Lecture on the necessity of the study of physiology : delivered before the American Institute of Instruction at Hartford, August 22, 1845 / by Edward Jarvis.

LECTURE

ON THE

NECESSITY OF THE STUDY

OF

PHYSIOLOGY,

DELIVERED BEFORE THE

AMERICAN INSTITUTE OF INSTRUCTION,

AT HARTFORD, AUGUST 22, 1845.

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ON THE

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STUDY OF PHYSIOLOGY.

The going to school is so universal among children — every one goes so much, as a matter of course, as early as he can be taught to read, and as late as the convenience of the family can spare him from the more active employments of life,— and this is done so much from habit, that one hardly stops to find reasons for so doing. And it would seem almost a work of supererogation to ask a child to tell, why or wherefore he thus buffeted with the winter's cold, or sweltered in the summer's heat, as he waded through the snows of January, or toiled beneath the burning sun of August, to the school-house.

Yet it is not an idle question to ask, nor a useless one to answer: — What are the objects of a common-school education?

What do we hope to gain for our children, by thus sending them to the public schools?

In what way, or to what degree, may we hope to prepare them any better for the purposes of life, by this process of education?

These are questions so apparently self-answered, that it seems almost a trifling quibbling to propound them.

Yet it is worth our while to examine them — not so much because we doubt that they can be answered at all, as because we need to be assured that they can be theoretically, or are practically answered in the best manner. It is well for those, who are engaged, or are interested in the education of children, to call up these questions, and settle clearly in their minds, first: What are the great purposes of life? — and, second, how can the training and the instruction of the schools aid in effecting those purposes? What foundation can be laid in childhood, upon which can afterward be built the happiest and most useful, the fullest and most vigorous manhood?

These are questions not to be settled at once, and to so remain forever undisturbed; but in the progress of knowledge, in the new developments of science, they are to be again and again called up, to see how far new improvements in teaching, or new discoveries in science, may be adopted and made available in the education of the young.

There may be differences in the minutiæ of the answers to these questions, both as to the purposes which are to be effected or aided by education, and

as to the special preparatory means, by which these are to be brought about.

Yet all agree as to the first step. A child must first learn to read, and thus obtain the key to all other knowledge.

Beyond this step, every other is a questionable one; not so much whether it should be taken at all, as whether it should be taken sooner or later. Which shall be first taken? Shall the child step first into arithmetic, grammar, geography, or writing? Or, if so be, time and opportunity will permit only one of these studies to be pursued, and all the rest neglected, shall the boy now, and the man hereafter, be a writer, a geographer, a grammarian, an arithmetician, a philosopher, an astronomer, a rhetorician, a logician, a naturalist, or a physiologist.

Every one of these subjects of study is useful. Each one may be wanted in the course of life; no boy's education is full and complete without them, nor is he ready-armed and equipped for the chances and the responsibilities of manhood, without understanding each and all of them. But they are not all equally necessary. Man can live, he can perform the duties, and bear the burdens of life, better without some, than he can without others.

Writing seems the second article in education; reading is the first necessity, but writing seems the second. First, to learn for ourselves, second, to communicate to others that which we have learned; this is the general, perhaps the natural order.

As early as possible after learning to read and write, the child is taught geography, arithmetic and grammar. He may travel, he may read history, or the newspaper; he may be engaged in commerce; he must therefore know of his own and foreign lands, their situation, their people, and their productions; and therefore he studies geography.

He may hold converse with his fellows by his tongue or his pen, and it is desirable that he should convey his ideas in correct language. He must, therefore, study grammar.

He may buy or sell, he may be a trader, an accountant, at any rate a calculator. He, therefore, studies arithmetic.

These three, or these five, are deemed essential; their usefulness is beyond chance. No one is ready for life without them, so that in the present day, in New-England, scarcely is a parent found so ignorant, or faithless, or a master so selfish and niggardly, as to refuse a child or an apprentice an opportunity to become acquainted with them.

Many aspire beyond these, and crave more knowledge. They wish to meet other chances, and prepare for greater responsibilities of life. They aim to discipline their minds, to bring forth powers which can be applied to the varied objects, that may present themselves. They have a natural and a laudable desire to make themselves useful and acceptable to their fellows, to become agreeable members of society. They wish to understand the natural laws of motion,

and of substance, so that in dealing with matter, they may act in obedience to these laws,—they may avail themselves of the inclined plane, the screw, the wheel and axle, gravitation, &c., and without making mistakes, suffer no loss of time or labor. Natural Philosophy and Mechanics prepare them for these.

Chemistry enables one to make surer and better mixtures. Astronomy may guide him across the seas. Music makes him a more acceptable companion. And Painting gives to the scholar a peculiar kind of enjoyment.

With the knowledge of these and some others, men and women are not only educated, but accomplished; they are prepared to meet not merely the responsibilities, that must and do come upon every one, but those, which, in the varying chances of the world, may come upon them. So that, whether a man be a laborer, a mechanic, farmer, or merchant, whether he be master or servant, whether he live on the land or wander upon the ocean, he is ready for every emergency; his storehouse of knowledge contains every fact and principle which any occasion may call for.

Besides all this, he is so trained in the graceful accomplishments, that he is able to share in the courtesies, to mingle with the generous hilarities, and to give and partake of the enjoyments of social life.

Thus is a man supposed to be educated not only for the certainties, but also for the probabilities, and even the possibilities of life.

But in all this, there is one thing wanting, one study of primary interest omitted — the man has yet neglected to prepare himself to meet one responsibility, that, for every child of earth, comes first in the course of human life.

Before a man can become a geographer, a calculator, or grammarian, before he can reason or write, before he can be a merchant, a sailor, or mechanic, before he can engage in any of the occupations of the world or share in any of the burdens of society, he is appointed to live.

He may not necessarily be a trader, a traveller, a chemist, or an astronomer, but he must necessarily breathe, eat, and exercise, and carry on all of the functions of the living body.

The necessity of superintending the operations of life within his own body, inevitably falls upon every one, of every condition and every age. Whatever else he may be engaged in, whatever may be his tastes and means, this necessity comes upon him; it comes first, it takes precedence of all.

Without wishing to say any thing in derogation of the preparation for other responsibilities of life, whether certain or uncertain, I think I do them no injustice, if I now and here urge upon you the necessity of giving a high and front rank to the study of the Laws of Physical Life.

It is to these laws of Physical Life, to Physiology, that I wish to call your attention in this lecture.

Time would fail me, if I were to attempt to explain all of them; for a full treatise upon this subject usually fills one volume at least, generally more than one. But I shall only endeavor to explain a few of the laws, and those few, in regard to which we have some responsibility. I shall therefore confine myself to the subjects of the digestive system and digestion, the lungs and respiration, the skin and its functions, the locomotive system, the brain and nervous system, their method of operations, and their connections with, and dependence upon external nature, their dependence upon our volitions, and our duties concerning them. It is also my purpose to show the beautiful and happy consequences of health, and vigor, and protracted life, that follow the faithful obedience to these laws; and, on the other hand, the melancholy consequences of pain and weakness, of sickness and premature death that follow from our neglect and disregard of them.

But here I may be asked, What is this Physiology — what are these laws of Physical Life to us? We take life as we find it, and meet death when it comes. We eat, and drink, and labor; we breathe and think; we clothe and shelter our bodies, and enjoy the world as long as life lasts, and of what use is it to us to learn the way that food digests, and that air purifies the blood, or the effects of clothing, exercise, and mental labor upon the body? We know that few can escape sickness, and that death is the common and inevitable lot of mankind. And of what avail will the knowledge of Physiology be to prevent the one, or to ward off or postpone the other?

