useless. This is really the case with the whole of the sanitary laws of England. They are comparatively useless, because we have a population growing up around us, entirely ignorant of the nature of the laws which produce death and disease. It is thus that diseases spring up in homes long before those who are instructed in the means of their prevention can know anything about them.

18. Let me take an example from the group of zymotic or contagious diseases. The deaths from these diseases are at least a seventh of the whole deaths of any given district. These diseases are regarded as essentially preventible because they are produced by poisons passing from one body to another. In families where the laws of these diseases are known and acted on, death from them is very rare indeed. Take smallpox for instance. In all well-instructed families there is a knowledge of the fact that, where cowpox has been communicated in infancy, there smallpox will not occur. And if occasionally persons after vaccination for cowpox should take smallpox, the disease is so mild that few people die. Yet, through ignorance of the beneficial effect of this operation, hundreds of thousands of the population of England grow up without being vaccinated. Neither the government nor the parochial authorities have sufficient enlightenment either to meet this ignorance or its consequences, and in England and Wales alone 21,687 persons died of smallpox in the four years from 1862

to 1865. Where one person dies of smallpox, twenty get the disease and recover. From these facts any one can form an idea of the enormous cost of the ignorance of only one physiological fact in a great series.

19. The death from typhus fever in this country is more alarming still. Whilst smallpox attacks chiefly the young, typhus seizes the middle-aged—the bread-winner and housekeeper of the family. In one year upwards of 30,000 persons die of this disease in England and Wales. It is a contagious disease, and it can be abundantly shown that it spreads and produces its dire effects only when all precautions for its dissemination are disregarded. Dr. Christison says he has never known it to spread amongst the families of medical men and students who have contracted it at the hospital. At the meeting of the Social Science Association in Bristol, in 1869, Dr. Budd read a paper in which he showed that in the last five years typhus fever was almost an unknown disease in that city. This he attributed to the fact that where a case of typhus fever arose, proper measures were taken to "stamp it out." On this account this disease does not spread in Bristol, although previous to this practice typhus fever carried off a large number of its inhabitants. In certain districts of London typhus fever is never known to spread where proper precautions are taken, thus showing that this alarming and frightfully fatal disease is perfectly under the

control of those who have a knowledge of its nature and the laws of its dissemination.

20. There is abundant evidence to show that in certain towns and districts where disease and death have been unusually present, the adoption of sanitary measures has stayed the rate of mortality and diminished disease. Many towns in England have presented high rates of mortality, and on the adoption of sanitary measures the mortality has immediately decreased. Examples of this are so numerous that I need not repeat them here. Whenever the deaths of a district rise above a certain average, it is a well-known fact that it is due to some obvious law of healthy existence being transgressed. In the case of the great outbreaks of cholera the cause has never been obscure. When cholera, in 1854, decimated the population of a particular district in the parish of St. James's, Westminster, it was clearly traceable to the poisonous water supplied by a popular pump in the parish. The frightful devastation caused by the cholera of 1866, in the East of London, was proved to be due to the contaminated water of the district. That the "curse causeless cannot come" is obvious to those who will study the causes of disease, and the necessity of the study of the causes of disease is thus pressed home on all classes of society. We must not expect that the government, or the medical profession, or the clergy, or vestries should study these

questions for the good of the public. It is only by the universal instruction of the people, in the laws which regulate their existence, that we can hope for the adoption of those measures of precaution that will ward off disease, and prevent the destruction of human life.

21. It is not, however, alone in a knowledge of the laws of contagious disease that we may expect benefit from a people instructed in the laws of life. In many town populations of England half the individuals die before they are five years of age. It cannot for a moment be supposed that this is the necessary destiny of humanity. The contrary, in fact, can be easily proved. There are many districts and families in England where infant death bears but a small proportion to the rest of the community. This clearly shows that in those districts where infant mortality is large, that it must arise from one of two causes, either a wilful destruction of human life, or an ignorance of the laws by which it can be maintained. There can be little doubt that the latter is the cause. Where one child is sacrificed wilfully and maliciously, I believe that at least one hundred perish through ignorance.

22. In none of our systems of education is it deemed desirable or expedient to teach women who will become mothers the structure or requirements of the offspring which will be committed to their charge. Of the children that die before they are five years

of age, the largest proportion are first-born children. Women are allowed, without any guidance or instruction whatever, to experiment on their first children, and the consequence is that a large number of them die from the want of the humblest elements of knowledge as to the requirements of their healthy existence. The argument in favour of maintaining this ignorance is, that the brutes instinctively know how to take care of their young, and in this way most young mothers are left to take care of their children.

23. With regard to diseases which destroy life, and which are not contagious or infantile, the same ignorance of preventing them prevails. There is, for instance, consumption—a disease which carries off alike rich and poor. In some districts of England this disease is scarcely known, whilst in some of our town populations it is the great scourge of the community, and is the cause of the death from one fifth to one eighth of the population. Of all diseases this is regarded popularly as the most inevitable and unpreventible. Yet the fact of its occurring more largely in one district than another ought to show that it depends on preventible causes. The fact is, that the more the causes of this disease are studied, the more obvious does it become that it is produced by external circumstances. That overcrowding, impure air, deficient food and clothing, with probably contagious communication, are the efficient causes of this disease,

is becoming every day more evident to those who are studying the nature of this most destructive malady. Dr. William Budd has stated that he believes this disease is communicable by contagious germs, and that of all diseases it is most under human control.

24. Besides this there are a host of other diseases demonstrated to be dependent on special occupation and locality. With regard to these it is not possible that any general superintendence or any form of special medical advice can prevent their occurrence; it is only knowledge possessed by individuals of the dangers to which they are exposed that can lead to any decisive action by which they can be prevented. Such knowledge it is not impossible to communicate, and were it given, the reduction of the death rate would repay a hundredfold all efforts that might be made to give the required information.

25. The question, then, comes for consideration, as to how large an amount of useful *information* in the laws of life can be conveyed in the course of two or three years to boys and girls at school? I say girls, for I believe it is of more importance that girls should be instructed in the rudiments of physiology than boys. Girls are constantly employed in domestic work, and the many arrangements of the house on which health is dependent, is more or less left to their active superintendence. It is to girls, as nursemaids, that the children of the family are committed. It frequently happens that the whole

of the younger members of a family are dependent for their healthy existence and development on the females who are occupied in the nursery. With regard to the management of the house, the ventilation of the room, maintaining cleanliness, the proper cooking of food, the prevention of the entrance of impure air into the room, appointing meal times and selecting food—all this is more or less under the management of the mistress of the family. Hence I would urge that, even if physiology is excluded from the boys' school, that it should be introduced into those where girls are educated. Nor is it difficult to educate girls on this subject. For many years I have conducted classes of girls in which physiology has been taught, and have found no difficulty in making intelligent girls of twelve or fourteen years of age understand the great facts of the structure and functions of the human body.

