THE CIRCULATION OF THE BLOOD. Aug. 19/ 01.

A stereopticon lecture by J.H.Kellogg, M.D.

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Ladies and Gentlemen: I propose to talk to you a little while to-night about the circulation of the blood; and I am not going to talk very long at this time, because you will have an opportunity to see the circulation of the blood to-morrow night. We will have a number of microscopes arranged so that you can take turns in looking through them and in seeing the circulation of the blood in a frog's foot, and thus see just what is going on in your own bodies; but, in order to make clear to you what this function is, and what you are really looking at, I will first give you a few words of explanation of some slides or views which will be placed before you .

"The blood," the Bible says, "is the life;" and physiologists reiterate this fact, if possible with redoubled force, saying that the blood is the life, and the blood is the healing agent of the body.. The blood is the body-builder and the body-healer; there can be no question about that .

First, what is the blood? Let us think a moment about that. We begin with a representation of living cells. These cells are in the form of a clear, transparent jelly with a few granules in it, as you see represented here, the central portion being called the "cell." Professor Huxley has written upon this subject.. These cells have been differentiated; they send out little filaments or hairs, or protoplasm which, in the water, undergo a constant movement. By this means these little masses of protoplasm are able to move about in the water and have the power of locomotion. This that you see down here is a sort of white slime ~~which~~ such as you can scrape off from an old stone, or perhaps a watering trough. Sometimes they are round, sometimes they are elongated, and sometimes they are like the tick of a sheep; they are such as you see

here. (Screen.) Here is one putting out feet. Here are the legs that it puts out. This curious little mass of jelly has no feet, but it can walk; it has no hands, but it can feel. It has no brains, and yet it seems to think and to have a volition. It has no stomach , and yet it can digest; it has no mouth, and yet it can eat. If it wants to eat s mothing, it makes a mouth and surrounds the morsel which it wishes to eat. It is called the amoeba. Suppose this little amoeba wishes to eat s mothing,--it puts out a lip on one side and then on the other ,and gradually approaches the morsel until it surrounds it and eats it. You see here it has taken in a little mass of chlorophyl. This amoeba grows in a stagnant pool. We have the same thing in the human body,--the same thing which you find in a stagnant pool--the amoeba is to be found in the human body; they are smaller than the amoeba which grows in the water, but they are of the same character--their functions are the same ,- they are able to do just the same things as are accomplished by the amoeba. This is a very interesting fact which has been brought out by the physiologists of modern times,--and that is what I want to show you next.

First, we have the wild amoeba in the pond; and then we have what you might call the tame or domesticated amoeba in the human blood. Here is one taking in a little speck of food. Here is the white corpuscle,--here is one in its resting state, and here is one moving about It puts out a foot and draws the rest of its body up to it, and in this manner it moves about from point to point . Here is the nucleus of a cell. There is about one in two hundred corpuscles in the body represented here. There are different varieties of white corpuscles. Here is one with several nuclei. In some cases the nuclei is very large in proportion to the cell. Here is one covered all over with fine granules of eosinophyles. Here are some lymphocites, and there is a great vari-

ety and a different function for each kind of amoeba. The presence of a number of these red cells produces the red color. (Screen.)

Now let us talk a little while about the red cells, and what they do. I have shown you how the amoeba captures and digests its prey,-- while it floats on the water, it comes in contact with some little particles which it desires to eat; it sorrounds the little particle, captures it and eats it, and digests it.

Now the white cells in the blood are constantly doing something ; that is the way the blood is kept free from the debris after it is first broken up into little particles. If we should inject into the human blood a quantity of germs, we could see, by the aid of the microscope, these white cells capturing them; they capture them, digest them, and thrive upon them.r they form a part of their diet ,and it is a part of their duty to capture these little particles or parasites. By the help of the microscope we can see a battle of this kind going on. Some years ago, I made the experiment of injecting a little indigo into the lymph-sac in the thigh of a frog. The next morning, I drew out a drop of the frog's blood, and upon examination, I found there was not a particle of indigo present, and each white cell contained two or three particles of the coloring matter of the indigo. These little cells had been busy during the night, and they had capturged the indigo, and were eating it up. Some of the cells had several specks of indigo in them. So these little cells are scavengers, cleaning up the lanes and alleys of the body, picking up and carrying off minute specks and particles of foreign matter which they find in the body. Sometimes you have a boil with a lump in it; these are caused by the action of the white cells which come in contact with the exudate which is thrown out as soluble matter; after being melted down so it can be removed.

If you scratch the skin with a pen multitudes of these little white cells

comes to that place and enter the injured part in a mass and then they set to work making repairs. They are sent out as sheriffs to arrest the invading germs; they are sentinels which take care of the body and preserve the citadel of life from attack. (Screen.)

This is a very interesting view. Here is a number of different kinds of white cells and a number of red cells. The red cells carry oxygen from the blood to the tissues and repair the spleen, and lymphatic regions, while the white cells purify the blood and keep the blood channels open by their action in destroying various particles of waste matters which they can digest. Sometimes the red cells are attack by certain micro-organisms which get inside. These represent what we sometimes find in the blood when a person has malaria it is because certain little parasites get into the blood, and the get there by the aid of mosquitoes. The mosquito is not quite so harmless a creatures as he is supposed to be. We visits marshes or persons suffering from malaria where he finds these parasites and he draws them in with the blood which he extracts and which coptains these malaria parasites. The malaria parasite is very much like the white corpuscle, only much smaller. This represents one of these parasites inside of a red corpuscle. They multiply in the mosquito, and by and by they get into its poison bag; the mosquito injects a little formic acid poison into his bag, the same as the honey bee does in his honey when he is disturbed; this formic acid is what causes the swelling. This poison is injected into the skin by the mosquito. By injecting this poison the blood vessels are dilated, and then it is easier for him to extract the blood. Now this poison sackof the mosquito is filled with parasites in the course of a week or two; it takes about two weeks for the parasites to develop within the mosquito, and after they have developed in the mosquito, and get into the poison sack of the mosquito, the next operation will be the inoculation of

the body with parasites which are injecte into the body by the mosquito; this is the way we get malaria. If so many parasites get into the body that the cells cannot dispose of them, they will get into the blood. These organisms are closely allied to the white cells; the white cells eat up the malarial parasites, so the thing to do is to have a multitude of the white cells always present in the body to defend it, for if these cells are able to cope with the malaria parasite you will not have malaria fever. We sometimes succeed in curing malaria fever by the use of the cold bath, which brings the white cells out from every nook and corner of the body where they have hidden away, and they ar e brought into the circulation where there are twenty-five to thirty per cent more of them after the cold bath than before. (Screen.)

This shows how the blood circulates. You see there are two hearts-- a right heart and a left heart. There is a curiosity in England-- a man with two hearts, who goes around the country exhibiting himself. The dugong has two hearts. They are re-ally two hearts bound up in one bundle so they seem to be one. The left heart pumps arterial blood and sends it round through the lungs to be purified, and t en it is gathered up in the large veins and brought back to the right heart. (Screen.)

Here is the web of a frog's foot. This is just what you will s e through the microscope pretty soon. Here is the blood coming in; you can see the blood cells chasing one another through the capillaries in single file, and then passing out through the vein. Here is a vein, and here are the arteries. The blood passes through the arteries into the into the capillaries and from the capillaries into the vein and thus it is gathered up by the veins and carriedto the body in general. (Screen.)

This shows the arteried in the bones,-- this is a bone. There are arteries in the bones, and there are little bone cells in which these arte-

ries are manufactured. (Screen.) This shows a bone cut across the other way. This shows a bone cut lengthwise, and this, crosswise; and here are little cells surrounding the arteries. This is very interesting spectacle when seen through the microscope. The serous part of the blood finds its way down into the little hollows in the bone. These little bone cells make bone from material which is furnished by the blood. These cells have such vitality that you can take a piece of bone and chop it up and make hash of it and then plant this littleparticle of bone in the flesh and they will grow and develop again. There was a case not long ago of a boy who had lost his leg bone, and the surgeon took a rib and cut it up into little pieces and packed them into the flesh of the bone of the leg, and thus manufactured a leg bone out of that,-- after one little piece had grown another little piece was put in, and so on until the leg bone was complete. This idea is also put in practice in operations upon the brain, the parts growing in easily because of the vitality of the larger brain cells. (Screen.)

This is an illustration of muscular fibers, and cartilages, etc. (Screen.)

This shows how the brain cells are nourished. These are nerve cells. These are the cells we do our thinking with. These cells are all associated-- they touch fingers,-- it is like taking hold of hands in the dark. These are the cells with which we think and feel. This is a photograph of these cells; you can see the brain through the microscope. These cells reach over and touch the ends of their fingers. This cell over here knows what this cell is doing, because one cell takes hold of hands with another cell and by means of this association one cells knows what another cell is about.