This is not a rare doubt, nor is it confined to a few of the uneducated. It pervades all ranks, the learned and the simple indulge in it. Its woful consequences are manifested throughout the whole world. But it is founded upon the ignorance of those very laws, which are neither understood, nor believed, nor obeyed.

There is a common, perhaps a general notion, that diseases come from without, and not from within; that they come down from Heaven, or arise up from the ground; that they and death are the messengers of Providence, and have nothing to do with the condition of our organs, nor with our faithfulness or unfaithfulness to the laws of our members.

A cursory view of the five organs and functions before spoken of, and of their relation to external nature, and our duty in respect to them, will show the fallacy of these notions, and convince us that our health and our strength are placed, by a generous Providence, in our hands to keep and sustain, and that we are truly responsible for their full and protracted maintenance.

All the works of the Creator are the results of infinite wisdom and of infinite goodness. There is a beauty and also a harmony running through them. Every one of these works is complete and perfect in itself, and perfectly adapted to its station in the universe. It is fitted to the circumstances amidst which God has placed it; to the elements that float about it, and is capable of effecting the purposes for which it was designed.

The human frame, as it comes from the hands of the Creator, is a perfect, self-sustaining, vital machine. It is composed of many organs of various kinds, which perform various functions, and effect different purposes; yet all of these so coöperate as to produce one grand result, which is Life.

In this collection of organs there is no redundance; there is not one too many, neither is there any one wanting. Each is made exactly of the due shape and size; it is placed in precisely the situation, and is endowed with just the powers needful for the performance of its duties. Each one performs its own work, and no other. Each one acts independently in its own sphere, yet is dependent upon all the rest for its power. No one is strong, if any of the others are weak. No one acts with its full energy, unless the others are also in active and undisturbed operation.

Man cannot breathe freely, unless he digest well; nor can he digest well, unless he have muscular power and muscular motion; nor can he have muscular power, unless the skin perform its functions faithfully. For any one organ to be well, all must be well; and whenever any one suffers and is weak, the others sympathise with it, and are also weak.

Some of these organs depend upon the external elements; all of them are more or less under the control of man; and so far as they are under his control, they are submitted to his direction, for good or for evil.

MAN RESPONSIBLE FOR THE USE OF HIS ORGANS.

The generous and provident Creator has given to man all the organs and vital machinery necessary for carrying on the operations of life. But he has left it to man, to set and to keep some of these in motion.

He has supplied man, or has given to him the means and the power of supplying himself, with all the materials and the elements upon which these organs are to operate. All directly or indirectly are supplied to us, and nothing is wanting for the support of our lives.

We are supplied with the digestive apparatus, by which dead food is to be converted into blood and flesh; and the same hand has furnished us with the elementary principles out of which that food is to be made. But it is assigned to us to select that food, to determine its quantity and quality, the times and the manner of eating, and to adapt the whole to the peculiarities of our individual constitutions.

We have given us lungs to breathe, and the air to enter them; but it is left to us to see that air is always pure, and fitted to effect the due changes in the blood.

We receive our skins from the Creator's hand, but we are to make and adapt the clothing and protection to their wants. We are to give them the needful cleaning and friction.

The muscles and the rest of the locomotive apparatus are made to our hands; but how much or how little these shall be exercised, is left to our control.

The brain and the nervous system are the creation of God. But how, and to what degree these shall be worked, to what purposes they shall be applied, it is left to our discretion and our volition to determine.

Thus we see, that in carrying on these functions of life, we are coöperators with the Creator. He has done one part towards this work, and left us to do the rest; and he has put into our hands the means and the powers to do what he has required of us.

What God has done for us is well done. So far nothing is deficient, and nothing is redundant. What we do, is done well or ill according to the degree of our intelligence, of our knowledge of the organs with which, and of the material upon which they are to operate, and according to the conscientious faithfulness, which we apply to our part of the work.

Seeing then that we are co-workers with the Creator in the work of sustaining life, it will be our first duty to learn what has been done, and what is left for us to do; to know the nature, powers and wants of our bodily organs; the purposes to which they can best be applied, and their capacity of endurance. We should also ascertain the nature and fitness of the material upon which they are to operate. Without this knowledge we may err and stumble; we may supply our organs with improper material, or apply them to improper purposes; we may thus create weakness instead of strength, and disease instead of health.

DIGESTION.

The most prominent necessity of the animal body is nourishment. The food, dead, lifeless upon our tables, is to be converted into living flesh with many attributes,— into flesh, that shall move, and feel, and think; that shall enjoy pleasure, and suffer pain. This is a mysterious work, a beautiful transition from death unto life; a wonderful process, wonderful beyond all others, and one which, were it not a matter of the most familiar observation to every man, would excite our interest and astonishment.

For this conversion of bread into flesh, God has given to us all the needful apparatus, the mouth and the stomach, and all their attendant and coöperating organs and parts, by which the food is digested and made a part of the living body.

In the mouth we see the lips, the cheeks, the teeth, the tongue and the salivary glands. Each one of these has definite purposes to fulfil, and definite acts to perform, and is exactly fitted with powers and capacities for those acts and for no other.

The Creator, in making the mouth, knew the objects, to which it was to be devoted, and provided all the means for effecting these, and no more. There is nothing in or about the mouth, which should not be used for these purposes, and there is nothing wanting to effect them.

In the mouth there are thirty-two teeth, of various shapes, for their various uses. The front ones are thin, to cut the food; the others are broad and flat, to grind it down.

About the walls of the mouth there are several glands, which make and throw out the saliva that waters the mouth, and mixes with the food. When the mouth is still, these glands are inactive, and throw out no saliva; but whenever we take food and begin to move the jaws, they commence their work, and manufacture and pour out as much of this fluid as is wanted to moisten the food that we are masticating.

This saliva is not merely to wet and soften the food, but it imparts to it a peculiar quality, which prepares it for the next step of digestion in the stomach. Nor will any other fluid answer the same end. It is a peculiar liquid made in these glands, and in no other place, precisely for the purpose of taking the first step in the work of digestion, which no other liquid can do.

It is the work of the mouth to grind down the food to very minute portions, and to mix it with the saliva; and the teeth and saliva combined reduce the food to a very soft pulp. When this is done, and well done, and not before, it is ready for the next stage of digestion.

Next, the food is transferred to the stomach, and there it is submitted to a second process of digestion, by which it is dissolved and reduced to a finer pulp, and is converted, by means of the fluids of the stomach, into chyme.

The stomach is a soft, fleshy bag, of various sizes, according to the quantity of matter which is contained in it. It is capable of great expansion, when unnaturally crowded.

It is composed of three coats, or layers of flesh. The outer coat is fat, thick and strong; the middle one is made up of muscular fibres, which are called the lean meat upon our tables. This coat is the one that gives all the motion to the stomach. These fibres contract and extend, as does the leech, or the earth-worm. They lay crosswise of each other; one set running around the sack, and another set running lengthwise of it, so that whenever the circular fibres contract, they must draw down the stomach as a string closes a bag, and when the longitudinal fibres contract, they shorten the stomach; and when both act, they lessen the internal capacity, and force the contents out.

The inner or lining membrane is soft, loose, and is sometimes thrown into loose folds, like the sleeve-lining, that is too large for the outer cloth. In some animals this inner lining is thrown into a cellular form, as in the stomach of the cow and the ox.

The structure of the stomach is familiar to all, who have eaten tripe. In that, the fatty surface shows the outer coat; the lean, stringy fibres show the middle or muscular coat; the cellular, or honey-comb like surface, is the inner or mucous membrane.