26. It may be difficult to point out what should be the minimum or maximum of knowledge to be communicated on this subject. The great difficulty is not, however, to estimate the amount of knowledge to be given, but to get teachers competent to the task. Provided, however, the managers, masters, and mistresses of schools have determined that this subject of physiology should be introduced, it would not be difficult to find teachers. In every district of England there are young medical men who, with a proper text-book in their hands, have a sufficient knowledge of the

science of physiology to communicate its rudiments to a class of intelligent children. There are also scattered throughout the country young men and, I am happy to know, young women, too, who have successfully passed examinations in Physiology in the Science examinations of the Committee of Privy Council on Education. But even should these aids be wanting, an intelligent teacher impressed with the importance of the subject, and bent on instructing his pupils, could easily employ any one of the numerous manuals of physiology as a reading-book in the school, and endeavour to explain its meaning as far as he himself understands the subject. It is in this manner that physiology needs not to stand in the way of any other branch of study. The children must read; and it seems to me of much more importance that children should read about the wonderful structure of their own bodies than of distant lands, extinct empires, or even moral and didactic tales. An intelligent teacher might easily take the opportunity whilst the pupil is engaged in reading about the structure of the eye, the hand, the heart, or the lungs of the body, to improve the subject and make it to exert a moral and religious influence on the child by pointing out the wisdom, the goodness, and the power of God, as exemplified in the facts of his own existence.

27. The teacher having been obtained, the question comes, how he should proceed? Should he at once commence with some interesting portion of his sub-

ject, as the brain, the heart, the eye, or the skin, and thus by a process of analysis place the nature of a human body before his pupils ; or should he begin by showing the nature of the elementary parts of the human body, and, putting them together, at last show how they form a human body? I confess I am in favour of the last method. By teaching children that the human body is composed of certain elements which are found in water, air, and earth, they are prepared to understand the purely chemical nature of many of the vital functions.

28. The human body, in common with that of lower animals and of plants, is principally composed of four elements—carbon, hydrogen, oxygen, and nitrogen. When once the property and interaction of these elements are well understood, it is not difficult to make a child comprehend the action of food, the nature of animal heat, the function of respiration, and the importance of fresh air to life.

29. There are certain compounds of these elements whose nature and relation to life should be known to all. Thus oxygen and hydrogen form water. Of all the substances presented to man in nature for his use, water is the most important. Four fifths of the bulk of his body is composed of this material, and the way in which it acts on the body should be thoroughly understood. By mixing and solution in water all the rest of the elements are carried into the body, and by its agency, to a greater or less extent, all the excre-

mentitious or refuse constituents of the body are thrown out.

30. Water is taken largely with our food, and by it are introduced into the body not only all the other constituents of the food, but foreign ingredients which injure the body and set up disease. One of the great sources of epidemics which destroy the life of thousands upon thousands every year is impure water. Yet the great bulk of the community is utterly ignorant of the nature of the poisons thus conveyed by water, and indifferent to its purity or impurity.

31. The elements oxygen and nitrogen constitute the atmosphere we breathe. Their proportions are definitely fixed in nature in such a way that the health of animals is secured. By oxygen the tissues of the body are renewed, and the active functions of life carried on. Diminish the quantity of oxygen supplied to the system, and diseases occur which rapidly destroy human existence. Not only is it necessary for the elements of the atmosphere to exist in proper proportions, but it should be free from the taint of all impurities. By contact with impure substances of various kinds, the atmosphere becomes changed, and carries into the body, poisons which act in various ways to the destruction of human health.

32. Whilst breathing is going on, the oxygen of the air unites with the carbon of the body and forms *carbonic acid gas*—a poisonous compound which, if not got rid of from the blood, produces disastrous

effects upon the tissues, and which, if allowed to remain in the air to be respired again, is the cause of the most deadly diseases. Hence the necessity of surrounding the body with fresh air, and the practical importance of ventilation.

33. I might stop here and say if we taught mankind universally the importance of pure water, and fresh air to health, it would be sufficient to prevent half the agony of disease, and a large proportion of the deaths that happen in the world. But this is not all; the compounds of the elements I have named above, form the various textures out of which the human body is made. Carbon, and hydrogen, and oxygen form fat. These, with nitrogen, constitute the substances out of which the nerves and muscles of the solid fabric of the body are formed. The body whilst living is constantly throwing off compounds of these elements. They must be supplied or the body would perish. The material thus supplied for the waste of the body is food. We derive our food from the vegetable, animal, and mineral kingdoms. Food needs to be supplied in proper quality and quantities. A redundancy or deficiency of particular kinds of food produces disease and death. A knowledge of the nature of the constituents of food and its action on the body is not difficult to supply, and a child may be more easily taught the true relations of the food it eats to its health than it can be taught the geography of the earth or the history of its own country.

34. Proceeding from teaching the principles of the chemistry of life, we may go on to give a knowledge of the special structures of the human body. The structure of the organs subservient to the function of digestion; the nature of the changes whereby the food we eat becomes converted into blood; the circulation of the blood, the changes it undergoes during respiration, and the structure of the heart and lungs, are not difficult things to teach intelligent children of from ten to twelve years of age. From these subjects they may advance to the study of the muscular system and the nature of animal mechanics. The nervous system, the seat of consciousness, intelligence, and emotion, may then be studied, and the physiological course closed with the structure and functions of the organs of the senses.

35. During these studies a variety of practical applications will arise. The value of fresh air and pure water, the desirableness of exercise, the importance of adapting clothing to climate, the necessity of avoiding all strain upon the muscular and nervous systems, will necessarily occur. Although such subjects are at present entirely foreign to a course of general education, and are seldom or never alluded to in our courses of primary education, it will be found in practice that no subjects can be more easily taught, and that there are none that can be illustrated with so much facility, and none that are more easily impressed upon the minds of the young.

36. Having glanced at the subjects which I think should be brought before the minds of a class of pupils in a school, I would add a few words with regard to the method of teaching. Although physiology is usually taught by means of lectures, it is not necessary that it should be so. The teacher may use some of the elementary books on physiology,* and, getting a class to read a few sections, might explain each section if necessary, and before reading the sections at the next lesson make an examination on the last, taking care that each pupil understands what he or she has been reading. These lessons should be illustrated by experiment when the chemical part is brought before the class, and the elements spoken of should be demonstrated. A very few simple experiments will impress on the mind of the pupil the nature of the four organic elements, and their principal chemical compounds are always at hand to exhibit and demonstrate their properties.