Here are some healthy cells. Here are some cells which have been injured; they have lost their fingers. There are little bunches growing in

on the fingers like arts or like the buds on the limbs of trees. Notice this colquund the correspondence here,-- in each one there the same number of fingers. Under the microscope you can see millions more fingers than you can see here. This is only a partial representation of the number of fingers that the cell has; the fingers are sent out in all directions like the quills of a porcupine which sticks out on all sides. These fingers are all covered over with minute little buds and there are millions of these which come in contact. Here these little cells are all stripped away; nearly all the branches are shrunken and shrivoled up. What causes this? This represents cells of the brain on a larger scale. This is the brain of a man who has been addicted to the use of arsenic and opium. This is the brain of an old smoker who has carried his smoking to such an extent as to produce actual brain deterioration. This is not an imaginary picture, it is an actual fact and it is just as I copied it from some beautiful micro-engravings found in the Journal of Neurology which the eminent scientist was describing the effects of the habitual use of alcohol upon the brain cells and other parts of the brain. It is no wonder that the old toper loses his memory,-- when advanced in years and far advanced in the use of alcohol, having used for a long time he loses his memory and intelligence; the brain cells are actually crippled; it is like a lame horse who is trying to go without his legs; at first he is lame in one leg and then he walks on three legs; then he is lame in another leg and then he walks on two legs, and by and by he walks on one leg, and then he cannot travel on any. Here are muscles trying to do their work with only three or four arms whereas they ought to have twenty-eight to thirty arms instead of three or four. The microscope of recent times has produced most conclusive evidence of the poisonous character of alcohol and the effects which are produced upon the brain by this deadly poison. (Screen.)

This is a diagram which I have had prepared and which represents the relation of the general circulation to the stomach, liver and spleen. This screen represents the left heart which pumps red blood. This is the right heart pumping out blue blood. The heart has two cavities-- the auricle and ventricle. The left heart sends blood to all parts of the body-- the muscles, glands, bones, the stomach, spleen, pancreas, intestines-- all the organs of the body are supplied with blood from the left side of the heart. Then the blood is gathered up into the large veins, and carried around to the right side of the heart, and then by the right heart it is pumped through the lungs and purified, and then sent round to the left heart again, and then distributed to all parts of the body, and so the blood goes on in its ceaseless round-- there are really two rounds you see here-- a sort of double circuit. (Screen.)

There is another circulation which is exceedingly interesting from a dietetic standpoint, and also from the standpoint of the liver. You see the blood goes to the spleen and pancreas and liver and intestines and the mesenteric glands, and all the organs found in the abdomen. All this blood is gathered up and carried to the liver before it gets into the general circulation. The blood of the muscles, bones, and other parts of the body is gathered up in the large vein and carried directly to the heart. The blood that goes to the organs connected with the process of digestion is gathered up into one vein which is called the "portal vein"-- (screen) Here is this large vein carrying the blood to the liver to be purified, and from the liver it carried into the general circulation. (Screen.)

The purpose of this arangement is protective. When we take into stomach food to be digested in the stomach, when the food has been turned into fluid it is partly digested and absorbed, and some of it is taken to the liver, and the liver does some digestive work that is not done in the stomach

and intestines-- the liver completes that work; it rounds off the digesti ve process; the liver is a great digestive gland-- it is one of the most important glands of the body, and it is the largest gland in the body, weighing three and one-half pounds and acting as a filter. In addition to this work the liver acts upon the proteids and the albumen of the food. It also does another very important work,--the separation of poisonous substances. Suppose a man takes a glass of wine after dinner-- the alcohol is strained out by the liver and soaked up into itself, making a sacrifice of itself in order that the alcohol shall not reach the brain and destroy the brain cells; the liver captures the alcohol and holds it until it can be destroyed and oxidized and sent on to be carried out of the system through the kidneys. Suppose a man smokes a cigar after dinner; he takes nicotine into his system, it goes into his stomach and blood, somewhat; but that which goes into his stomach is carried to his liver through the portal vein to be purified instead of going directly to the heart and into his circulation. When a man chews tobacco, he swallows more or less saliva, and some swallow the quid. Sometimes those who chew tobacco get quite sick because they have no place to expectorate and are obliged to expectorate into their stomachs, and then all this nicotine is carried to the liver to be disposed of, and after a while the liver is overwhelmed by the great amount of work imposed upon it.

The liver destroys nicotine and other poisons, as we know by experiments. Sometime ago some experiments were made upon a dog, guinea pigs, etc. They were injected with nicotine at this point (hepatic vein) and at this point (portal vein), it required twice as large a dose of poison when injected into the portal vein which carries the blood to the liver, as when injected into the hepatic vein which carries the blood into the general circulation. This experiment was made by Prof. Roget of Paris, and I am acquainted with him and am sure of the accuracy of his observations. What does this experiment prove? It proves that the liver destoys half the nicotine or other

poisons taken into the sy stem, as it is passing through it. This is the reason the doctor injects morphia into the skin, this side of the liver, which only requires half as large a dose as if taken in the form of pills; for if it is injected into the portal vein it passes through the liver, and the liver taken out half of the poison.

Suppose one swallows pepper, peppersauce, horseradish, and other burning, stinging things,-- suppose one takes a mustard plaster with his beef-steak etc-- the liver captures that mustard plaster, and keeps back as much of it as it can, because the mustard plaster will do the same thing in the inside of the body as it does on the outside, so the liver captures it and stores up as much of it as it can, receiving the damage and injury which would be inflicted upon the brain and nerves if it were not for the liver. Now the effect of the storing up of these things by the liver, at length, is to produce a serious disease of the liver. You have heard of "hob-nailed liver", and of "gin liver". "Jin liver" is a disease in which the liver is contracted and shriveled up into a knob, not much larger than my fist, and covered on the outside with little hob nails which make the liver look like an English cartman's hob-nailed shoes.

Now in regard to this "gin liver" that we are talking about,-- it has been recently discovered that it is not necessarily due to the use of gin. Prof. Boix, of Paris, has made the discovery that red pepper makes a gin liver six times where gin will make a "gin liver" once. It has also been proven that popper has six times the power to make a gin liver that gin has,-- in other words that it takes six times as much alcohol to make a gin liver as it does of red pepper. It has also been discovered that gin liver is much more often due to indigestion than to the use of alcohol. I think likely it is generally due to indigestion produced by alcohol, and also by various irritating, burning, stinging things, as mustard, pepper,

leaving out the alcohol itself. Next we find a great many people whoare dyspeptics and who have enlarged livers, without making a large use of these things. We find that an enlarged and contracted liver is exceedingly common. These irritating substances are absorbed into the blood andare carried by the portal vein into the liver and and irritate the liver and cause inflammatory processes to be set up which give rise to contraction or shrivelling of the liver. I met a case about two weeks ago in which a lady's liver was not more than half as large as it ought to be and the spleen as six times as large as it ought to be.

Perhaps some of you would like to know what the spleen is for-- here is the liver over here. Now notice the blood that goes through these organs, the spleen, the pancreas, the intestines, and the stomach; it is gathered up and goes through the different sets of capillaries into the general system. The great force of the heart is chiefly expended in getting the blood through the capillaries. The capillaries are very small,-- so small that it requires 300000 (?) of them to cover an inch in diameter. And all the blood must be forced through the minute capillaries.

There are two things which help the circulation, one of which is the diaphram which lies just above the liver. When one takes a deep breath the diaphram comes down upon the liver and forces the blood up into the vena cava and so helps the circulation. Now every one of you take a deep breath. (Deep breathing.) You take a deep breath and the diaphram comes down, and every time the diaphram comes down it gives the liver a good healthysqueeze and sends the blood along. Deep breathing also sends the blood up through the heart. The diaphram also acts as a suction pump; as it moves out and in it produces a partial vacuum, sucking the blood out of the liver; so there is a double action of the liver which helps the blood through it.

We have other means of helping the blood through the liver,-- and this is the spleen. The spleen is a pump. It has been proven by careful

experiment of animals that the spleen has a contractile action; it slowly contracts, and then dilates, and then contracts again, so that we find that one funtion of the spleen is to act as an abdominal pump, forcing the venous blood through the liver and also aiding the pirtal circulation.