This lining membrane manufactures and throws out a peculiar fluid, called the gastric juice. This is prepared whenever the food is deposited within the stomach, and not at other times. It is a powerful solvent, so strong that it dissolves all the proper food that we eat, and reduces all, of every sort, to one homogeneous pulp. Whether it be bread, meat, vege-

tables or fruit of many kinds, all is reduced to one kind, and made the same in the stomach.

This process is a comfortable and an easy one, when the food is of a proper quality and quantity. It is painful and difficult, when the food is not suited to our wants and to the power of the stomach.

After this is done, the digested food is separated into the nutritious and the waste. The former is taken by innumerable little vessels, and carried from the digestive organs to the veins, and poured into the blood near the heart.

This is digestion; these are the processes through which the food must go, in the transmutation of bread, meat, and vegetables into living blood. These processes are established by nature; and the means by which they are accomplished, are all prepared by her.

These processes are necessary, and in the appointed order. Nature, when she established them, knew exactly the object which she wished to effect, and the material upon which she intended to operate. Therefore mastication, thorough and complete, and perfect mixture with the saliva in the mouth, must take place before the gastric juice and the coats of the stomach can do their work upon the food.

This is nature's law, absolute and unchangeable. No other fluid can be substituted for the saliva for first moistening the food, and the stomach has no grinding teeth to make up the deficiency of imperfect mastication in the mouth.

Nature made both the saliva and the gastric juice

of precisely the chemical composition, to follow, the second after the first, and to dissolve the food.

The dyer knows that he must use first one coloring matter and then another, to produce the desired shade, and each must not only be used in due succession, but each must have its due time to effect its work; and that all haste or neglect of any one of the processes, will be shown in the imperfection of the color at last. But not more certainly does this bad color follow the unfaithfulness, or ignorance in the performance of the work, than bad digestion will follow imperfect mastication, or insufficient salivation of the food in the mouth.

For all the work of the mouth, we are therefore responsible. It is for us to determine how faithfully and successfully this shall be done.

Yet, notwithstanding this is the unyielding law of nature, we see men and children eating their food as if nature had made a mistake, or done a superfluous work in giving them teeth, and had made the salivary glands for no useful or decent purpose.

There are many, who entirely misunderstand the objects of these parts of the mouth, and use them for purposes for which they were never intended. They chew tobacco all day long, but they cannot find time or interest to chew their food for the few needful minutes; they stimulate their salivary glands to furnish saliva sufficient to make themselves disagreeable, and even offensive, but they cannot afford this to soften their food, and prepare it for the stomach.

We are responsible not only for the work of digestion so far as it is performed in the mouth, but also for the selection of our food, for its quality and its quantity.

What shall we eat? How much shall we eat? These are questions which some affect to despise, as if they were beneath their notice; and their practice corresponds to their contemptuous disregard of these things.

There are others, who care more for these things; who eat for their palate and not for nutrition; who seem to forget that the stomach is not a cavern of illimitable expansion, and a repository for every sort of matter, which their perverted appetites may thrust into it.

Between these two extremes of stoicism and gluttony there is a great class, embracing almost the residue of mankind, who from ignorance, from thoughtlessness, or from convenience, violate, in a lesser degree, the law of mastication. They are not careful to select and eat that, and that only, which their systems require for their strengthening, and which they have power to digest. They eat that, which their cooks or their friends provide, without regard to its suitableness or unsuitableness to the wants of their frame, or the powers of their digestion; and after they have taken as much as the stomach and digestive organs can well convert into chyle, they eat a little more for appetite, a little more to gratify others, a little more for politeness' sake.

The consequence is sometimes oppression of the

stomach, and a heaviness of the whole frame, a languor of the spirit, and indisposition to exertion. Now and then, there is a pain and sharp distress; the remoter consequence is imperfect nutrition, and finally dyspepsia, which is frequently found throughout the land.* Men differ as to temperament. One is nervous and excitable, a second is sanguine and irritable, and a third is lymphatic and heavy. The nervous is over stimulated by the kind of diet, that only nourishes and invigorates the lymphatic. On the other hand, the lymphatic is dull, and hardly supported by that food, which is sufficiently stimulating for the nervous. Yet we see these men, of such various powers of converting food into blood and flesh, and such differences of excitability, all sit down at one table, eating of the same food, with the vain hope, that it will be equally beneficial to all.

HEART AND CIRCULATORY SYSTEMS.

The heart is placed nearly in the centre of the chest. Two sets of blood vessels go out from it, and two

* A man of fashion once said that it was vulgar to say, "What is one man's meat, is another man's poison." But he understood etiquette better than Physiology. Vulgar or not, it is true; and pity it is, that more men could not believe and regard it. Men differ widely as to their digestive powers. One can digest one thing, and another another, but they cannot interchange. They differ as to their wants of nutrition. The hard laborer in the field, or the sailor, needs a much more stimulating and strengthening diet than the scholar, the sedentary mechanic, or the female in the house.

sets return to it. One set carries the blood out to the whole body, another carries it to the lungs. Two other sets bring the blood back from the whole frame, and from the lungs.

They have not been defined. These arteries and veins all begin at the heart, in large trunks, like the trunk of a tree, and divide and subdivide again and again, like the branches, until they become almost infinitely small, and are lost in their minuteness.

The blood goes out in the arteries, and is distributed through these minute tubes, in every part of the body.

After passing through these minute arteries, the blood finds its way into the veins, which are equally small, and through these, it passes into larger and larger veins, until the last and the largest opens into the heart.

This is the circulation of the blood. It goes out from the heart through the arteries, and returns back to the heart through the veins. When it goes out it is of a scarlet color; when it returns it is of a purple color. At first it is rich with the new blood from the digestive organs; it has then been purified in the lungs, and is prepared with the nutriment for the whole body.

Nutrition takes place in the extremely small blood vessels, in the transition from the arteries to the veins. Out of the arterial blood which they contain, they supply the growth and the waste of every organ and every texture; the solid and the liquid, the fat, the lean, every kind of flesh, that is wanted in the

animal frame. The bone, hair, nails, brain, muscles, tears and bile, are created from this one blood in the arteries.

It is the universal law of animal nature, that life cannot abide long in matter. Our material bodies are composed of myriads of particles, that are now endowed with the living principle; but these particles cannot long retain it; they must soon give it up, and as soon as this is done, as soon as any particle gives up its life, the veins remove it, and the arteries immediately replace it with another and a living particle. This change, from death to life, is going on incessantly in all animal bodies, so that the particles that compose our bodies to-day, are not the same that composed us yesterday, nor will they be the same tomorrow. We are not the same identical beings from hour to hour. Hence comes the necessity of a new supply of blood, and therefore a new supply of food, daily and oftener; and this is the principal purpose of eating, to supply the wants of the system, and provide nutrition for the waste and the growth of the body.

The dead particles after being removed from their original places in the flesh, are now in the veins. They are dead, useless, a weight and a clog upon the system,—and yet they are in all the veins, and these are distributed in all parts of the body.

It is a natural question to ask, How shall these be removed from the body? They are buried in the very deepest recesses of our limbs, our trunks, our brain. How shall they be carried out? To us this

might be a difficult work, but to the Creator it is an easy one.

This matter, exhausted and dead, is composed principally of carbon; it is now in the veins, and mingled with the venous blood. All the blood of the veins is sent to the heart, and from the heart it is sent to the lungs, and there distributed through thousands of minute vessels, throughout every part of the respiratory organs.

LUNGS AND RESPIRATION.

It is familiar to all, that the wind-pipe leads from the mouth to the lungs, and that at every respiration the air rushes through this tube into the chest, and is forced out again every time we breathe.