37. In the same way, when the tissues of the body are referred to, it is not necessary to have recourse to, or even allude to, the dissection of the human body. The butcher's shop will supply ample illustrations of the tissues of which the human body is composed. A mutton chop in the hands of a competent teacher

* At the request of the Irish Board of Education I drew up a small volume entitled 'A School Manual of Health,' intended for Reading in Classes in Schools. Groombridge and Sons.

would give illustrations of nearly every tissue in the human body. In the same way particular organs, as the tongue, the ear, the eye, and the teeth, may be advantageously demonstrated in the head of a sheep; whilst a mouse, rat, pig, or rabbit, in the hands of a skilful teacher, would afford ample instruction in the position of the lungs, heart, and abdominal viscera. Besides such direct appeals to the senses as could be afforded by demonstrations of this kind, there are few subjects for which provision has been more amply made in the form of diagrams. Some of our great physiologists have directed their attention to this subject, and the late Professor Goodsir, with Professor Turner, have published a series of diagrams expressly intended for the assistance of teaching classes in schools. A number of admirable diagrams, life-size, have also been published by the Committee of Council on Education, and executed under the direction of Professor Marshall, of University College, London. Either of these sets of diagrams would be found of great assistance in teaching a class of children the "rudiments of physiology." When I consider the immense facilities for teaching the great facts of physiology as compared with any other branch of natural science, I confess I am astonished at the objections urged by some naturalists to the introduction of the teaching of physiology into our schools.

38. An important practical question arises here, and that is, How much time ought to be given to these

studies? It is the error of masters and mistresses in schools that they think natural science may be taught in leisure moments, and that a few lectures in the course of a year will suffice to give their pupils all the information that is necessary on these subjects. If they would reflect on the fact of how large a portion of time is given to the study of subjects of which, when the education of their pupils is completed, they exhibit but a comparatively small amount of accurate knowledge, they will see that to give children a sufficient amount of knowledge of any branch of natural science, to make it available in life, they must devote to it as large an amount of time and labour as to any other subject of equal importance. No boy could be expected to know anything of Latin by a few lectures delivered in the course of his annual studies. Physiology, if it is to be taught at all, must have regular and systematic attention. I would suggest that two hours a week, at least, should be secured for this branch of teaching. If extra time can be given for preparation for the lessons received in these two hours so much the better. What I would wish to impress is this, that little or no good will be effected if the subject is made a matter of indifference with the teacher or the pupil. The only way in which benefit can be derived is by making the pupil thoroughly understand the subject, and feel the importance of the facts it imparts.

39. If what I have advanced in the foregoing

remarks be true, then there is no class in the community that would not be benefited by a knowledge of the "rudiments of physiology." At the same time, I would point out in individual groups of the community the advantage that would flow from a knowledge of this subject. To take first the highest round of the social ladder, I would refer to our statesmen, the great object of whose position is to make those laws and enforce those principles of action which shall most conduce to the physical welfare of the people. If we want proof of how little the natural laws which govern the existence and well-being of men are understood by our legislators, we have only to turn to our sanitary legislation. It has been dimly apprehended by our legislators that one of their functions is to secure the physical well-being of their fellow-creatures, but when we come to examine our laws we find that they have almost entirely failed to secure the great object of their enactment. They all of them exhibit a timidity with regard to the subject of preventing disease and death which point at once to an ignorance or want of faith in the great laws by which life and health are secured. I would especially refer to the permissive character of all our sanitary legislation, throwing upon local bodies and the community at large the responsibility of preventing the destruction of life. The result has been that local bodies have shown as much diligence in throwing off the responsibility

placed upon them as the legislature has been anxious to thrust it upon them.

40. In a social community the question of saving life is of as much importance in one direction as another, but whilst our legislators hesitate to save life by preventing disease, and throw the burden on local authorities, they enact laws for the preservation of life from violence of a very different character. This is provided against by imperial enactments, without power being given to local authorities to wink at the destruction of life or not as they please. The condition of mind which our legislators exhibit when the devastations of cholera, typhus fever, smallpox, and other like diseases are brought before them, must be very different from that with which they contemplate agrarian outrages in Ireland, or death from violence in our large towns, or surely some of the remedies which are applied in the one case would be contemplated in the other. While deaths from violence occur in unprecedented numbers, the police is increased and armed men are employed to prevent the evil. But when typhus fever ravages a district, when mortality tables mount up to a frightful extent, the imperial legislation takes little or no action, and regards the calamity as a visitation of Providence, over which they have no control. Such indifference to the destruction of human life could hardly occur amongst men who had been educated to understand the first principles of the laws which govern human

existence, and who have but to exert the power given them by the nation to apply remedies for the arrest of the evils thus produced.

41. Of course I am speaking collectively of our legislators. There are, undoubtedly, men in both houses of legislature who, by the force of their natural intellectual character, have come to the understanding of the nature of the causes of disease and death, and who, if they could be alone entrusted with the making of our sanitary laws, would make them so efficient that we should have no cause of complaint. But what are they among so many? If all classes were taught physiology, of course we should catch our statesmen and legislators. It might here be worth while to inquire as to how much information is given in the laws of life in those courses of education in our universities where, perhaps, the majority of our legislators are educated. If we turn to the *curricula* of education required for degrees, we shall find that little or no encouragement is given to the study of physiology as a branch of knowledge independent of a medical education. It is, perhaps, a cause for real hopefulness for the future that in all the universities of Great Britain and Ireland ample means exist for teaching physiology. Oxford has its magnificent museum, with its distinguished Linacre professor Dr. Rolleston. Cambridge, Edinburgh, Glasgow, Aberdeen, Dublin, the Queen's University of Ireland, have all their physiological museums and professorships,

which might be made available for teaching much more than the "rudiments of physiology;" but of what I think there is reason to complain is, that in all these spheres of education, with the exception of medical students in the universities, and the examination for the degree of B.A. at the London University, none are *required* to study physiology.* It is true that Cambridge has her natural science tripos, where physiology is allowed to take a position; that she has rewards for natural science, of which physiology may form a part; that Oxford has her schools, scholarships, and studentships for natural science, which include in many cases physiology. But the importance of the interests involved demand that in no case should a student graduate in arts in the universities or receive degrees without displaying at least a competent knowledge of the "rudiments" of those laws by which life and health are maintained.