These facts in reference to the action of the liver upon food substances and the poisons absorbed by it, ought admonish us to take care of our livers by being careful what we put into the stomach. One man says "I can eat what I like, and I can digest anything,--" and so you can, so long as the liver holds out. So long as this is the case you can digest anything that is hard to digest, as sardines, Saratoga chips, etc., and you liver will manage to get along with it so long as the stomach can make good strong gastric juice. But when this is not the case the stomach will cease to do that; the gastric juice making power in the slow stomach will become worn out by overwork, the stomach will fail, and then things putin the stomach will rot, and then you will begin to have gas and bloating in the stomach, and then your will have bilious attacks in the stomach, and bilious attacks always mean something rotting in the stomach, and by and by you will find that the stomach will "fail up" , and the germs which it contains will produce fermentation and decomposition of food just as they do when it remains outside of the body, as the consitions of warmth and moisture in the stomach favor putrefaction. By and by the liver begins to fail, and then there will begin to be little appearances of sugar in the uric acid secretions; the doctor examines the uric acid secretion and says "there is sugar here". That means that your liver has lost its power to absorb sugar and to hold it back-- that it has absorbed and stored up all it can. It has been so long a time storing up such things as pepper, peppersauce, ginger, that its storage capacity is exhausted and there is no room for storing up glycogen; that it is in a crippled condition and not able to do its work.

These thing s should admonish us that we should not take into the body anything which will give the liver an excessive amount of work. Sometime ago we examined a gentleman and found that he was producing twice as much uric acid as he ought to produce, and yet he thought he ought to live upon a meat diet. Someone had told him that he should not eat starch but that he should eat meat, because meat will not produce lactic acid; so, instead, he produced twice as much uric acid as he should. I expostulated with this man, but he was sure that he was right, and he said he was going to follow it up, and he did, and after a time his liver was one-half the size it ought to be, and his spleen was four times the size that it ought to be and he produced twice the amount of uric acid that he ought to produce. This man continued this meat diet for months in the vain hope that it was the only cure. But instead of being the only cure, it has made him immensely worse, and now he comes here and begs that something be done for him, and we can only try to undo the things that have been done. And I want to tell you my friend that immense mischief has been done in this way . And this evil has been done through feeding this man meat. Man is not a carniverous animal and should not have a carniverous diet,-- he cannot live on meat. A meat diet is death to a man who follows it. The only way a man can live on the Salisbury diet is by drinking large quanitties of water. They tell you when giving you this diet that you must take large quantities of water and they give their patients laxatives which stimulate the bowels to carry off the poisons and carry off uric acid. If it were not for these laxatives, etc., the patient would soon be in a very serious condition. We find cases of person who have Bright's disease, diabetis, etc. and have eaten the Salisbury diet, and I have known them to be killed off in two or three weeks on that diet. The natural diet for man is the only diet that is safe for him; the unnatural diet of mustard, pepper, peppersauce, and otherirritating articles is

a safe diet for man. God knew when he made man what was good for him, and he told him what was good for him. Any one who thinks he can improve upon the Creator's plan at creation in regard to diet is mistaken. Robert Ingersoll said that health should be contageous as well as disease. Health is contageous-- it is spontaneously contageous. We get health from the sunshine, fresh air and natural food. But when we eat unnatural food, as meat, beefsteak, etc., we must suffer the consequences. God gave man permission to eat meat, but notice how his days are shortened as soon as he commenced eating meat,-- from a thousand years it was reduced to less than one-fourth that number of years in three or four generations. As soon as man began to eat meat his longevity began to diminish and has been diminishing ever since, until, at the present time man does not live out only about one-twentieth of his days. Man is naturally a lone-lived animal, but within reliable historical times his life has been reduced about two hundred years. The elephant is stronger and longer-lived than are carniverous animals, sometimes living to be about two hundreds years old, and if the elephant can live so long with his coarse organism, man who has a highly perfected organism ought to live five times as long as he does. Accordingly the bible record of olden times is, that man lived to be about a thousand years old-- and there is no reason why he should not. The human body is constantly being renewed by new food which has life in it? After the food is perfected there is no reason why we should not live on and on and on for a thousand years. The present average length of life is only about forty-two years. It is evident that man might live at least two and one-half times as long as he does. Even in recent years some people have lived to be 150 years old, and I have read this inscription

"Here lies the body of Thomas Parr

Who died at the advanced age of 152 years, 9 months."

This man's age was fully authenticated. John Harvey, the discoverer of the circulation of the blood made a post-mortem examination of Thomas Parr, ("Old Parr", as he was called), and he declared that he could not find any reason why Thomas Parr died, except that he ate too much. He had a surfeit while visiting the king. He had always lived plainly,-- he had eaten no meat and lived very plainly. He was a simple, hard-working peasant. But he was invited by the king to visit him, so he visited the king during two weeks, after which he was carried off by a fit of indigestion-- so the king killed him with kindness -- he meant to be kind to him but he killed him. If he had let him alone with his simple country fare he might have lived fifteen years longer.

Some years ago a certain Hungarian died after living to be 167 years old-- 11 years longer than Abraham live . That was considered a very long life; but the truth is that we see men die at the present time when they have just begun to live, and centenarians are getting to be less and less common, and soon there will be no centenarians. Sickness and disease are multiplying, especially constitutional maladies. This is because of the increase of city populations. City populations are increasing too rapidly and the country population is proportionately diminishing. But customs of the city are getting into the country so that we find people living in the country in almost as luxurious a manner as people living in the city; they have more fresh air and sunshine, which is a great advantage, but unfortunately there is not much difference in their manner of life.

Now what are we going to do about it? The thing to do about it is the thing that needs to be done about it,-- and the thing that needs to be done is to "cry out" and warn the people, and point out to them the evil of a perverted civilization, the evils which are leading us on and on to a premature death.

A Chicago man some time ago wrote a very interesting book (although I do not recommend some of it very hartily) entitled "The Cause and Cure of Civilization", and there is a good deal of truth in the things that he writes. He shows very clearly that our civilization is largely a perversion; that our manner of eating and living is unhealthy; that it is unhealthy to live in our houses; that our clothing and modes of life and work are unhealth y; the schooling of our children is exceedingly perverting, deforming, and thus we are rapidly going down.

The time has come for us to study the causes of this degeneration and find them, and then turn round squarely and learn how to live and then live right,-- I suppose that is what you are here for-- how to live more wholesomely. Here you may find out the best means of purifying the blood and keeping it pure, and the exercises by means of which the vital forces of the body may be kept alive, and the means by which the poisons of the body are burned up and removed from the body; here you may learn to use pure food, pure air, and have the proper amount of sleep. Plenty of out-door life and exercise and sunshine which are essential really to a healthy life, the means of healthful liv-ing of which a great many people are deprived.

Now some of you have been sick for some time; your stomachs and livers and other organs have broken down and I want to admonish you of this fact,-- that hereafter you must live close to the line, in accordance with the rules of life. When you find out here how you can live more comfortably, and how you can eat so as to have comfort and peace in the stomach, so you will have no trouble with your liver, you must remember that this is the way you are to live all the rest of your life. You cannot come here and "do penance" for a short time, and atone for your dietetic sins, and then go back to the flesh pots of Egypt again. When you find out the right road and start to travel in it you must stick to it, for if you don't, you will

have a relapse and then you will be astonished to see how soon you will be down in the old rut again. I remember a gentleman who had the dyspepsia so bad that his friends took him to the lunatic asylum, thinking he was crazy but he wasn't crazy, so he was brought here and his wife came with him to see that he was properly taken care of and that he ate and dressed properly. He had been a banker, speculator, and real estate dealer. After being here for a time he went away and wrote to me saying, "Doctor, I am much obliged to you -- I can smoke three cigarettes a day and eat fried ham for breakfast." I wrote back to him; "My dear Sir,- You are making some more business for us, for you will have to come back in three months", and he was back in six weeks, and spent six months with us and then he went back and relapsed again. This gentleman in the course of the next twenty years spent seven years with us in this institution because he relapsed into his old ways. As soon as he began to live right he recovered rapidly, but when he went back into his old ways he paid the penalty. Now he need not have come back at all,-- his first visit here was enough for him to find out what ailed him, and what did him harm, but after a while he thought he was well enought to stand it again, in leading such a life as he did before he came here. Now when a man has come into such a condition in which he is chronically sick, he must go to some Sanitarium-- for example, Battle Creek Sanitarium-- he must be pretty bad before he is willing to come here, because he knows that if he comes here he must submit to many hardships-- he must be dieted; he must live right; he must go straight. I saw a restaurant in New York with the sign, "The Straight-Edge Restaurant", and since then I have been thinking of calling this "The Straight-Edge Sanitarium". A man who has got so bad that he is willing to submit to the regimen of this place is practically a physical bankrupt-- he may not be a bankrupt in heart but a bankrupt in stomach, or maybe he is bankrupt in liver and nerves, and if so he is a physical

bankrupt; for the body is like a chain,-- the real strength of the chain is only measured by the strength of its weakest link; if that weakest link has a single flaw in it, it breaks, and the whole chain is broken-- and the body is like that chain: it may hve one weak link, and the stoma-ch may be that link. I want to admonish you, while you are here to learn the right way and then stick to it, and when you go home follow it up. I have found the good way and am raising my children to walk in this good way; I would not have the go in that old way of wrong and luxurious living. There are none of you who live more abstemi-ously than I do for I want to keep well and not get down into the rut in which many of you have gotten. We have have this exhibition begin this evening at half past seven o'clock and it will last the whole evening. So you can come this evening and to-morrow evening, and see the circulation of a frog's foot. I hope you will all come, because it is the most impressive sight that you can possibly look upon.