The wind-pipe is a single tube in the neck, but in the chest below it is divided and subdivided, and this is done again and again, until it reaches almost infinitely small air cells, which lie everywhere in the lungs; there they lie in contact with the vessels, that have borne the blood from the heart to be unloaded of its dead particles.

Every hundred parts of the air contains about twenty-two parts of oxygen, and about seventy-eight parts of nitrogen. Chemically this oxygen has a stronger affinity to, or attraction for carbon, than it has for nitrogen; therefore, when the air meets this blood, which is loaded with carbon, in the lungs, the carbon leaves the blood in the veins, and the oxygen leaves the nitrogen in the air, and these unite together and form a new compound called carbonic acid. This

mingles with the air in the air cells, and is thrown out with it at every expiration.

The blood is now relieved of its dead burden ; the exhausted carbonic particles are taken from it and sent out of the body. It is changed from the purple to the scarlet ; it is sent back to the heart, and is ready again to be sent through the body to nourish and invigorate it.

When pure air enters the lungs, it is composed of pure oxygen and nitrogen ; when it goes out, it has lost some portions of its oxygen, and is loaded with some carbonic acid gas and some water. If breathed over a few times, all its oxygen is lost, and it is saturated with moisture, and very much loaded with carbonic acid gas. It is thus absolutely unfit for respiration. It has no power whatever of relieving the blood of its carbon. This is the condition, in greater or less degree, of all the air that has been once or more respired, and of the atmosphere of all inhabited and unventilated rooms.

The heart beats seventy-five times a minute, and sends its living blood to the general frame to nourish it, and its dead blood to the lungs as often to be relieved of its death. The lungs expand and contract from sixteen to twenty times a minute, and, at every respiration, they carry off the deadly burden from the blood. This is a work that, from birth to death, is never suspended, nor can it be stayed except with the suspension of life. Day and night, asleep or awake, the heart beats and the lungs move, and carry on the incessant work of nutrition, and of purification of the blood.

For this purpose of carrying the carbon out of the body, the atmospheric air and the venous blood precisely suit each other. The same intelligence that created the one made also the other. Exactly the chemical composition of the air, and no other, will relieve the blood of that quantity of carbon which it can best spare. If the air contained a greater proportion of oxygen, it would absorb more than the dead carbon and take away some of the healthy elements of the blood, and thereby weaken our bodies. If it contained less than the natural proportion of oxygen, it would be unable to bear away all the carbon that needs to be removed.

No chemist in his laboratory makes his analyses or his compositions with more precision, than nature does this work in the lungs of man. Her part of the work is well and faithfully done, and but little is left for us to do, but that little is absolutely necessary; all she asks of us is to give the lungs pure and fresh air, and to give the chest free play, so that it may draw in as much air as the decarbonization of the blood may require. These she must and these she will have, or she will not do the work well for us. She will not purify the blood except in proportion to the purity of the air we give her, and the freedom we allow her to carry on her work. If she have not sufficient pure air to do this, she will send back to the heart the unpurified blood. This impure blood is then sent from the heart to the whole frame, with its deathy load in part, or entirely, to impair instead of nour-

ishing — to disorder, rather than to invigorate the animal body.

This law of nature is fixed and cannot be revoked, nor modified in the least degree. As certain as the chemistry of the laboratory is the chemistry of the lungs — as sure as that nitric acid and potash, and nothing else, will make saltpetre — so surely will the air, precisely as nature made and compounded it, combine with the carbon of the blood, and make carbonic acid, and carry this out from the living body.

It is our duty, therefore, at every moment of our lives, to give our lungs fresh and pure air; not air that has been breathed over once and more, for that has lost a part or the whole of its oxygen, and is loaded more or less with carbonic acid gas. Nor should we breathe the air mixed with any other gas or substance, nor with the dust of streets, nor the exhalations of marshes, nor the smoke of lamps, of fires, or tobacco, nor the effluvia of shops or breweries, or of decaying matter.

The lungs were given us for this sole purpose of decarbonizing the blood, and for the formation of the voice. To use them for any other purpose is a perversion of their legitimate objects, and a violation of the natural law.

The next demand of nature is room for free expansion of the chest. In this, all she asks is to be let alone; she is content with non-interference, so that she may lift the ribs and spread the walls of the chest far and wide, and breathe deep and full, and give the blood plentiful supply of air to purify it.

These are the laws of our government, in regard to the lungs.

1. Give them fresh air.

2. Use them for no other purpose than respiration and the voice.

3. Give them freedom of expansion.

To these nature requires absolute obedience from us, and she gives in return the due reward of life and vigor, and buoyancy, precisely in measure of our faithfulness. But for all our disobedience, she will surely punish us with languor and imperfect life, in exact proportion to our neglect of duty.

One would suppose, that these laws of life are so palpable, that all would understand them, and so easy, that none would fail to obey them.

But such is not the happy history of the world, nor are the men and women of our day any better in these matters than their fathers were.

We live mostly in houses made as tight as the carpenter and mason can close them; we have, therefore, a limited supply of air, with none or imperfect ventilation.

A man of ordinary size and health consumes, or destroys, about two hundred and forty cubic feet an hour, that is, four cubic feet of air every minute. A room of average size, sixteen feet square and eight feet high, contains about two thousand cubic feet of air. This is enough for the respiration of six persons one and a half hour; but it is all that is allowed for a family of six or eight persons, for several successive hours.

Men work in shops even smaller than this room, where the air, which is not sufficient to last twenty minutes, is made to last half a day; and their chambers, where they sleep the whole night, are of still narrower dimensions, and allow less air for respiration.

I measured a shanty on the Old Colony Railroad in Dorchester, Mass., where fourteen laborers slept in one attic, sixteen feet long and fourteen feet wide; the roof comes to the floor at the sides, and rises only to six feet and ten inches at the summit. The whole capacity of this chamber is only seven hundred and eighty-four cubic feet. In this room there are no means of ventilation whatever; there is neither window nor chimney, not even a knot-hole to admit fresh air; nothing but a few cracks left by the imperfect carpentry. The entrance, not more than two feet square, was through a hole in the floor from a room below, in which nineteen persons lived in the day and five slept at night. The air of the lower room was therefore almost as bad as that in the chamber. And here, in this black hole, fourteen men slept through the night, and breathed over and over, for seven or eight hours, the stifled and corrupted air, loaded with the deathful exhalations of their lungs. Every one of these men wanted two hundred and forty feet of air, and the fourteen wanted three thousand three hundred and sixty feet each hour; and yet here were only seven hundred and eighty-four feet for the whole night. Here was enough to last the whole nineteen minutes, and yet it was used eight hours. It is not strange, then, that the men

told me, that they felt faint and languid in the morning, that they had neither spirits nor appetite, and they rushed, as early as possible, out of doors to catch some air to breathe.

I examined some two years since the great sleeping-room of the workmen who are building a new fort on George's Island, in Boston harbor. Here I found that one hundred and thirty-two men slept in a room about sixty feet long and twenty feet wide, and eight feet high. They were piled up one above another, almost to the very ceiling. The whole allowance of air was less than eighty feet to a man, not quite enough to last twenty minutes.

Travelling in the canal boats of New-York and Pennsylvania, and in the steamboats from Baltimore northward, I have slept in rooms almost as crowded as these, and have found the air of the cabins so suffocating as to be almost insupportable. I felt feeble and faint, and unrefreshed when I awoke.