42. The importance of requiring a limited amount of physiological knowledge on the part of all those who take any kind of degree in our universities is not, however, limited to the fact that in this way a certain number of our statesmen would gain some knowledge of the laws of life, but it would to a certain extent influence the whole of the school-teaching throughout Great Britain. In the report to which I have before alluded it is stated that, "although no more than

* In New College, London, the theological students are compelled to attend an annual course of lectures on Physiology.

35 per cent. even of the boys at our great public schools proceed to the university, and at the majority of schools a still smaller proportion, yet the curriculum of a public school course is almost exclusively prepared with reference to the requirements of the universities and the rewards for proficiency that they offer." The middle-class schools imitate our higher schools; and thus it is seen that our universities exercise a much wider influence than that of educating their own graduates.

43. Coming down to the next grade of the social scale, I would refer to the importance of possessing a knowledge of the laws of life to the members of the clerical, legal, and medical professions. Although physiology forms part of the education of a medical man, it is not taught him in the practical way which makes him fully alive to the prevention of disease and death in communities. At none of the medical schools in the United Kingdom are lectures on public health* delivered, nor is any examination required on this subject for a licence to practise medicine. Such was the ignorance of this and other cognate subjects displayed by those who possessed licences to practise surgery and medicine, that the government, in order to secure efficient medical service in the army, found itself compelled to institute a separate examina-

* Since this was written Chairs of Public Health have been established both at University and King's Colleges in London.

tion, and has founded a school of medicine at Netley, where amongst other things public hygiene is taught, and one of the most excellent works on public health in the English language consists of the lectures delivered by Dr. Parkes.

44. Whilst, then, it must be admitted that the members of the medical profession have the greatest opportunity for studying physiology and have been, in fact, the great cultivators of it as a branch of science there is no doubt that the great practical aims of physiology in preventing disease, have been neglected as a part of medical education. Hence it is that we often find medical men neglecting in their own families, the most ordinary rules of maintaining health and life.

45. Perhaps of the other two professions, the clerical and legal, a knowledge of physiology is more important to the clergyman. Whether as a preacher, missionary, minister, or priest, he is always the centre of a circle which his mental and moral culture must more or less influence to a very great extent. He has not only the power of setting men an example of how they ought to live, but he is expected to teach others from the pulpit this lesson. Probably there is no other moral influence so great in this and other civilised countries as that of the clergy. Now, I do not wish to enter into an argument of the comparative worth of spiritual and natural knowledge, but I would say that the Book on which the office of priest or preacher

is founded, justifies the claim I make, that they should understand the laws of life.

46. "My people perish, and there is none to consider," was not spoken so much of the souls as of the bodies of men. The social economy of the Jews, and which is believed to have been of Divine origin, paid the most minute attention to the physical well-being of the people. If our sanitary laws were as well adapted to meet the necessities of our age as the laws of Moses were to meet the requirements for preserving health and life amongst the Jews, we should not now have to point out the large amount of preventible disease that is allowed to exist in every town and village of this kingdom. In the New Testament we find that our Saviour went about doing good. He healed the sick and raised the dead. He did this out of sympathy with those who were distressed and afflicted. If these, then, are the sanctions for attending to the physical welfare of the people, surely every clergyman should be taught what are the laws by which life and health are maintained. They are God's laws, and cannot be broken with impunity. Disease is the result of a broken law, and by acting in obedience to the healthy law, and inculcating in others the necessity of obeying these laws, the minister of the Gospel of all living men may do the most good. In the social arrangements of the household of the poor, in their depression of spirits and want of health before the doctor is sent for, in the management of children, and

in matters of food and clothing, the clergyman has more influence than any one outside the family, and where he is properly instructed in the nature and requirements of living beings, may exercise an almost unbounded influence for good. But where the clergyman does not possess this knowledge he may be the means of leading people deeper and further into the miseries which punish their ignorance. Through his want of the knowledge of the laws of life he may adopt some absurd form of quackery, or oppose some of the beneficial sanitary arrangements for which the law provides, and become a curse instead of a blessing in his parish.

47. In the pulpit the clergyman may do more good than even in his social relations. He here has the opportunity of bringing before large masses of people the necessity of learning and obeying those laws by which God governs the natural world. He can show his audience that the spirit of Christianity is the spirit of inquiry, and that just as men discover the laws by which their existence is regulated are they blessed by freedom from disease and death. He will be able to correct that fanatical tendency to believe that disease is a matter over which man has no control. He will not want for texts from the Bible by which he may appeal to the consciences of his hearers as to the necessity of maintaining in health and strength the body which God has made "a temple for the Holy Ghost to dwell in." Whilst soliciting

charity for institutions that give relief to the sick, comfort to the dying, and support to the bereaved, he will not fail to dwell on the greater blessedness of preventing all this disease and misery, and show that the excellence of a cultivated mind is even greater than that of a benevolent heart.

48. There is another function which the clergyman performs, and in which he can greatly assist the cause I am attempting to advocate. As a minister or priest he is sure to be connected with the various schools for the instruction of the children of the people. It is in these schools that he may exercise his influence with masters, teachers, and committees to get the subject of physiology introduced. If no other person can be found to teach this subject, the clergyman himself might undertake to give the two lessons a week which I have asked as a minimum for this subject in schools. He would find such exercise quicken his feelings with regard to the goodness of God in creation, and provide the best possible foundation for sermons on natural theology.

49. From what I have previously said it will be seen that for the legal profession to have a knowledge of the "rudiments of physiology" is most important. It is not, perhaps, as ordinary practitioners of the humbler walks of the profession that this is necessary, but wherever lawyers practise in courts of law where cases involving bodily injury or disease are brought forward, it is necessary that a knowledge of physiology

should exist on the part of the legal advisers employed. It is true that in a large number of cases where points involving a knowledge of human anatomy and function are disputed a medical witness is employed; but if he is not allowed to take the part of adviser of the plaintiff or defendant, how can a case be properly conducted if the legal adviser is ignorant of the simplest terms of anatomy or conditions of disease and death? In the cases, for instance, which come before the coroner's court; if the coroner is not able to understand the nature of the medical evidence, he is either the mere creature of the medical witness, or opposes him in cases where the interests of justice require that he should be upheld. It is not at all necessary that a coroner should be a medical man; but it is of the utmost importance that he should know enough of the laws which regulate the life of human beings to be able to apprehend the nature and value of medical evidence. It may happen that the medical witness is a charlatan or an interested party, and if the coroner is ignorant of vital laws he will be utterly unable to detect the valuelessness or the one-sidedness of the evidence. There can be no doubt that the same knowledge would be of advantage to judges either in our civil or criminal courts. It is often a complaint of medical witnesses in our courts of law that their evidence has been entirely misunderstood by the legal authorities employed in particular cases. It is true that barristers employed often

display, in cases in which they are engaged, a great amount of knowledge which they have got up for the occasion; but this knowledge does not belong to their special education, but to the diligence they exercise in mastering the details of the cases in which they are employed. A deficiency of physiological knowledge is especially exhibited by the great body of magistrates before whom cases are constantly brought where this knowledge is recognised. Take, for instance, the application of our sanitary laws to the cases of nuisance where the health and life of individuals is concerned. These laws are almost entirely permissive, and when the magistrate does not exhibit a knowledge of the details of physiology on which they are founded, uncertain and erroneous decisions are often given.