Constipation

STUDENT'S CLINIC, Aug. 25, 1901.

J. H. Kellogg, M. D.

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We will recapitulate a little. This patient is suffering from chronic constipation. The first thing to be done in every case of constipation is to find out what kind of constipation the patient has, because there are different kinds of constipation. There are many different causes of constipation, aside from that, there are many different varieties of constipation; so we want to ask the question first, what kind of constipation this patient is suffering from. We must be sure, in the first place, whether she has really got constipation. We will ask this patient how often her bowels moved? ("Once a day by enema.") Suppose you hadn't had an enema,- how often would the bowels move? ("I don't know.") With every single case of so-called constipation, we must find out whether there is constipation.

Now this patient says she don't know how often her bowels move,- Have you had an enema every day? ("I have tried that.") Now if the patient is taking an enema every day regularly, they don't know whether they are constipated or not, because the bowel is compltely emptied and then the bowels will not be ready to move for two days,-- and I will show you why by this little diagram on the blackboard. (Illustrating by diagram) Here is the large end of the colon,-- at this point the food empties into the colon. It takes the food fourteen hours to pass from the stomach through the small intestines into the colon. This has been proven by actual experiment and observation by a person having a fistula at this point. It it found that food passed out of this fistula in fourteen hours after it was eaten, and ordinarily that length of time is required. Now the food is deposited in the lower end of the secum in a fluid form, and absorption

takes place; gradually the food is absorbed; the fluid contains the dissolved or digested portions of the food, and the solid or semi-solid portions-- the undigested food substances remain here and the fluid gets more and more of a consistency until it has become more or less thickened. Now the next meal that is taken, sets up in the stomach peristaltic movements which are passed down into the intestines. These peristaltic movements in the stomach pass down into the intestines in a wave of motion , just like getting hold of the end of a rope and shaking it, and the wave of motion travels down the rope; then shake the rope again and the wave goes down further, and so on until the movement goes down to the other end of the rope. This excites the stomach and the stomach contracts and the muscles of the stomach contract. The stomach begins its work at the first contraction and these contractions pass down into the intestines forcing the food along into the outer end of the colon. I want you to understand the philosophy of the rhythmic movement of the bowels. Here are the small intestines, and here is the stomach, and when the food goes into the stomach it contracts, and the contractions are ~~considered~~ transmitted to the small intestines and the contents are forced into the colon and that forces along the mass which has been removed into the caecum for absorption. (Referring to diagram) It moves it along down here-- here is the sigmoid flexure and a little sort of valve is formed here; this is S-Shaped . The colon comes down almost like this , and forms an S., when the valve is down at the beginning. This is especially intended to support the movements of the food while passing into the rectum. This portion of the food has been resting here since the last meal, and it has moved on down to this point. Next morning, when another meal is taken, the portion remaining here is pushed along, and

the other portion is pushed down into the rectum, and then comes the desire for the evacuation of the bowels. It is the successive movements of the intestines set up by the meal itself that moves the contents of the colon up the different parts of this depository for the absorption of digested foods .

Q. Is there a peristaltic movement of the colon ?

A. Yes. And it is set up by the small intestines, and it also helps move the food along; by moving the food along, it makes room for other room which is present and ready to take its place . Suppose a person omitted a meal,--what would be the result ? There would be no food introduced into the intestine, and there would be no peristaltic movement set up, consequently the fecal masses would remain up here, and they would not come down to the lower part . Now suppose a person takes an enema and empties the colon completely,--you can readily see that there is nothing left in the colon to stimulate the movement of the bowels the next day, because you have got to wait twenty-four hours for the colon to fill up again. Then there is another thing to be considered: The colon does not require, when an enema is administered,that the colon should be entirely empty; it is only necessary that the lower part of the colon should be empty, because this part of the colon contains foodstuffs that have not yet been absorbed. There are two reservoirs in the alimentary canal,--the stomach, which has power to receive and dissolve the food, and the colon receives the digested food, re-absorbing it. That is what the colon is for--this great absorbing-pouch absorbs the food-substances; that is what these little pouches are for. The colon is very necessary and essential for that purpose; the great share of the absorption takes place in the colon. So the stomach and the small intestines digest food , and the colon absorbs the digested food. Some portion of

the food is absorbing all the way, and when it gets to the large intestine it is in a semi-fluid state, about the consistency of gruel but in the large intestine,it is reduced to a considerablbly harder state, so that it is in the form of a mass, and the patient sometimes has a well-formed stool, the fecal mass leaving the bowel with a definite form; sometimes it is a little harder than usual, and is pressed together in the form of little pellets ,--that is because of the small ends of the pouches--the sacculated ends of the intestine. A soft stool is not a healthy stool. It may be due to the presence of undigested foods, or it may be that fermentation has taken place; or it may be that irritation is set up, and in that case a soft stool would have a ~~fetid~~ foul smell Soft stools are generally very foul smelling stools, and when the bowels are in such condition that the fecal matters in the lower part of the colon are in a fluid state, the patient will be in a state of chronic autointoxication, because,when the fecal matters are dissolved into a fluid state,then absorption is taking place very rapidly; whereas, when the fecal matters are in a hard state,only the outside is exposed, and the absorption will be very slow. Now, which way do you think a lump of sugar will taste the sweetest,--in the form of rock-candy,or in the form of sugar dissolved in water? ("Dissolved.") Yes,--and it would dissolve more readily-and the effect would be greater . It is exactly so with the fecal matters in the intestines; if in a soft state, absorption is taking place very rapidly. That is the reason patients feel faint after taking an enema, because the water dissolves the poisonous matters and carries them away, and the patient feels weak and faint from this cause--the dissolving of fecal matters.

It would take a large volume to tell all about constipation, but I will give you a few important points that you should know about.

It is exceedingly important that the patient should take a large enema completely emptying the bowels. He should not take it more than three times a week, because, if he does so, and empties the colon he takes away from the caecum a portion of the nutrient material that should be dissolved and absorbed. I have not said that patients should never take a coloclyster three times a day, or a large enema three times a day. There are cases in which it is necessary to administer a large quantity of water into the colon every day,-- for example, in liver trouble, as the parts may be suffering from gall-stones or some similar trouble.

There are other cases in which we need to introduce large quantities of water to encourage the kidneys, and so we may use the colon as a means of administering a bath to the kidneys, disregarding other things. We do that sometimes, but if you want to administer a large enema for coloclyster, emptying the colon, it should be only three times a week. If we are going to use an enema every day, it must be a small enema,-- it must be only large enough to cleanse the lower portion of the colon.

This patient has taken an enema every day-- a large enema. ("I took a pint, but it would not bring away anything.") There was nothing brought away, because there was nothing in the lower portion ofthe colon; it had been emptied the day before and the fecal matters had not been brought down far enough to be prepared for exit from the human body. You must understand the philosophy of the physiological movements of the bowels before you can uderstand the pathology and diseased conditions of the body.

The patient says the bowels have been moved every day by enema, and that she used water enough to empty the bowels. Why did you

take the enemas? ("Because it relieved me.") Because you hadn't strength to evacuate the bowels?-- When did you neglect emptying the bowels by enema? ("Before I came here; I used to wait two or three days before taking the enema, but after I came here I attended to it every day, and when I started in I didn't do any work.") You ought to take an enema every day. You say before you came, your bowels didn't move, or you neglected it two or three days-- and then there would be a desire for a movement? ("Yes sir".) Was it a desire in the bowel itself to move which made you feel unconfortable, or was the distress in the rectum? ("Yes sir".) And you think there was a necessity for the evacuation of the bowels? ("Yes.") What do you think was the reason you could not move your bowels when there there was a desire for it? ("I do not know.") What do you think was the reason you could not move the bowels when there was a desire to do so? ("I don't know, unless it was because I had got in the habit of using the enema.") When you had a desire for the bowels to move, why did they not move ? ("I could not tell you the reason.") Was the contents of the bowels hard ? ("No, but I didn't have strenth enough.") The contents of the bowels were not hard and dry, then? ("No.") Did there seem to be a contraction of the anus ? ("Yes.") And there was not power to evacuate? ("No.") Can you evacuate your bowels completely? ("No.")