This want of fresh air is not confined to the poor, nor to canal and steamboat travellers. We find the same evil in our public halls, in our churches, and in our lecture-rooms. I have several times lectured to an audience of five hundred persons, in a hall which contains about twenty thousand cubic feet, which gave to each person fifty feet of air, enough to last them twelve and a half minutes; and yet these meetings are continued from one to two hours, and sometimes longer.

It is rare to enter a church in the afternoon of a Sunday, without perceiving the closeness of the at-

mosphere. But our school-houses seem to be the worst supplied with this almost all-pervading element. In the course of my official duty, I find it one of my greatest sufferings to enter these halls of learning, (I might call them little dens of suffocation,) and breathe with the little sufferers their polluted atmosphere. A school-house near my home, is built of beautiful architecture, and strikes the eye as a grand evidence of public liberality. One room containing seven thousand six hundred and thirty-seven cubic feet, is arranged to accommodate ninety-two children, besides the teacher, and it has fifty-eight upon an average. Here is air enough to last the whole complement twenty minutes, and the average number thirty-three minutes. One school-house in Concord, Mass., gives seventy-five, and another forty-three feet to a child — enough to last them nineteen minutes in one case, and eleven in the other. I cannot say that these are fair specimens of school-houses throughout New-England, but they are good samples of those, which I have seen.

The lungs are created for no other purpose than to receive pure air and decarbonize the blood. They are of an exceedingly delicate texture, and suffer when any other matters are introduced into them. The coughs and the irritations that are excited, whenever any thing, as a drop of liquid, any gas which nature has not intended to be inhaled, gets into them, are manifest to all.

The law of life requires that these organs be appropriated exclusively to respiration. Yet we daily

and hourly see this law voluntarily violated by those who smoke tobacco.

Nature determined that the lungs should be expanded by the raising and spreading the ribs, and thus extending the diameter and enlarging the capacity of the chest, in order to receive the new air at each respiration. When this is done, the ribs fall, the chest is contracted, and the lungs compressed; and the air having done its work is forced out. This is the unceasing work appointed for all mankind to do. Nature has made no distinction between the sexes, nor between one man and another. Male and female, fashionable and unfashionable, she has created all with blood, that must be relieved of its carbon, with ribs, that lift and spread; and ordained that, by this motion, each and all should get their breath.

This is nature's law. But fashion has set up another law, and many there be that follow in her train. Between the laws of these two there is a painful conflict. The great Creator determined that the ribs should play and move freely; fashion determines that they should be kept still. Nature made the chest a cone, with its base downward; fashion has ordained, that though this is well enough in the male, yet it is better that the female should have the cone inverted. He that made us, so arranged our frame, that we should at every inspiration receive forty cubic inches of air into the lungs, and He has required that quantity to purify the blood. But a good portion of the world have thought they knew better than the Creator, and have concluded, that although

forty inches are necessary for a man, thirty inches are sufficient for a lady.

But all resistance to the law is vain, whether we violate it alone, or in the company of a multitude, or of the whole world; whether we err under the auspices of fashion, or in quiet obscurity, the law relaxes none of its requirements, and foregoes none of its penalties. The judgment surely follows upon every error. For the breather of impure air, for the smoker and the corset bound, there is less purification of blood, less nutrition, less vital energy, a lower degree of life.

THE LOCOMOTIVE SYSTEM.

The muscles are the sole moving organs of the animal body. They are the lean meat which we see on our tables; they are composed of strings or fibres, and these are arranged in bundles, and tied at each end to the parts which are to be moved. They contract like the earth-worm, and draw the parts to which they are affixed, toward each other. The muscle which closes the jaws, and which principally does the work of eating, has one end fastened at the temple, and the other at the lower jaw. When we eat or close the jaw firmly, by placing the finger upon the temple, this is felt swelling out, in proportion to the contraction.

The muscle which bends the elbow, is fixed at one end to the lower arm, just within and below the elbow, and at the other end to the bone of the upper

arm near the shoulder. By laying the hand upon the front of the upper arm, about midway between the two joints, we feel this muscle swell out every time we bend the arm.

The muscles are distributed throughout the whole body, and are arranged in such beautiful order and fitness, that every motion, however complicated, is made with astonishing precision and celerity.

By the means of the muscles we walk, we move the arms, we lift the hands, we roll the eye, and we articulate language; by these we do all our work.

These are strong or weak, according to the manner of their use. If never used, they have no strength; if over used, they are exhausted; but if used with due discretion, they are very powerful. These are put into our hands, to exercise them much or little; to apply their powers to such purposes as may seem good to us.

To a certain degree, muscular exercise is absolutely necessary for the development of this system, and for the vigorous action of all the rest. Beyond this degree, and within certain limits, muscular exercise is allowable; and this we can apply to our labor, and to our enjoyment. But if we trespass beyond those limits, and over-work, then comes exhaustion and reduction of life.

These are our laws which we should, each one of us, study and apply to ourselves. Obedience brings its sure reward, and disobedience is followed by its inevitable punishment. The violations of this law are manifold and manifest; they come within the ob-

servation of every one; we sometimes commit them ourselves.

Some men and women keep themselves in their houses for days, and perhaps for weeks together, vainly imagining their muscles will not lose their power, and their nutrition will go on as well, and their brain will be as clear as if they bestirred themselves abroad.

The book-keeper, who stands at his desk in his counting-room,— the tailor and the shoemaker, who confine themselves to their benches,— the student who loves his books better than any thing else, and grudges the time spent away from them,— all these may think, that because their professions do not need labor, their frames do not require exercise, and they may carry on the operations of life as well without as with it. But they sin against the law, and its judgments overtake them in the measure of their delinquency.

An over anxious mother guards her daughters with injudicious care. In her notions of female education, fatigue is a stumbling-block, and the weather is a bug-bear. Her girls are cautioned not to worry themselves with walking or active play. They have no employment nor amusement that will call forth muscular exertion; consequently they grow up inactive and feeble. The power of their limbs is never brought out, and the strength of their whole frames is never developed. The energies and the health of all their other systems are feeble like those of the muscular. Their digestion is bad, their respiration

imperfect, and their brain is languid. All that portion of life which consists in action, courage, and command of their physical and moral powers, and readiness to apply them to the common and ordinary purposes, has never been born. Their listless days drag heavily onward, and they have a quantity of existence, less than their latent powers might have given them, if they had been called into exercise.

On the contrary, some violate this law of exercise, in the opposite extreme of over exertion. They seem to consider that the whole energies of the body may be concentrated in the muscular system, and that the whole purpose of life is work, work, and this almost unceasing. So they make long days and short nights, and find hardly time for their hasty meals. In this endeavor to over-work and over-produce, they do for a time succeed, and they congratulate themselves because they are more industrious and therefore more prosperous than their neighbors; and thus they go on adding toil to labor, in the vain expectation that they will be able so to continue, until they shall have fulfilled the measure of their days.

But nature here is watchful of neglect, and will not alter her law. This over-exertion is only an expenditure of future income,—a borrowing of life and power from the days that are yet to come,—and, when those days do come, they find them exhausted and comparatively powerless. Old age comes prematurely. Then in the midst of the natural term of earthly existence, but near the end of their days, they are decrepid and useless, because they have

squandered their strength, and they are now suffering the consequences of their improvidence.

The same is true in regard to any unwise expenditure of any power, whether physical or mental, for however short periods. All great and over-exertions of the mind or body, are followed by more than a corresponding lassitude, or weakness. One day or one week of extraordinary labor, is followed by more than a day or a week of extraordinary depression. The loss is always greater than the gain; and the man accomplishes less by irregular labor, than by that systematic industry, which expends on each day its own strength and no more, without ever borrowing of that usurious lender, that unrelenting Shylock, the future.

LABOR AND REST.