50. Another class of persons in society to whom a knowledge of some of the details of physiology would be of great advantage are those who supply information for the people, and are employed more particularly on the periodical press. Few men write books on subjects with which they are not more or less acquainted, but those who write from week to week and day to day in our journals and newspapers are constantly dealing with questions affecting the life and health of the community. It is amongst this class that we find frequently the profoundest ignorance of the nature of the physical laws affecting the well-being of the human body. Throughout the long

struggle which has taken place to get a few laws passed through the legislature for protecting the health and life of the community, there has not been wanting, on the part of the members of the press, an unceasing hostility to their enactment and application. These writers, whilst they have displayed great power of expression and fertility of argument, have exhibited an entire misapprehension of the nature of physiological law. Even those who advocate sanitary improvement, and these are happily by far the greater number, often display a want of knowledge of the laws of life which if they possessed it would greatly advance the value of their contributions.

51. It is true that the leading journals, when devoting an article to sanitary matters, employ men who are competent authorities on the subject on which they treat; but these are often dependent for their information on reports supplied them by persons incompetent to give correct information. Thus, the reports of cases in our law courts, of inquests and accidents, are often ludicrously deficient in that accuracy which ought alone to form the basis of correct criticism. If members of the press were only as well educated in the "rudiments of physiology" as they are in many of the other branches of human knowledge, the statements and opinions of the press would have much greater value and influence than they possibly can at the present. I have often been startled at the almost entirely erroneous view that a

newspaper report gives of remarks made on physiological subjects by public speakers on questions connected with subjects involving some slight amount of physiological and anatomical knowledge.

52. Before speaking of less specially educated classes of the community, let me draw attention to the position of the engineer and architect. To these two professions we are indebted for the construction of our great public works and our dwelling-places. They lay down the plans which the humbler profession of the builder and his labourer have to follow. How often does it arise that in their magnificent conceptions not the slightest thought has ever arisen in their minds as to the necessities of the human beings who are to occupy or use the structures they have designed. The whole country has heard of the failure of the designer of the magnificent Houses of Parliament to secure for the few gentlemen who occupy those houses for a small portion of the year the air necessary for their healthful existence. Although thousands of pounds have been spent on the ventilation of these buildings, it is a question as to whether any public buildings in the country at the present day are so badly ventilated or more exposed to the charge of unhealthiness than they are. They are really open to the charge of being "nuisances injurious to health" in accordance with an act passed within their own walls. In these cases the members of the legislature who suffer from this

state of things are less to blame than the architect who constructed the glorious pile without reference to the necessities of the human beings who are to occupy it.

53. The same criticism may be passed on our naval engineers, who construct ships of great merit as far as their warlike powers are concerned, but in which all conditions are neglected which would secure the health and strength of the men who alone can make these ships successful. Our railroad engineers are often equally negligent in securing the health and comfort of the passengers whom their lines are intended to carry. No example could be more forcible than the great Underground Railway of London, where miles of tunnels were constructed without any consideration as to whether human health and life could endure the exclusion of that atmospheric air which is essential to comfort and health.

54. In the construction of public buildings and houses the same professional classes present themselves to the public as ignorant of the laws which regulate human life. Splendid exterior and interior decorations are given us without the slightest arrangement for the comfort and health of the thousands who are to be accommodated in these buildings. Take, first, our places of worship. How often they are so constructed that even if the mass of worshippers are not inconvenienced in the morning they are sure to experience inconvenience and ill health in the

evening by the burning of gas, for the products of which there is no possible exit. The arrangement for the ventilation of churches and chapels in the metropolis in the evening is so deficient that it is only a small minority to which people can resort without present inconvenience or future disease. Our courts of law are bywords for their unhealthiness and morbid effects upon those who are compelled to attend them. Theatres and other places of public amusement are equally constructed with indifference to the laws of health. Many of our workhouses and infirmaries are notoriously built without reference to the necessity of fresh air and warmth, which the absolute existence of their inmates demands. In the construction of our houses the same want of knowledge and foresight prevails. The cost and the appearance of the building are all that is thought of; whilst the supply of water, the perfection of the drainage, the situation of the closets, and other things necessary for health are not at all considered. I have no hesitation in saying that the amount of health and life sacrificed by the deficiencies of our public buildings and houses is much larger than the thoughtful inhabitants of this country are prepared to imagine.

55. Passing on from the professional classes let me now draw attention to the advantage to be derived to society from a knowledge of the "rudiments of physiology" by the middle classes. It is from this

class of society that the members of our corporations, vestries, boards of guardians, municipal bodies, are derived. The shopkeeper, in nine cases out of ten, is our alderman, town-councillor, vestryman, or member of a board of guardians. To these bodies are entrusted the carrying out of our sanitary laws and the preservation of the health and lives of the communities over whom they preside. The question which has really brought our corporations and vestries into disrepute in late years has been their inability to understand the nature of those arrangements which are necessary for the protection of the health and lives of their fellow-creatures. Take, for instance, London with its fifty local boards; there is scarcely one of them which may not be charged with neglecting to carry into effect the powers which have been given them for the purpose of preventing disease and death in their midst. It would be an utter perversion of argument to charge these men with wilfully compassing the death of their fellow-creatures. Their hesitation to act on the powers given them by the imperial legislature arises from their entire ignorance of the fundamental facts on which the life and health of their fellow-parishioners depend. Read their speeches and study their objections to spending money on sanitary measures, and it will be at once seen that they have no right ideas on the subject of health and disease, nor do they understand the means of promoting the one or preventing the other. It is not till the

schools where these men are educated afford some slight information on the subject of the structure and functions of the human body that we can expect them when they take part in the business of life to be found advocating those active measures of sanitary reform which are at the present moment needed for preventing unnecessary death and disease. They are often men of deep religious feeling, and being entirely ignorant of the causes of disease, they not unfrequently attribute to a beneficent Providence the permission of the mortality which prevails around them.