Then I must inquire further,--we will talk about her habits : How long ago was it that you felt constipation? ("Twenty years.") Do you mean to say that for twenty years your bowels have not moved naturally? ("Yes,sir,--very rarely.") Practically you have had no normal movements of the bowels for twenty years? ("Yes,--perhaps longer than that.") You don't know how you became constipated? What

have you dome to relieve your constipation? Have you taken laxatives? ("Once in a while I have ,--I have taken medicine .") What medicines would you take ? ("Cascara.") Did you ever take any other medicine? ("Yes, sometimes,--but not late years; sometimes I would take pills.") What kind ?— (Brandreth's ? "No; sometimes a doctor would recommend one thing, and some one else would recommend another. Sometimes I would take Liver Pills.But I never took many.") You would take pills to relieve you? ("Yes.") Were you better then ? ("Yes;but it was only for the time.") Would your bowels be better? ("No,--they would be worse off than ever, if anything .") Did you ever take salts? ("Yes.") Epsom salts ? ("Yes, sir, I think they were Epsom salts.") Have you taken mineral waters? ("Yes.") And your bowels have stead-grown worse? ("Yes.") How long have you been using enema? (" I have used it more or less for several years; once in a while I have used medicine .") Why did you do that? ("Because I didn't think I had constipation.")

Patients are very often deceived in this respect: They think sometimes that their bowels have not moved sufficiently, when they have. When the bowels move they have been prepared to be moved. The amount of fecal matter that is discharged from the body depends largely upon amount of food eaten, and the kind of food eaten. , Do you think you have large stools ? ("No.") Why not? ("Because there is no residue.") So the fecal matters would be small. If, on the other hand, a person were eating largely of fruit, coarse grains, vegetables and meats, there would be large stools. So the amount and kind of food eaten must be taken in consideration . Sometimes a patient will lose a meal, and they don't think, if they do that, they must expect to lose a movement of the bowels also; and if patients fast, they

must not expect their bowels to move the next day, for there will not be anything ready for the movement until the next day; so that fact must be taken into consideration. Many people do themselves much injury by taking pills, salts, mineral waters, and enemas when they find their bowels do not move till the next day.

It is astonishing how long the bowels may be neglected without serious injury. There was a man in New York who didn't have a movement of the bowels regularly once in three months; his bowels were very irregular . The eminent Dr. Austin Flint, in a lecture before a class of students, told of a case that came under his observation (and he is reliable authority): Once in three months this man would have a regular movement of the bowels,--he had an awful time of it--and it lasted for two or three weeks ; there would be an evacuation -- during that time he would lose three or four pounds--and in two or three days there would be an accumulation. Now in this case there must be an enormous dilatation of the colon,--and why ? ("Becaw there has been a three days' accumulation stored up in the colon.") So the colon would be mehcanically stretched by this accumulation, and when that state of things has gone on for twenty years, there must be an enormously dilated colon.

We have another evidence that the colon is dilated,--there is a feeling of dilatation three or four days beforehand--a desire for evacuation. How often do the bowels move regularly in an infant ? ("Three times a day.") Yes. When the child gets older, the bowels move ~~three times a day.~~ twice a day, and when the child reaches the age of ten or twelve, the bowels move once a day, that is when the meals come further apart. I am inclined to think that the practice of eating but two meals a day has in itself a slight tendency to consti-

pation after having been accustomed to three meals a day-- because the rhythmic contraction set up by two meals causes a movement the next morning, and when the third meal is lacking, the person who has been accustomed to depend upon it is likely to suffer from constipation the next day. This difficulty may beobviated by taking a small meal of fruit at night, or even by taking the juice of two or three oranges, or still better, take a couple of glasses of cold water at bedtime; that cold water will set up contraction of the stomach and intestines just as well as a full meal will do, and a save the patient's stomach the trouble of digesting a meal.

Now let us examine this patient,-- make an objective investigation of the case and see what we can find. Now I want you all to come and see the conditions as we find them here. I will ask the patient to raise her feet and put them upon the upper part of the chair,-- now put them down again,-- what would you judge, by looking at this patient? I think we will get the patient near the window,-- now come round and see the abdomen here-- does it look alike on both sides? ("No".) What is the difference? ("It is a little fuller on one side.") Now as you look at it do you think you can make out the shape of the stomach? You can get the shape of the intestinal mass can you not? ("Yes.") Now let us percuss a little. (Percussing.) That is the samll intestine. (Percussing again.) This is the colon. (percussing.) This is the stomach. You see there is a difference in the sound. I can feel the intestines moving when I percuss the abdomen,-- this buldging is not the colon, but the colon is behind pushing up against the intestine,-- this is the colon-- that has a different sound. Now you can see just where the colon begins. (Percussing.) The colon is under here, and the small intestines over it-- it is a

combination. (Percussing.) Is that the colon or the small intestines? ("The colon.") Now bring some water and let the patient drink it. Now keep very still and you will hear the movements of the water in the stmach, up and down,-- I can feel it by touching my finger down there. We have a dilated stomach havn't we? -- And when we have a dilated stomach we are certain to have a dilated colon, because the same condition will bring about a dilated stomach will also bring about a dilated colon. We want to find out what has made this stomach and colon dilated. This is a thin walled stomach. Now you can can see the shape of it,-- hold your breath; breath out and don't take any breath in. Now if you watch sharply you can see the form changing- this is visible peristalsis ; it only in a very thin-walled patient that you can see that-- and you can't always see that even in these cases. The cold water that we gave her to swallow has set up a peristaltic movement and caused the intestine to move round. Sometimes you can see a wave traveling down very plainly. Now I will ask the patient to raise her head. Now look at this-- raise your head as high as you can. Here are little strings-- muscles bulging out on both sides; see how soft it is. There is only a little string of muscles there, and you can hardly feel it- you can only see a couple of little strings when she raises her head as high as she can. There seems to be no muscle there-- put your foot up high. Now these muscles are contracted,-- do you see the difference? Now put your feet down and raise you head. Please observe this-- it is almost a hernia. Lay your head down-- now raise your feet-- look at that-- it is a good thig to remember that. In order to exercise all the muscles of the abdomen you must raise up both the head and the feet. Now raise one foot,-- does that cause a contraction here? ("No.") It does not bring these

muscles into active play; she must raise both feet-- now raise both feet again-- that brings it down with the muscles tense and hard. Now put your feet clear out as far as you can, and reqch your toes out as far as you can,-- now raise both feet without bending your knees-- she can't do it her feet are too large. ("My knees are too weak?) These are small slender limbs. See what a lack of devlopment there is her; these muscles are soft and weak, just as these muscles of the and consequently there is not muscular strength sufficient to raise the feet in this manner-- she cannot lift it up-- now what are you going to do in such a case? I will try to raise this chair on the end of my finger,-- it is quite a strain-- now I let it down. Now tak hold of it near the upper end-- it is easier to raise it. Now sit down in the chair and sit back as far as you can-- now with my two hands I will try and lift the chair and nurse right up clear up from the floor,-- I can do it in this manner, but I could not do the same thing at arms length. That is the same situation with the patient, so she can not lift her feet so far away from her body. Now suppose we wnt the patient to exercise for the purpose of strengthening these muscles-- draw the feet close up to the body-- now we will ask her to raise her feet keeping the thighs right where they are-- raise the feet clear up-- don't strian your legs out; bend the knees down-now push them up again. If the patient wasn't very feeble she could bring her knees down here-- push your feet right up straight, now let them doen-- she can do that. In this manner, by degrees, the feet may be raised further and further and further, away from the body until the leg can be raised perfectly straight. We see these muscles are extemely weak, because the patient has to draw her feet close up to body before she can straighten the limbs and raise them. So I think

it pretty reasonable to suppose that this weak condition of the adominal wall is caused by the dilation of the colon. The abdomen is bulged out, and that is an evidence of enlargement-- it is ballooned. With my hand I can feel a crepitance or crackling of the ligaments in the intestines-- here it is on this side-- stop breathing a moment-- you can see the change taking place.

What relation is there between this weak condition of the abdominal walls and the dilation of the colon? ("The abdominal walls help hold the viscera in place.") This is not prolapse but dilatation.

A general muscular weakness will produce a weakness of the intestines as well as of the adominal walls. There is another reason for this state of things-- gas forming in the intestine; there is more or less fermentation taking place in gaseous form; gas is being formed and thrown off and through the blood. The skin throws off carbonid acid gas, the lungs also throw off carbonid acid gas; every surface in which the blood is distributed exchanges carbonic acid gas with air or oxygen,-- it throws off carbonic acid gas and takes in oxygen..... The blood throws off carbonic acid gas and takes in oxygen, and at the same time carbonic acid gas is being formed by the fermentation, and the result is that the intestines are filled with gas, and there is nothing which pervents the continual expansion of the intestine but the pressure outside of it;- the pressure of the walls, the tension of the intestinal walls and the pressure of the abdominal walls outside. The intestines are shut up in a cage just as if they were in a box; the abdominal walls make the walls of this box which contains the intestines; this box is full,-- the intestines and the viscera absolutely fill the adominal cavity; there is not a particle of open vacant space outside of the intestines between the adominal walls

and the intestines-- the intestines fill every little crack; that is the reason that when aperson gets a weak place in the adominal wall the intestine creeps out, that is because there is no room to spare.