Nature has appointed the succession of labor and rest; for this she has provided the alternation of the day and the night. The motions of the earth and the necessities of our frames correspond exactly with each other. The day is the time for labor, and the night the time for rest. Yet we often partially, sometimes entirely, reverse this law, and turn night into day, and day into night. We sleep while the sun is shining with his life-giving beams, and work amid the deathful influences of darkness. Thus we are exhausted more, and refreshed less. Life and power are not sustained in their highest degree, and we are more susceptible of disease and pain.

Some will go farther than this, and add the night

work to the day toil. Franklin, with all his wisdom, seems to have had an unwise notion, that a man could work with his hammer from four o'clock in the morning until nine o'clock at night. Many will do full six days' work in the week, and add to this all the extra labor of going to market, of travel in public night conveyances. Six days' work a week, is the regular predetermined plan, and all variations from this are encroachments upon the time of rest.

Some seem to suppose, that although they would not transgress so far as to work in the night, yet they may perform their full day's labor, and devote a night or part of a night to pleasure, to charity, or to the acquirement of knowledge, and yet suffer none of the consequences of depreciation of life. But nature, though a generous giver, is a hard bargainer. She proposes no bargains, but if man does so, she makes a hard one for him. For every moment he takes from his natural rest, whatever may be the cause, he must suffer a loss of some of his natural vigor, and lay a tax upon his permanent constitution, greater or less in proportion to his delinquency; and invariably, in the long run, he will gain less ability for labor, and accomplish less by attempting to overmatch, or cheat nature, than if he trustingly take her upon her own terms.

SKIN.

The skin has a two-fold duty to perform. It is appointed to protect the body from the elements, and from external injury. It also aids the lungs in carrying off the wasted and useless elements of the body.

The insensible perspiration in health never ceases. This amounts to near two pints a day. These particles, like those that go off from the lungs, have finished their work of life, and seek this outlet. They are a burden and a poison to the body, and cannot be retained without injury. Our duty is first, not to interfere with or retard this work of relief, and next to aid this organ all in our power.

The perspiration, and the oily secretion of the skin, unite with the dust that floats about, and with the lint of the clothing and form a glutinous compound, which stops the pores, and obstructs the excretions of this organ, and interferes with its free operation. To relieve itself of this, the skin needs bathing, frequent and faithful.

We do indeed bathe the hands and the face, but these we wash to be seen of men, while the residue of the surface may be full of all uncleanness. Very few purify themselves with a daily bath throughout. Some indulge themselves in this as an occasional luxury, or submit to it as an unfrequent and dreaded penance; but the great majority of mankind feel no responsibility for the health of this organ, and from summer to summer, even from year to year, they do not wash, but carry upon themselves the corrupting waste that has ceased to live; the gathered filth, the accumulated excretions of months and years, remain upon their skins, a deadening clog upon their living operations.

Our natural defence against the elements is greater or less, in proportion to the vital energy of the skin.

This power of defending ourselves from the cold is a matter of development and of growth, not of entire and original creation. Like the strength of the muscles, it increases by use, and it diminishes by neglect. This is proved by the face, which is never covered, and is able to endure almost the severest cold of winter without suffering, because its powers have been taxed and developed; on the other hand, the skin of the breast, which is never exposed, is so tender, as to be hardly able to endure the temperature of summer, without the protection of clothing.

The same difference of power of endurance is seen in persons of different habits. The timid, who confine themselves to hot rooms, and never venture abroad without abundant covering, are chilled and suffer severely, when exposed to any storm, or to the open air of winter; while, on the other hand, stagemen, pilots and wagoners, who expose themselves to every variety of weather, are able to endure the severest cold and storm, with impunity and comfort.

The energies of the skin are reduced down to the level of the demands that are made upon them, however low, and they are nearly raised up to meet these demands, however high they may be; so we see those people, who always wear upon their persons a great quantity of clothing, always shiver if these are diminished; and those who wear comparatively light garments, will need no more, for their skins have brought forth great powers of protection, and will themselves do that work which we require of them. It is not a strange thing, therefore, to see two men

walking side by side, in winter, whose habits illustrate this principle. One accustoms himself to exercise abroad in every kind of weather; he has his daily cold bath, and now wears only his usual close dress; the other takes no bath, and goes out only in pleasant weather, and then he puts on his heavy extra garments. Both of these men are equally warm, the one by the natural energies of his skin and vigor of his frame, the other by his artificial covering.

Coughs and colds are frequent among our people, but they are more abundant among the timid and the over-cautious, than among the bold, that use their powers freely, and have no fear of the atmosphere. Shoemakers, students, and women, have these disorders much more frequently than farmers, carpenters, and sailors.

BRAIN AND NERVOUS SYSTEM.

The brain and the nervous system are the organs of thought and sensation, and the regulators and directors of all other systems of the animal body.

These seem to be more elastic as to their habits and powers, than other organs. The mind, the infinitely expansible mind, has been held up as the grand distinguishing characteristic of the human family, and this is not done without good reason; but whatever we may say of the mind, the spiritual essence — the physical brain, which is its organ of connection with this world, is not so lawless and expansible. It has its limits of power, of exertion and of direction; and

if not used aright, it is liable to disturbance and disorder, as are any of the organs of the animal body.

But there is a great proneness to disregard this law, to press the mental exertion to its utmost, to tax these powers as much as they can possibly bear. This is the most seen in the education of children, who are hurried onward in their pursuit of knowledge, and urged to become bright scholars, sometimes prodigies of learning, and their extraordinary and precocious development is hailed as the bright promise of a brighter future. But just so far as the brain is tasked beyond its natural power, and makes unnatural exertion, the consequences must be weakness and failure of all the previous promise. This is the effect of undue stimulation of the brain in childhood. The same result comes from the same treatment of the organ in after life. Weakness and derangement, dementia or insanity, come from undue use or improper application of its powers.

We are therefore required to suit the burdens imposed upon the brain to its capacity of endurance, not to over-load and oppress, and finally weigh down and destroy it; nor, on the other hand, leave it dormant and inactive.

MAN'S RESPONSIBILITY FOR HIS HEALTH.

These are some of the most important organs and systems of the human frame, and these are some of the essential conditions of their existence. No one of these organs is the seat of life, to the exclusion of

the rest. But any one of them may be the seat of death, and include all the others in its destruction.

God has created this beautiful frame with its hundreds of muscles and bones, its thousands of blood vessels and nerves, its complicated digestive apparatus, its nicely adapted lungs, its active skin — and all these he has formed into systems and organs, and given each a separate duty to perform for the general good. Each has its peculiar work to accomplish, yet not without the co-operation of all the rest.

All these systems and organs, varied yet harmonious, constitute the machinery of our life. This machinery, thus constituted and complicated, is placed in our hands to govern, to supply its wants, to adapt the elements of nutrition and excretion, food, and drink, and air, bathing, exercise and rest precisely to the necessities and condition of each organ; and out of the whole to produce the greatest amount of strength and health.

This is our responsibility, this is the harp of a thousand strings, which we are to play upon, and to bring forth the sweet music of energy and cheerfulness. We are to play, each one of us, upon his own harp. Whether we thoroughly understand the instrument, its powers and its uses, or whether we are perfectly ignorant of them, still we are to be the players, and the music, gentle or harsh, must be such as we individually are able and willing to produce.

Each one of our vital machines has its own director, and admits of no substitute. And the amount of vitality, which we shall enjoy will be in propor-

tion to the skilfulness and faithfulness of this direction.