56. If this class in the community could once be put in possession of a sound knowledge of the causes of preventible death, a strange improvement in the health of all classes would at once take place. One of the great reasons for the tendency of intelligent men to seek the aid of the government, and invoke the powers of centralisation for the suppression of the obvious causes of death in the community, is the continued impotence displayed by our local authorities in dealing with this subject. London is a remarkable example, where, in spite of the general intelligence of the inhabitants, the vestries and other local bodies display a wonderful amount of apathy in applying the most acknowledged remedies for the removal of the causes of death and disease. I am obliged here to confine myself to generalities, or I might point in detail to the sufferings of the less opulent classes in London from the removable

causes of mortality. Improvement is going on, but it is so slow that those who know how easily much of the loss of life and health in the metropolis might be removed by intelligent action, become righteously impatient at the inaction of those who have the power of saving human life and suffering. Not a little of the pain thus inflicted on the intelligent witness of these things is the knowledge of the fact that the suffering thus inflicted by ignorance for the sake of economy is the most expensive method of procedure. Unnecessary disease and premature death are the most expensive incidents in a civilised community; and the great object of all well-governed societies should be to prevent these occurrences. It might easily be shown that money spent on sanitary works, such as water-supply and sewering, is speedily followed by a diminution of death and disease, the expense of which calculated in a community shows that large gains follow the introduction of such arrangements. What is very obvious on a large scale can easily be shown to happen on a small one. It is not alone by pure water and complete sewerage that towns are relieved from disease, but in the application of all the minor advantages of ventilating houses, preventing overcrowding, repairing drains, and the hundred details of cleanliness and attention to health, that communities are saved from poverty; and sanitary arrangements are made to contribute to wealth. By a thorough appreciation of the fact that health is wealth

on the part of the members of our municipal institutions, they might again recover the confidence and enthusiasm of the people of England. But this can only be done by bringing up their intelligence to that of the knowledge of the day; and one of the great branches of human knowledge, of which all English citizens ought to be in possession, is that of the "Rudiments of Physiology."

57. In order that this may be done this subject must be introduced into our middle-class schools. It is, perhaps, in vain to hope that any independent action will be taken in this subject by those who manage middle class schools. They are all more or less servile imitations of our higher class schools, and these, as we have seen, regard the university system as their example, so that we are again driven to the conclusion that the Universities alone, by altering their curriculum of study, have the power of introducing the study of physiology into the general education of the youth of Great Britain.

58. In speaking of the importance of physiological knowledge, I have more particularly referred to classes who exercise an influence over others—as the statesman, the clergyman, the lawyer, the architect, and the vestryman; but however valuable the services of these classes in the community might be rendered by their possessing a knowledge of the laws of life, they can do comparatively little good if the great mass of the people are not prepared to avail themselves of the benefit of

arrangements made for their welfare. The legislature may pass an Act of Parliament for enabling a corporation to supply a town with water, and the corporation may erect works and supply every house with water, but if the inhabitants are ignorant of the benefits of cleanliness, and prefer a sottish indulgence in beer, rather than partake of healthful beverages made from water, the intelligence of the ruling and executive class is vain. In fact, to do all the good that can be done by the present available knowledge of the laws that govern life, the great mass of the people must be instructed. In speaking of the various groups of individuals in the community, and the special advantages each would derive from physiological knowledge, I would begin with working men. We may divide those into workers in the open air, and workers in closed rooms. With regard to the first, they have this enormous advantage over the last, that they for several hours of the day inhale fresh air, which is one of the great sources of a healthy life. At the same time, this class has much to learn with regard to the effect of cleanliness on health. The larger number of them are addicted to potations of beer and spirits, which are perfectly unnecessary for maintaining their health and strength. Whilst their carelessness with regard to the cleanliness and ventilation of their sitting and sleeping rooms is a constant source of disease and premature death.

59. One of the great sources of death and expen-

sive disease, where death does not occur amongst the adults of our working classes is typhus fever. This disease is nurtured and spread by the want of cleanliness and ventilation in the dwellings of our overcrowded population. All other forms of contagious diseases are spread in the same way by a want of proper attention to cleanliness and ventilation. There is another disease which is also maintained by the same neglect of home sanitary arrangements, that is, consumption of the lungs. This disease prevails almost as much amongst the families of open-air labourers, as amongst those who dwell in towns. The ordinary explanation of the occurrence of this disease is that it is hereditary, but when we come to examine the circumstances under which it occurs, it is found that it is most fatal amongst those who live in overcrowded homes, whether they exist in the country or in the town.

60. It is not less important that the wife of a working man should be taught the causes of disease in her household than he himself. If not at home all day, she at least has the control of the home when he is away. If she is ignorant and careless, the arrangements of the household are such as to encourage those conditions which favour the spread of contagious diseases. The same may be said of the wife of the artisan who is employed all day under cover, but the workshop is more or less subject to his intelligence. If the indoor worker is ignorant of

the worth of fresh air, he may be daily exposed to contaminations which will produce various kinds of depressing diseases, and at last produce those structural changes in such organs as the heart, lungs, kidneys, skin, and liver, as will inevitably lead to an early death. It is a well-known fact that it is the ignorance of artisans of the laws of health that lead them to reject the arrangements which science devises for the benefit of their health. In many of the tailors', shoemakers', and other workshops of London, it is in vain for the masters to make arrangements for the ventilation, as the workmen from ignorance strive to undo what the master has done. A few years ago a sanitary association in St. James's, Westminster, provided ventilators for all the overcrowded houses of the resident artisans. At the end of a year, when an inspection was made, it was found that nearly all the ventilators had been blocked up by some artificial device. In the same way the admirable arrangements made for the ventilation of the model lodging houses in St. James's, Westminster, were rendered altogether useless by the inhabitants of the rooms pasting paper over the valves of the ventilators. This shows how utterly useless it is for a ruling class to possess knowledge unless it is accompanied by an appreciation on the part of the class to be ruled, of the advantages of intelligent obedience.