It is the tension of the adominal walls that preserves the size and form of the intestines and prevents undue expansion. The gases formed in the intestines cause a pressure until the point is reached where the pressure of the intestines and the pressure of the blood are equal to the pressure of the gas; if the pressure of the gas and the blood are greater than that of the intestinal wall the pressure of the gas becomes sufficient to balance the pressure of the blood.(?) That is the reason we have the valve at the upper end of the oesophagus closed, and the valve at ghe lower end opened, so as to regulate the pressure. When the adominal walls become weak they stretch and allow the intestines to bulge out more than they ought to and allow the gas to escape.

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Constipation

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J. H. Kellogg, M. D.

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What do you think is one ofthe causes of constipation,-- the question which we are now considering in connection with gastric formation? ("Dilatation".) What relation does the condition of the adominal muscles have to constipation? ("Prolapse".) Yes. There are prolapses-- anything else? The colon dilates very often for want of proper support-- so there is dilitation and prolapse both. Dilitation produces constipation by allowing fecal matters to accumulate too long and become impacted together because the walls of the colon are not able to contract with sufficient vigor to expell the contents of the colon.

Let us consider, in systematic order some of the causes of constipation,-- tell me one of them. ("I think one of the causes is a neglect to empty the bowels.") Why is it that neglect to empty the bowels at a proper time will produce constipation? ("One reason would be that it might cause congestion by overaccumulation.") It would take a long time to do that,-- perhaps it would take months to produce permanent injury, but it would produce some bad results. If a person neglects to attend to the movement of the bowels at the proper time for one day, what is apt to happen the next day? There would be no inclination for a movement and constipation would result in a short time. And why does neglect in this particular produce inactivity of the bowels? Persons have the habit of being hungry at a certain hour of the day because they have been in the habit of taking a meal at that time and so they become hungry at that hour, and if he changes his hour of eating after a time he will not become hungry until that time. The body forms habits in that way, and so the body has its natural habit in this respect, and when that habit is

broken up, the natural rhythm of the bowels is disturbed, and constipation is the result. But there are more important things that must be considered,--can you think of any? ("I should think that by neglect of a meal, the peristaltic movement would be interfered with, the sensation or desire for evacuation would be taken away, and the fecal matters would become hardened.") Yes, the fecal matters would become hardened and dry, and it would require more than the ordinary expulsive power to produce evacuation.

We are now speaking of an inactive state of the bowels from neglect, and the reason why,--will you give us the reason why? ("I think the fecal matters would harden and would adhere to the walls of the intestines.") Yes. Sometimes the bowels have not been emptied for months, and then hardened masses will be too large,--too large to find exit until they have been broken up by mechanical means. I had a case of this kind once which distressed me very much for it resulted in the failure of a surgical operation. The lady had laceration of the perineum and had diarrhea. The nurse who made the preparation thought it was not necessary to give a laxative because the patient had diarrhea, and she had had an enema. The next day after the operation the patient complained of pain, and there was considerable fecal discharge, and every once in a while she had a chill and fever set in; and after a few days I examined the case and found a great fecal mass bearing right against the perineum and had to inject oil to loosen it up. The diarrhea continued and large masses were discharged,-- great masses had been accumulating and were brought down by the stimulation set up by the operation. That is one of the evils of neglect of bowel movement.

There is another bad result of neglect in this regard,-- and that is, that a reversed peristaltic movement is set up; that is perhaps

the first thing that happens as the result of this neglect-- if the fecal matters are not removed nature reverses the peristaltic movement and carries them back again.

If you are presnt in the surgical ward at some time when I am operating upon hemorrhoids, you can see that there is a little smoke produced when they are burned off; and I have often seenthis happen-- that after the operation is completed a little puff of smdke came from the rectum and then another puff of smoke, and then another. This smoke had been carried up the intestine duri ng the operation by the reverse movement. The effect of burning the tissues naturally produced a drawing in.

When the patient has a desire to move the bowels and restrains that desire there is a contraction of the lower part of the intestine, and when the desire is resisted the result is a reversed peristaltic movement which carries the fecal matters back into the colon where it remains until it is hard and dry. The next day, it may be necessary to introduce a quantity of water into the lower part of the colon to soften up the contents and carry them off.

Now where there is so much neglect what is there that will prevent the accumulation of an excessive quantity of fecal matters-- how are they disposed of? ("I suppose there is absorption.") No; the thingthat happens in these cases, is that after a time the presence of fecal matters produces irritation and that sets up a diarrhea and the fecal matters in the alimentary canal will be softened up and cleared out. In the majority of cases, after two or three weeks, if the bowels have not moved patients will have an alternation of diarrhea and constipation, and they generall y have more or less catarrh of the colon,-- there will be large quantities of mucus that will be discharged along at intervals. We have a patient now in the Sanitarium who has an accumulation of a great amount

of mucus every once in a while, and he has got the idea that he must have a quantity of medicine to tear that mucus off the lining of the stomach. I once knew a patient who took Brandeth's pills once a week and that would tend to irritate the bowels. Many persons take large doses of mineral water for this trouble. We have a ptient now who has been in the habit, for years, of taking about once a week, a large dose of mineral water, following that with a big dose of castor oil. He drinks water before breakfast, and after breakfast and takes a table-spoonful of castor oil. But he has been going on for several years in this way, and now that dose of castor oil is not sufficient, so, in addition to that he must take a soap enema in order to afford relief. He kept on persevering until he secured a discharge of tough white mucus, and whenever he does that he feels relieved. Unless he does that, his legs are numb, his head is dull, and he feels wretched and miserable. Now what do you think is the cause of that? ("Toxins.") That is possible, and yet I rather imagine this,-- that his head becomes so full, (as he complains that it does) and he has these symptoms that he speaks about,-- that the relief afforded is due to the relief of the intestines by the retention of blood in the head (?); this is a sort of derivative effect. This practice is a very detrimental one. He will continue to get worse everyday of his life as long as that practice is continued.

Now let us consider another cause of constipation: What would you think about skipping meals? Would that have any effect upon constipation-- suppose a person has habitually taken supper and then drops off his supper-- would that produce constipation? ("He might loose a peristaltic movement".) Yes, he might have trouble in that respect until he got used to it. Suppose a man goes without his dinner and supper both-- suppose he don't take an ordinary breakfast or dinner-- to day would that be

likely to produce constipation tomorrow. ("I don't know as it would, because the meal of the day before would be far enough downward so that the peristaltic movement would not be necessary.") Then your idea is, that it would not be necessary for his bowels to move tomorrow,-- but the question is whether the natural movement of the bowels tomorrow would not be interrupted if a person did not eat today. ("Yes.") Yes, because each meal taken moves the previous one along the alimentary canal a little further, and it usually takes about three meals to fill the alimentary canal and discharge the residue of the preceeding day. It takes one day's eating to fill the alimentary canal and the eating of the next day has the effect to stimu late the bowels to empty itself,-- the food comes along in regular procession. Here is something to illustrate that: When a chemist is going to make an examination of fecal matters so as to know the extent of digestion that have taken place in different kinds of food, he must have some way of dividing the meals that the man is eating; he must know what portion of fecal matters he must take for analysis-- for example he puts a man on a strict diet of milk for one day, then he makes a careful examination of fecal matters discharged from the body , and when it comes to the time for the milk diet to be discharged there is a distinct line for careful examination. The fecal matters are of a different color so that within a short space there will be a change and he makes a division right there; then he commences giving the patient food which he wishes to analyze, and when the change of color takes place he begins to make his examination of the residues from that time on. The fecal matters are made up of the residues of food, and the previous meal taken pushes the contents of the alimentary canal along by setting up the peristaltic movement, and when it gets down into the colon which is the depositary and store-house of the digested food-stuffs which

are being stored up for absorption, then they come incloser contact and become more solid and compact.

You can readily see that if a person neglects to take breakfast and dinner, there would not be enough to fill the colon, and there wouldn't be stimulation in the alimentary canal sufficient to pass it along. Now would it be a good plan for such a patient to take cold water at meal time? ("Yes.") And if you can't find anything else to eat you can take a meal of water, because that would furnish peristaltic activity,-- and there might be something better-- and what is that? ("Eat some fruit") Yes; and then there might be bulk enough to move the food along. So if a person would drop off breakfast and dinner, he might eat some fruit. I think we understand now why being regular at meals is necessary. It is not important simply in relation to the nutrition, but it is of the highest importance in relation to the daily evacuations of the bowels,-- it disturbs their functions.....