This, I am aware, is a fearful responsibility, and some, in distrust of their competence to sustain it, would fain shrink from it. But all in vain is any attempt to escape. We must sustain this responsibility, or we must fall. No one can assume it for us, no one can take from us the blessed consequences of obedience, no one can bear in our stead the dread effects of failure; as we individually eat, and breathe, and move, so shall we alone live or die.

But there is a general notion, that some how or other, these laws of life are not quite so inexorable; and common and careless observation seems to prove, that they are not always so absolute in their requirements, nor so inevitable in their penalties. We are told that many are acting in opposition to them, yet are not cut off. One works night and day, and is not broken down; another never exercises at all, and yet has power of motion; a third eats all sorts of strange compounds, and has no dyspepsia; and therefore some think, tbat men may give free reins to appetite, may drive their muscular energies to their utmost tension, and the student may bury himself in his books, and yet expect to rise in unimpaired health.

But the judgment is sure, however blind we may be to it. Not every sin merits annihilation, but every one has its corresponding punishment. The loss of that specific strength, or power, or comfort, which obedience would have given, is the first result of neglect. That specific pain or disturbance, which is

the natural consequence of error, is certain to follow. As we have no exact standard of health, no precise measure of life, we cannot easily determine when and how far we fall short of either. If we are about as well as our neighbors, we flatter ourselves that we do not suffer, although we do come short of that fulness of vitality, which we might have obtained.

The laws of life are as fixed and unalterable, as are the laws of matter. The ebb and flow of the tides are not more certain, than the ebb and flow of the blood. The predominant affinities of one acid over another for certain alkalies, are not more clearly demonstrated in the chemical laboratory, than the affinity of the oxygen in the pulmonary air-cells, for the carbon in the blood.

These laws are written in every human constitution, they are visible to every eye, they can be recognized by our own sensations. They have thus been proclaimed ever since the world began, but man has been slow to read, and dull to understand, and still more unwilling to obey.

It is melancholy to see, how many of the habits of mankind, and how many of the customs of society are established in contravention of these laws. It would seem as if men were ignorant of them, or did not consider them as designed for human government.

We have therefore devoted our organs and powers to purposes, for which the Creator did not intend them. We have forgotten the designs of our present being; we have mistaken the means for the end.

We have sometimes eaten for appetite rather than nutrition. We have toiled for riches rather than for exercise and support. We have involved ourselves in corroding cares and distressing anxieties about things, which are not for us to do or to accomplish. We expose our bodies to undue heats and colds. We have wrong notions of self-sacrifice; we give up that which is not our own, but only entrusted to us by God for a special purpose. We undertake burdens, which the Creator has not given us strength to bear. We admit the caprices of fashion to influence our clothing, and often sacrifice comfort and health to our notions of beauty.

The texture and form of our garments are selected to please other men's eyes, rather than to meet the law of our necessities. These necessities are permanent and universal. Yet we see strange contrarieties in the shape of the garments in different persons, and in different years. At one time, fashion commands that the collars of our coats be full and reach the head, and that the neck be encased in shawls and scarfs, and heated to constant perspiration. In another age, the same fickle governess directs that the collars be low, and the neck be left open and exposed even to the wintry cold. We see, in the winter, men shod in the stoutest water-proof leather, walking by the side of women clothed in silken hose and satin slippers, and both seem to imagine they are obeying the same law of life.

The stomach is the instrument of hospitality; and a man proves his love for his friends by filling

this organ. Disregarding the wants of nutriment in the frame, men are called to eat together, in public or in private, of quantities and qualities of food, that the digestive organs cannot convert into blood, and the nutrition of the body does not require.

In this entertainment of friends, it is wonderful to see how minute is the gnat, which the entertainer will strain out, and how monstrous the camel, which he will swallow down! How anxiously careful he is about trifles, and how indifferent he is concerning matters of importance! How diligently provident he is about the flavor of his wine and cigars, and how reckless he is, whether his food be digestible and nutritious, or not.

A lady proposes to have a large party at her house. She designs to give her friends the keenest intellectual and physical enjoyment, the highest exhilaration. She provides the richest and nicest eatables for their palates, but she feeds their lungs with the foulest air. Her apartments can contain no more air than is sufficient for the respiration of her ordinary family, nor more than is enough for the purification of the blood of six or seven persons, as it incessantly flows through their hearts. Her table is measured out according to the every-day wants of her household. But now she carefully numbers her invited guests and enlarges her table correspondingly, so that there shall be no lack of eatables, which they do not want, and which probably will be injurious. But she neither enlarges the capacity of her rooms, nor increases the quantity of air, which they must have.

What indigestible provision would be sufficient to feed her own family with dyspepsia, is now multiplied manifold, to meet the increase of mouths, but what air is no more than sufficient to supply her usual family with breath and purify their blood, is now distributed among, and made to supply a multitude; and this hospitable entertainer, mistaking the means of benevolence, serves out death without measure, while she deals out life with the most niggardly economy.

In this hospitality, the appeal is made to one sense only, while the others are neglected. Taste, the palate, seems to be alone thought worth indulging; and so accustomed are we to this species of gratification, that it might seem strange to propose to substitute another in its place, and appeal to the eye instead of the tongue.

People eat at their regular meals all that they need, all that their stomachs can easily digest, or their nutrition requires, — of course then, all that they can permanently enjoy. After the day's work is over and the day's food is consumed, they gather in parties where refreshment is again offered them of tempting deliciousness. The single sense of taste is gratified; but the stomach is burdened, and the energies of the whole frame are taxed in order to digest this food, which is not wanted. Digestive disturbance, and some general languor necessarily follow. The evil consequences are more than momentary, they may be lasting.

It as rational and as pleasant to gratify the eye as

it is to gratify the palate. It is as humane to burden the skin as it is to burden the stomach. If, therefore, our hostess should hope to entertain her company by providing a vast number of cloaks of the most beautiful texture, and most gorgeous colors, and invite her company to put them on, yea more, urge them to pile on as many as they could carry, no matter how much they may heat the skin, and oppress the body, so long as they please the eye, she would have as healthy, and to the physiologist, as rational a mode of entertainment as that which is now adopted.

It would seem most ludicrous to do so. But, if we we were not accustomed to our present practice, this would appear equally ludicrous. It is surely as generous and as hospitable a method of entertaining our friends, when they visit us at our houses, if we were thus to provide the means, and ask them to sweat for us, with the certainty of some debility, and the remote chance of some cold and rheumatism, as that which we now offer, when we ask them to digest for us, with the certainty of some oppression, and the remote chance of some dyspepsia.

If it were not a matter of such grave importance to health and to life, it would provoke a smile to see with what sincere assurance a man, who intends to be generous and give enjoyment, asks his friend to lend him the use and the comfort of his vital organs. But this is among the acknowledged customs of society.

It is said that Dr. Franklin, when, in the early stages of the revolutionary difficulties, the British

ministry proposed to him, that the Americans should pay for all the expense of their attempts to force them to submit to the Stamp and other oppressive Acts, provided that those offensive laws should be repealed, told them the story of the madman, who ran into a street, and with a red hot poker in his hand, and asked a passenger to allow him the privilege of running it into his body one foot. This was refused. He asked to be allowed to run it in six inches — then one inch — and when he obtained no permission of this sort, he asked, with the utmost sincerity, if the man would not have the goodness to pay him for heating the poker.

This story finds a parallel in our hospitable entertainments.