61. In order that working men and their wives

should have some knowledge of physiology this subject must be taught in our primary schools. It is from these schools that are drawn the great mass of our *domestic servants*, especially females. There is scarcely any class in the community to whom a proper knowledge of the preventible causes of disease could be of more importance. Whether as nursemaids, housemaids, or cooks, such knowledge is constantly available. To the nursemaid is entrusted even more than to the mother the care of children. If she is ignorant of the necessity of fresh air for life she may suffocate, as is often the case, the children committed to her charge. Her ignorance of the influence of cold may often produce inflammation of the lungs, of which so many thousands of children die annually in England. She may scald them, choke them, and in a hundred ways kill the children for want of the simplest knowledge of the laws of life. I am not speaking here of imaginary evils, but of facts that come before me officially from day to day.

62. In the same way that ignorant nursemaids kill children, the other domestic servants for want of knowledge may cause disease and death among the grown-up members of the household. The ignorance of the nature and danger of foul smells amongst the domestics of a household frequently leads to the introduction of poisonous effluvia into the house, which will often produce dangerous disease if not death itself. A large amount of the ordinary illness of

society, which costs so much pain and such long doctor's bills, arises from the utter ignorance of master, mistress, and servants of how to take precautions against the most obvious sources of disease.

63. An intelligent servant may undoubtedly do much in a household to remove the ordinary sources of disease. She may see to the integrity of the drains, the condition of the dustbins, the ventilation of bedrooms, cupboards, closets, store-rooms, cellars, and all places where organic matter changing may develop products poisonous to the human frame; but there is nothing so effectual for these things as an intelligent mistress. Of all classes in the community, the one to whom it is most important to teach the "Rudiments of Physiology" is the woman who is to become the wife, the mother, the mistress of a household. And yet the question is asked with a seriousness which is almost melancholy, "Would you teach girls physiology?" I answer emphatically—Yes. I say, if you could have the choice of teaching all the other classes I have mentioned and girls, I would prefer that you should teach girls—not girls of one class, but all girls. And yet, in the latest attempt which has been made to improve the education of women by the establishment of a College for their education, there is no provision made for teaching the subject of physiology. The only allusion to this subject in the prospectus is that it *may* be taken up with zoology, as one of four optional subjects for examination in

natural science. So long as physiology is thus treated by those who undertake the education of women, so long will the households of England be the prey of preventible diseases, and the melancholy spectacle exhibited of women whose culture is complete in every direction except that which enables them to care for the health and lives of their husbands and children.

64. To educate women for everything but household duties seems to me to be the acme of misdirected education. When these women once know what it is to become the happy mothers of children, how much bitterness must it cost them to know that the time they have spent in acquiring the accomplishments of music, singing, and dancing, or even the sounder acquirements of Latin, Greek, and mathematics, might have been spent in the study of that knowledge which would have prevented the disease and death which they are compelled to witness in their households. It is not amongst the poor and entirely uneducated alone that death occurs from ignorance of the laws of life. Few women among the middle and upper classes of society are at all aware of the causes of domestic unhealthiness. Let us take even the ordinary question of ventilating rooms. In many of the streets of London inhabited by the upper classes, the upper sash of the window is fastened, so that it is almost impossible for the room ever to be ventilated. Again, if the sashes come down from the top, if you walk down the streets of London in midday on a July afternoon, not

one in ten will be found open. Take again the present system of lighting rooms with gas. It is a fact that one gaslight consumes as much oxygen and gives out as much carbonic acid gas as five human beings; yet it is very common for families to dine and sit in rooms with five or six gaslights without any arrangement for ventilation. Such practices speedily develop diseased conditions which, if not arrested by a change in the mode of life, are followed by death. The bedroom is frequently lighted with gas, and no measure adopted for its special ventilation. Children are shut up in close nurseries and bedrooms. Carpets, curtains, and other bedroom and sitting-room furniture are allowed to accumulate organic deposits till they are sources of disease. Contagious diseases are allowed to spread from one child to another when by proper precautions they might be prevented or arrested when they first appear. Clothing is put on children without any regard to the nature and objects of clothing. The mother in the majority of cases dresses in the same way according to fashion, and not according to reason, and, therefore, no wonder that the children suffer. In the treatment of illness before the doctor is called in the most absurd remedies are tried. Sometimes the follies of homœopathy are played with in the shape of globules of nothing, where more serious and equally unreasonable dosing does not take place from the family medicine chest.

66. More serious evils even than these occur. I

hold one hundred inquests annually on children found suffocated in bed by the side of their mothers. If in other parts of this country this incident occurs to the same extent as in Central Middlesex, then 3000 infants are thus annually destroyed in Great Britain. I do not believe these children are murdered. In all cases verdicts of "Accidental death" are returned. But no one who knows the details of these cases can for a moment suppose that they are not to be prevented. In nine cases out of ten they result from the gross ignorance of the mother of the laws which govern the life of the child. The deaths of these 3000 children must be set down to the neglect of teaching women the nature of the function of respiration, and the necessity of fresh air for life.

67. There is another department of a mother's care which is often entirely misunderstood, and that is the artificial feeding of children. Amongst the upper classes direction is obtained from medical men, but amongst the poor and middle classes the most wretched notions are entertained of how to feed children. Nearly half of the children born in England die before they are five years of age, and a very large proportion of these deaths must be set down to diseases brought on by improper feeding. Amongst the most intelligent women the wildest ideas of the nature of food are entertained, and children when not suckled are subjected to experiments which in a large number of cases lead slowly but surely to the destruc-

tion of the health and life of the child. These are some of the facts which lead me to plead for the introduction of the study of the "rudiments of physiology" into our boarding-schools, and our middle and lower class schools where girls are educated.

68. I would also urge upon those who are engaged in the conduct of the College for Women, at Hitchin, in Hertfordshire, that they introduce a distinct professorship of human physiology, and that no student of the college should be allowed to take any degree unless she have passed a competent examination in this branch of science. There is no doubt that the proceedings of this college will be watched with much anxiety, and that, just as what is taught at Cambridge and Oxford influences the teaching in the grammar schools of the country, so what is taught at Hitchin will influence girls' schools all over the land. The college at Hitchin will not have the difficulty in introducing the subject that is so often found in schools already existing. Neither pupils nor parents can object. But at the present time, where the mistress of a school is strong-minded enough to introduce a subject like physiology, objections are raised on all sides, and this chiefly arising from the ignorance of parents of the nature and objects of physiology. Recently, at a girls' school with which I am acquainted, a lecturer, in order to illustrate the subject of respiration in water, exhibited the gills of a fish, and pointed out their adaptation for breathing

in water. The following week the mistress of the school received a severe reprimand from the mother of one of the young ladies, and begged that her daughter should not be required to attend any more "dissections." Although in this case the parent was the objector, it is not less frequently the case that the schoolmistress is the objector. Where women are conscious of their ignorance of the laws of life, and where they have large establishments dependent on them for health, there is a kind of fear that to teach their pupils the danger of over-crowding, the nature of good food, the necessity of regular exercise in the open air, and other healthy ideas, would be to let in a flood of criticism upon the management of the school that might seriously damage their reputation. I have occasionally heard lessons given on the nature of pure air and its necessity for health in rooms so shockingly ventilated that, if the pupils believed what they were taught, they would have been justified in breaking loose from the schoolroom and rushing into the fresh air of the garden.