The dropping out of meals is a mistake, and you should not do it. Patients should be instructed to be regular at meals, also in regard to the quantity. If you fast a day, you must remember that the natural rhythm of the bowels will be interrupted, and that will be restored when you return to your regular two meals a day in the regular way. What other cause for this difficulty have we? ("A sendentary life would produce inactivity of the bowels.") ("A person's business might be such that he would neglect the emptying of the bowels.") It would be well for such a person to attend to the moving of the bowels before commencing his business, and be careful in regard to this matter. Many are careless and have no regular time to attend to the movement of the bowels; they never

think of it unless there is a pressing demand for it; otherwise there is a total neglect of the demands of the body. It is surprising how many are neglectful in this respect. Why does a sedentary life cause constipation? ("There would be weak adominal muscles.") Yes.

Sitting is a bad and an abnormal position,-- I am convinced of that it is avery bad position. The only normal position for man is that of standing, or reclining. That is my honest belief; I don't find any very good argument against such an idea. The greatest argument that I Have ever seen against such an idea is, that the dog sits up,-- that is about the only animal-- the dog, the lion, and the cat and the monkey sit down, but you never saw a horse sit down- unless it is taught to do it.

I will give you my reason from my ideas in regard to this mat-mat,-- I don't think animals sit much; they generally lie down or stand up. When one stands, he must forcibly exercise his muscles in order to maintain his equilibrium. The muscles of the back must be contracted all the time in order to maintain oneself in that position. Suppose the abdominal muscles were completed relaxed-- what would be the effect? The effect would be that the abdominal viscera would fall right over backward because it requires the contraction of the adominal muscles to keep them in balance. These muscles must be strong in order to maintain the equilibrium. When a person sits down in this way, (illustrating) the muscles are all relaxed. When we are standing the muscles are contracted and they hold the liver and all the other organs in place. The stomach, liver, kidneys and other organs are all pendant organs-- they are hanging down; they are all suspended from above and behind, the bowels forming a fringe of membranous support. (Illustrating by rubber.) They are attached to the mesentery. When the abdominal muscles are contracted they support these muscles; the principle support is the abdominal muscles, and their contraction holds the organs in place, the ligaments of the stomach, spleen

etc. are only mooring ropes like the rope attached to a ship and to the wharf-- it only keeps it in place. Suppose we try to suspend or moor the ship by one cable-rope-- it would snap in a hurry. That is the condition of the organs-- they are moored by the ligaments and they are depended upon to sustain the weight and when they are stretched they are not capable of supporting the organs. The abdominal muscles are the chief supports of the viscera by which they are held in place. When a person is in a vertical position the weight hangs on the ligaments. Suppose a person is in a verticle position and the weight is on the ligaments-- they immediately fall down and the muscles are contracted; so when a person sits up he must sit straight and thus keep the muscles contracted. But the natural tendency is to a relaxed position when one sits down. If we had the chairs of our grandfathers and mothers, which had perfectly straight backs, it would be much better for us; but I believe that sitting is an unnatural position-- that man was never intended to sit, and that we should either stand or recline. When a person lies down the body is horizontal and the organs are not hanging down and straining upon the ligaments, and in standing we must contract the muscles to support the abdominal organs in their proper places. I am satisfied that chairs are among the curses of civilization,-- that chairs and clothes are among the greatest curses of civilization-- chairs, houses, and clothes. (A lady;"we would be savages!") Yes, we would be savages but we would be healthy. Many ladies feel as though they must hold themselves together. Many times they have to use the abdominal supporter, and many are wonderfully relieved by the abdominal supporter.

Sendentary habits, one of which is the habit of sitting, results in weakening the abdominal muscles; you can almost always tell when a person has been in the habit of sitting,-- how can you tell that?

By the wrinkles on the stomach. Then there is another ear-mark,--what is that ? ("Corns on the back.") Yes. Look at your patients in the bath-room and see how many of them have corns or brown spots on their backs. That is where the spinous process presses against the chair; you will sometimes see four or five of these vertebrae in this condition; and sometimes there is a brown streak all the way down.

There is another reason why sedentary habits induce constipation,--muscular inactivity. Muscular movement favors peristalsis; muscular action has the effect to stimulate peristalsis. Here is a person with diarrhoea,--what do you say to him? "Lie down and keep still." Why? Because if he walks around, it will increase the movement of the bowels. So rest in bed is essential in such cases, because it favors lessening the peristaltic movement. So you can see that a sedentary life has a tendency to diminish peristalsis in a person who is ill. That is the reason we tell a person having diarrhoea to keep still. I hope you will not forget this .

"What is the use of knowing these things? So that the patient as well as yourself will understand it, and have confidence in his nurse or doctor.

There is another reason for this trouble: Sedentary habits lessen the nerve-tone as well as the strength of a person; and they depreciate the general health, thus slowing down all the machinery of the body.

There is another cause of constipation,--can you think of it ? ("Too concentrated a diet.") ("They must have diet that will stimulate peristaltic action.") Yes,--and bran bread, some say, irritates the mucous membrane of the stomach; you will find some foolish doctors who claim that bran bread irritates the intestine, and they describe the lac-

eration of the bowel by the bran coming down into it with other food. Did you ever soak some brand in water to see how irritating it is? Have you not sometimes applied a wet bran poultice for a wound? ("Yes.") What does this course residue do, does it irritate? Not it is not irritating at all, although it titillates the mucous membrane ,-- but that is not irritation. If you put a feather to your nose it does not irritate it, - it does not scratch and lacerate your nose, and yet it has a tremendous muscular effect dosn't it? Now suppose you put a feather down your throat-- would not that produce a most decided movement upward? Yes it would make you vomit. In the same way bran and other course foods titillate the mucous membrane. If you swallow agreat deal of soup it won't have that effect, but if you swallowsolid food or even semi-solid food, the woody portion of the food or the residue will have the effect to stimulate contraction. Course food tickles the membrane of the intestine and stimulates it, but it does not irritate it. There is a difference between irritation and stimulation; stimulation is normal while irritation is abnormal.

A change of diet from a very course and bulky diet to a concentrated diet has a tendency to produce constipation. That is why so many patients come here. Here is a person who has been taking a diet of pickles, olives , cucumber pickles. Many ladies try to live on that kind of diet,-- especially, "hot toast and salad." Ladies are particularly fond of salad-- I don't know why, and I have never been able to find out-- it seems to be a feminine appetite and I have never been able to discover the reason for it. Men are fond of meats and women are fond of salads. Now let a person change their dietary from such a diet to a wholesome dietary- say a diet of browned rice and eggs and zwiebach, white or whole wheat and perhaps kumyss and similar food,-- the doctor says we must have food

and food that is easily digested and that will not produce constipation. Now the patient has been accustomed to eating beefsteak which has a large amount of indigestible residue, also other indigestible foods some of which are chiefly wood, and the sudden change from such a diet to a diet which is entirely digestible, as rice, toasted wheat bread and similar foods which contain no indigestible residue-- by such a change the patient would become constipated for a time, and something should be done to overcome that condition,-- now tell me how you would mangage to overcome that difficulty. ("Give him a lot of fruit.") Yes. Some people say fruit does not do any good in such cases, but fruit is excellent for such cases, and that would be a good thing to do,-- but suppose that did not succeed, what should be done? ("Have the patient take water.") What do you think would be the best hours for taking water? ("About an hour before breakfast.") Yes,-- and on going to bed at night,-- and that would set up the peristaltic movement-- an hour before breakfast in the morning would start the peristalsis; that is what the cold water is for. But suppose a person says, I don't want cold water, I can't take it on my stomach-- what would you suggest in such a case? ("Fruit juice.") Yes-- you would say, "Take the juice of three of four oranges" and he might add a couple of apples,-- but we are now considering the removal of the causes.

Is there not something else that can be given as a diet for the patient that would answer just as well as anything that has been suggested and that would not have a constipating tendency? Would not granose and browned rice and similar foods answer this purpose? ("Yes.") Yes, and probably even more so.

Granose flakes, toasted wheat flakes and granose biscuit would do well-- what else would you suggest? ("Granola and graham flour.")

Is there anything else? Did you ever hear of a mother's giving molasses to her children for this trouble? ("Yes.") Yes-- and malted nuts also have a laxative tendency so you should give the patient a diet of granose flakes, malted nuts and so on, and you can arrange a bill of fare which will not be constipating and which will be as digestible-- and even more digestible than the foods mentioned. Why do you think malted nuts has a tendency to secure natural activity of the bowels? ("It is fattening.")

Q. How would fresh vegetables do?

A. He might add asparagas, green peas, and possibly string beans-- but they are pretty hard to digest if a person has a feverish stomach, but they might be used by a person with average digestion.

Q. How about sweet corn.

A. The bpulp of sweet corn is very good, but it would not have a laxative effect, it is so completely digestible.

Suppose you had no nuts,-- what would you substitute in their place? ("Milk.") Milk seems to be constipating but when you take thick cream or butter, that is better, because the lack of fat is one of the common causes of constipation. When yougive the patient a diet of cereals and a little fruit, there is no fat in that dietary, or almost none,-- and you must have some fat. There is a little fat in the yolks of eggs; but if you have a diet made up of fruits and grains there is no fat and so you must add fat of some sort-- what would it be? ("Olive oil.") It would certainly have some effect. You must add fat of some sort.