Our host offering to his friends his great variety of richest food, of most exquisite cookery, practically says to his guests: "Allow me, my friends, to give you a little indigestion." Probably they indulge him, but perhaps they have the courage and good sense to refuse. Not to be foiled, he offers the wine: "Permit me, my friends, to disturb your nervous system, and suspend the clearness of your brain." Still they may not yield. Holding out his cigars, he says, "Allow me, my friends, to disturb your respiration and befoul your breath a little." If their courage hold out, so does his, and with all the self-satisfaction and sincerity of the madman in the story, he says, "Then, gentlemen, you will have the goodness to stultify yourselves so far as to give me the credit

of being very generous, and doing all this solely for your comfort and happiness."

DEPRECIATION OF LIFE.

The consequences of all these violations of the law of life, are seen in the diseases, the debility and the premature death that come upon almost all mankind.

Threescore and ten are the years appointed for man; but few and feeble are they, who thus fulfil their days on earth; and it needs no prophet to tell us that, until we learn to live according to God's appointments, we must fall short of this measure.

The average duration of life differs very widely in different places, and still more widely among different classes of society. But in all it is short of nature's intention.

The average age of all, who died in Massachusetts during three years, ending May, 1844, was 33.74 years. And from calculations made from the records of various periods, the average duration of life was, in

England and Wales . . .	33.74	years.
Prussia, ...	27.77	"
Sweden, ...	27.00	"
Russia, ...	19.18	"
Concord, Mass.	38.87	"
Dorchester, "	32.54	"
Plympton, "	40.88	"
Louisville, Ky.	17.87	"

In the most favored of these towns and countries there was an average loss of three-sevenths of life, and the most unfavored more than five-sevenths.

In analyzing the people into different classes, according to their social condition, it is found that the burden of death lies much heavier upon the poor and the ignorant, than upon the prosperous and the intelligent. The Report of the Poor Laws' Commissioners upon the sanitary condition of the laboring classes of England presents some astonishing facts in illustration of this position. The average duration of life of the families, including fathers, mothers and children, of the comfortable and poor was, in

	Comfortable.	Poor.
Derby, ...	49 years .	21 years.
Bethnal Green, ...	45 " .	16 "
Liverpool, ...	35 " .	15 "

The same was shown in other parts of England.

I found similar facts in Dorchester, Mass. I analyzed the bills of mortality for twenty-seven years, and found the average age of farmers, who owned their farms, including parents and their families, was . . . . . 45 years.

Of the poor, ... 27 "

In Concord, Massachusetts, the age of the comfortable was . . . . . 44 years.

Of the poor . . . . . 24 "

Wherever I have been able to obtain the facts, I have found a similar difference of value of life among the prosperous and among the indigent. I doubt not the same would be shown in Hartford, and throughout this and all the other states. Here we have the irresistible fact, that from the wealthy and intelligent, from two-sevenths to one-half their life is taken away, and among the poor from one-half to four-fifths is lost.

Nor is this all, that we fall short of our destiny on earth. Even this short period, averaging throughout the world much less than thirty-five years, is diminished at every stage, reduced at every turn, and taxed throughout with innumerable burdens. The whole catalogue of diseases, whose name is legion, is born by our race.

Deduct the months during which we are prostrated by disease, and under the control of others — deduct the seasons, when, though we are not diseased, yet are invalids, with constitutions broken and powers wasted, dragging on a wearisome existence in premature old age — deduct the periods when our energies are somewhat paralyzed, and our strength so far reduced below its just standard, that we cannot enter upon the full tide of active business, which men in health freely venture upon, and therefore enjoy less and accomplish less than other men — deduct the periods when we are slightly ailing, whether from cold, from headache, or other trifling cause, when our frames are sluggish and our resolutions dormant, when we cannot do in the day and the hour, its own appointed work — deduct the times when we are heavy, stupid and inactive, when our energies are absorbed in digesting improper or excessive food — lastly, deduct the moments when we are irritable in temper, timid of purpose, or gloomy in spirit, when our moral powers are weakened and disturbed, and our mental faculties confused or oppressed — add to all these deductions the thirty or forty years that we lose by premature death, and then deduct the whole

from a complete human life, threescore and ten years, from two thousand, five hundred and fifty-five days of health, unimpaired by any sickness, and unalloyed by any pain ; and it is wofully manifest how small a portion of our natural destiny we obtain out of the means and facilities which a generous Providence has placed in and about us.

Seeing, that our short comings of life are so great and so manifest, it is worth a serious inquiry to learn the cause, and a resolute endeavor to remove it.

It cannot be questioned, that this depreciation and shortening of life are mainly chargeable to the general ignorance of the conditions of our existence on earth, and to a consequent failure to fulfil them. The knowledge of the Laws of Physical Life has not been and is not now considered requisite for the conduct of our lives. Nor are the young instructed in these, in order to prepare them to meet and avert the ills that flesh is heir to. Physiology has not been included among the necessary studies of our schools, nor have men in older life thought it worth their while to attend to it.

Other matters have been examined and learned. Natural Philosophy is taught in our schools. It is known more or less to all ; almost every man acknowledges and acts upon its general principles.

The laws of gravitation are so universally understood, that no man is so simple as to dig his ditch for water to run up hill. All are so familiar with the laws of mechanics as to make a ready and correct use of the inclined plane, the screw, and the wheel and axle.

Chemistry and its terms have become almost as familiar as household words; and in our employments, and in our domestic operations its principles are not usually violated. But the principles of Physiology have been regarded as belonging to one of the occult sciences, which might interest the student, but had nothing to do with the practice of every-day life.

We therefore see men managing their farms and carrying on their mechanical operations in wisdom, while they manage their own bodies in folly. Before a man assumes the care of a machine, he examines its parts, he learns its uses, the means of its movement, and the purposes to which it is to be applied. With this knowledge he is ready for his responsibility. He provides the proper material, with which it is to move; and that, upon which it is to operate. But for the management of his own vital machinery he makes no preparation. Hence he makes such mistakes in the conduct and use of his own body, as he would be ashamed to show in regard to his wagons, his water-wheels, or his spinning-jenny.

If a man, when he has woven his web, should put into his loom a parcel of sticks and wire, and then set the loom in motion, just for the pleasure of seeing it move, or perhaps in the hope that the loom would, out of these hard materials, make cloth as well as out of cotton and wool, he would do a very foolish act; but not more foolish than, when he has eaten enough for nutrition, he eats indigestible and innutritious matters, just for the pleasure of eating. No engineer

would pour upon the gudgeons and pistons of his engine acids instead of oil, just for a change, because this would be in opposition to his knowledge of the laws of mechanics, and spoil his machine. Yet he will pour wine and brandy, and tobacco juice into his stomach, and tobacco smoke into his lungs, which are infinitely more delicate organs than any thing of wood or iron.

If a dyer should use his old dyes over and over, and expect to produce fast and deep colors, or if the chemist should use acids over and over and expect to produce good salts, he would show himself so ignorant of his business as to lose employment. Yet men will breathe air over and over, and seem to expect that, by these imperfect means, they shall purify the blood.

If the laws of life were as well understood as the laws of matter, we should see no more mistakes in the management of our bodies, than we do in the management of our machinery; and if Physiology were as well taught in school and elsewhere as Natural Philosophy, its principles would be as familiar, and as ready for use.

The remedy then, for these evils and errors, is to incorporate the study of Physiology in the course of universal education. Give this science a prominence in all our schools, in proportion to its importance, to its bearing upon human health and human life. Then will men be saved great suffering, and be so far prepared to fulfil their natural destiny on earth.

Note. On account of the great length of the preceding Lecutre, and want of time, part of it was omitted at Hartford.

The readers of the Christian Examiner will here recognise many of the sentiments and some entire paragraphs which I published in that Journal for July, 1843, and which are here taken without acknowledgment. E. J

Dorchester, Mass., *Oct.* 17, 1845.