69. Quite independent of any benefits to be derived from special classes by a knowledge of the "rudiments of physiology," I might show that every individual, whatever may be his position, occupation, or employment in life, would be benefited by such knowledge. In the first place, I might refer to the numerous instances where ignorance of the real nature of the laws of life is supplied by erroneous notions which,

being acted on, are productive of disastrous results. Thus, it is a prevalent notion that persons when taken out of the water are drowned by water accumulating in the lungs and stomach, and they are submitted by the ignorant to the almost certain destruction of what little vitality remains to a process of suspension by the legs in order to allow the water to pass from the lungs and stomach. In this way people apparently drowned are often speedily killed. If the bystanders were only partially acquainted with the "rudiments of physiology" they would, instead of pursuing this barbarous practice, have recourse either to the Marshall Hall or Sylvester method of treating the patient, and would probably save instead of destroy the life thrown on their care.

70. A not unfrequent cause of sudden death is the existence of varicose veins. A very simple means of remedying the bleeding from veins results from a knowledge of the nature of the circulation; and if pressure upon the bleeding vein was at once employed in these cases, many lives might be annually saved in this country. Arising from the same ignorance of the nature of the circulation persons who are found fainting in the streets are constantly placed upright sitting or standing, and in this way death is hastened. When persons are faint the simplest knowledge of the laws of life indicates that the upright position is that in which death is most likely to take place.

71. With regard to ventilation there is scarcely

any other subject on which the ignorance of individuals is so great. Even in the most cultivated circles the habit of closing rooms so as to exclude the access of pure air from without, and the retention of foul air within, is so inveterate that it is a constant source of ill-health, actual disease, and death. If individuals, whether masters or mistresses of households or servants, were instructed in the most common and obvious sources of disease from this cause, a great amount of evil would be prevented. If every individual in a household had sufficient knowledge of the conditions which produce fatal diseases such as consumption, and the origin and spread of such diseases as scarlet fever, typhus and typhoid fevers, it would be impossible that they should be the cause of a fourth part of the death of the population every year. It is a want of the simplest knowledge of how we ought to live that produces these diseases. It is not sufficient that the medical man of the district is supposed to have this knowledge; it is necessary that every individual capable of exercising his or her intelligence should have it.

72. What is true of air is true of food. Half of the population of every town of England die before it is five years old, and half of this death arises from a want of knowledge on the part of the mothers and nurses how to feed children. This knowledge is not difficult to impart. The great error in feeding young children is giving the food which is only adapted to

adults. A knowledge of the principles on which food should be administered to children might easily be given to the poorest, so that they might avoid the gross mistakes by which a large number of innocents are sent to a premature grave. The death from alcoholic poisoning in Great Britain is prodigious; it may be set down at something like a tenth of the whole death-rate of the country. It cannot be supposed that this is the result of a kind of madness which controls and subdues reason. The fact is the great mass of the population are not alive to the danger of the practice of drinking to excess. They know nothing of the nature of the alcohol they take, or of its dangerous effects upon the organs of their bodies. It is in vain to ask them to deny this indulgence unless they are taught the nature of the evils it produces in their systems.

73. It is no use to expect that any sanitary legislation will be efficient unless the people are prepared to appreciate it. The Government may bring a drain to every man's door, but if the householder is ignorant and negligent of its use, legislation is vain. The Government may enact laws for the appointment of medical officers of health, but this office is comparatively useless unless it is upheld by the convictions of the people that the plans he proposes are for their benefit. The comparatively little impression produced by the great staff of medical officers of health of London arises from the ignorance of the population of the

laws of health, not only of the poor who most need his services, but of the members of boards of guardians and vestries, the majority of whom are ignorant of the laws of life as the poor who are dependent on them for health and freedom from disease and death.

74. One of the great evils of a want of healthy public opinion with regard to the nature of disease is seen in the way in which the Government of the country tolerates quackery and imposture by giving licences for the sale of secret remedies. The practice of selling secret medicines, which is founded on an altogether erroneous estimation of the value of remedies in disease, could not be tolerated in an enlightened community. The medicines thus vended under a Government licence may be on the one hand utterly valueless compounds, incapable of exerting any beneficial effect on the system; or, on the other, compounds which, taken indiscriminately, are frequently the cause of death. It would be impossible for a government to raise a revenue on the sale of such remedies were the people educated to understand what are the simplest facts connected with their healthy bodily existence.

75. This argument applies not only to the sale of quack medicines, but to the employment of quack doctors. History never fails to produce empirics who, preying upon the hopes and fears of the diseased and their friends, have promised cures that have never been fulfilled, and who, by the want of physiological

knowledge on the part of the public, have made large gains by their unhallowed occupation. I need not here go into the history of medical imposture, nor point to its existence at the present day. Every intelligent man is aware of the success that attends the pretensions of the medical quack, whether he be in or out of the circle of the "legitimate practitioner." It is very certain that all these pretensions would cease before enlightened public opinion, and that people educated in even the "rudiments of physiology" could not be led away by delusive systems of medicine whether called hydropathy, homœopathy, or by any other name.

76. I might prolong these illustrations, but my object has been to show that no human beings have ever lived who would not be the better for instruction in the nature and functions of the human body. It is the function of the body which supplies the consciousness with all its knowledge and experience of the external world. If the body is deficient in vital power the mind becomes diseased. So little do we at present know of what the real nature of a healthy body is, that probably no man has yet witnessed that type of human excellence the *mens sana in corpore sano*, and perhaps never will till the time comes when every human being is thoroughly instructed in the laws which govern life and health. But short of this it may be demonstrated that just as men know what are the laws that regulate healthy

existence are their lives prolonged, wealth is increased, disease diminished, and death less dreaded as the inveterate foe of humanity. On this, of all other subjects, it may be most appropriately said, in the words of our great poet, that—

"Ignorance is the curse of God;
Knowledge is the wing wherewith we fly to heaven."

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