Suppose you hadn't any of the things that have been mentioned,- you might give the patient some roast almond or puree of peas taking care to exclude the skins. With some persons potatoes have a tendency to loosen the bowels; potato meal or potato porrige has a tendency in that way. I think kumyss and milk are slightly laxative on account of the

acid; kumyss, kumyzoon, and buttermilk might be used. ("Bran bread might be useful?") Yes-- a teacupful of bran and a little water. We will continue these studies next time.

I wish to offer a prize, not a very big prize, but a series of prizes. I want to offer $2 for the best Bible beefsteak. I propose that we use meat in the Sanitarium in the Bible way. We won't have any more bloody beefsteak, but if a patient has meat we will grind it up and soak it until the blood is all extracted, washing it out with cold water and then turn boiling water on it for ten minutes and soak out the uric acid and the poisons, and then it will be so far as health as is concerned, just as wholesome as eggs-- I don't know but it is as wholesome as eggs after the poisons have been all washed out of it,-- but still it is hard on the ox. In a case of emergency, if you want to eat meat and must have it I want you to eat it in this way. I would like to have you make some experiments and see who can prepare meat in that way and make it palatable. Of course it would be pretty dry, and it might be combined with white of eggs or the juices of proteids, or possibly nuttolene, and it also might be preapred in the form of a gravy as you prepare cod-fish-- and cod-fish is sometimes used with tomatoes; it could be prepared in some of these ways and I am going to offer $2 for the best specimen or sample, a $1.50 for the next best, a $1 for the next, and fifty cents for the next best,-- and if you get up something really choice and good out of it we will give you something better than this offer. If some of you can prepare something that will take the place of beef without meat being eaten at all it will be just as good as the beef itself. One man ate protose for three weeks and thought it was a new kind of fowl. When protose was first brought out, Dr. Kress had some and he smacked his lips and said, "That is the best thing that I have tasted for years," and then he smacked his lips

again, and said it was the best thing that he had ever tasted. I asked him what it tasted like, and he said, "Beefsteak." It takes a good while to get away from old appetites. If any one can prepare protose so as to make it better than beefsteak, it would be acceptable to the people. I will show you a copy of "Hydrotherapy" the next time we meet .

HEALTH TALKS. Sept. 9, 1901.

J. H. Kellogg, M. D.

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What do you think is one ofthe causes of constipation,-- the question which we are now considering in connection with gastric formation? ("Dilitation".) What relation does the condition of the adominal muscles have to constipation? ("Prolapse".) Yes. There are prolapses-- anything else? The colon dilates very often for want of proper support-- so there is dilitation and prolapse both. Dilitation produces constipation by allowing fecal matters to accumulate too long and become impacted together because the walls of the colon are not able to contract with sufficient vigor to expell the contents of the colon.

Let us consider, in systematic order some of the causes of constipation,-- tell me one of them. ("I think one of the causes is a neglect to empty the bowels.") Why is it that negleet to empty the bowels at a proper time will produce constipation? ("One reason would be that it might cause congestion by overaccumulation.") It would take a long time to do that,-- perhaps it would take months to produce permanent injury, but it would produce some bad results. If a person neglects to attend to the movement of the bowels at the proper time for one day, what is apt to happen the next day? There would be no inclination for a movement and constipation would result in a short time. And why does neglect in this particular produce inactivity of the bowels? Persons have the habit of being hungry at a certain hour of the day because they have been in the habit of taking a meal at that time and so they become hungry at that hour, and if he changes his hour of eating after a time he will not become hungry until that time. The body forms habits in that way, and so the body has its natural habit in this respect, and when that habit is

broken up,the natural rhythm of the bowels is disturbed, and constipation is the result. But there are more important things that must be considered,--can you think of any? ("I should think that by neglect of a meal, the peristaltic movement would be interfered with, the sensation or desire for evacuation would be taken away, and the fecal matters would become hardened.") Yes, the fecal matters would become hardened and dry, and it would require more than the ordinary expulsive power to produce evacuation.

We are now speaking of an inactive state of the bowels from neglect, and the reason why,--will you give us the reason why? ("I think the fecal matters would harden and would adhere to the walls of the intestines.") Yes. Sometimes the bowels have not been emptied for months, and then hardened masses will be too large,--too large to find exit until they have been broken up by mechanical means. I had a case of this kind once which distressed me very much for it resulted in the failure of a surgical operation. The lady had laceration of the perineum and had diarrhea. The nurse who made the preparation thought it was not necessary to give a laxative because the patient had diarrhea, and she had had an enema. The next day after the operation the patient complained of pain, and there was considerable fecal discharge, and every once in a while she had a chill and fever set in; and after a few days I examined the case and found a great fecal mass bearing right against the perineum and had to inject oil to loosen it up. The diarrhea continued and large masses were discharged,-- great masses had been accumulating and were brought down by the stimulation set up by the operation. That is one of the evils of neglect of bowel movement.

There is another bad result of neglect in this regard,-- and that is, that a reversed peristaltic movement is set up; that is perhaps

the first thing that happens as the result of this neglect-- if the fecal matters are not removed nature reverses the peristaltic movement and carries them back again.

If you are presnt in the surgical ward at some time when I am operating upon hemorrhoids, you can see that there is a little smoke produced when they are burned off; and I have often seen this happen-- that after the operation is completed a little puff of smoke came from the rectum and then another puff of smoke, and then another. This smoke had been carried up the intestine during the operation by the reverse movement. The effect of burning the tissues naturally produced a drawing in. When the patient has a desire to move the bowels and restrains that desire there is a contraction of the lower part of the intestine, and when the desire is resisted the result is a reversed peristaltic movement which carries the fecal matters back into the colon where it remains until it is hard and dry. The next day, it may be necessary to introduce a quantity of water into the lower part of the colon to soften up the contents and carry them off.

Now where there is so much neglect what is there that will prevent the accumulation of an excessive quantity of fecal matters-- how are they disposed of? ("I suppose there is absorption.") No; the thing that happens in these cases, is that after a time the presence of fecal matters produces irritation and that sets up a diarrhea and the fecal matters in the alimentary canal will be softened up and cleared out. In the majority of cases, after two or three weeks, if the bowels have not moved patients will have an alternation of diarrhea and constipation, and they generally have more or less catarrh of the colon,-- there will be large quantities of mucus that will be discharged along at intervals. We have a patient now in the Sanitarium who has an accumulation of a great amount

of mucus every once in a while, and he has got the idea that he must have a quantity of medicine to tear that mucus off the lining of the stomach. I once knew a patient who took Brandeth's pills once a week and that would tend to irritate the bowels. Many persons take large doses of mineral water for this trouble. We have a patient now who has been in the habit, for years, of taking about once a week, a large dose of mineral water, following that with a big dose of castor oil. He drinks water before breakfast, and after breakfast and takes a table-spoonful of castor oil. But he has been going on for several years in this way, and now that dose of castor oil is not sufficient, so, in addition to that he must take a soap enema in order to afford relief. He kept on persevering until he secured a discharge of tough white mucus, and whenever he does that he feels relieved. Unless he does that, his legs are numb, his head is dull, and he feels wretched and miserable. Now what do you think is the cause of that? ("Toxins.") That is possible, and yet I rather imagine this,-- that his head becomes so full, (as he complains that it does) and he has these symptoms that he speaks about,-- that the relief afforded is due to the relief of the intestines by the retention of blood in the head (?); this is a sort of derivative effect. This practice is a very detrimental one. He will continue to get worse everyday of his life as long as that practice is continued.

Now let us consider another cause of constipation: What would you think about skipping meals? Would that have any effect upon constipation-- suppose a person has habitually taken supper and then drops off his supper-- would that produce constipation? ("He might loose a peristaltic movement".) Yes, he might have trouble in that respect until he got used to it. Suppose a man goes without his dinner and supper both-- suppose he don't take an ordinary breakfast or dinner-- a day would that be

likely to produce constipation tomorrow. ("I don't know as it would, because the m al of the day before would be far enough downward so that the peristaltic movement would not be necessary.") Then your idea is, that it would not be necessary for his bowels to move tomorrow,-- but the question is whether the natural movement of the bowels tomorrow would not be interrupted if a person did not eat today. ("Yes.") Yes, because each meal taken moves the previous one along the alimentary canal a little further, and it usually takes about three meals to fill the alimentary canal and discharge the residue of the preceeding day. It takes one day's eating to fill the alimentary canal and the eating of the next day has the effect to stimu late the bowels to empty itself,-- the food comes along in regular procession. Here is something to illustrate that: When a chemist is going to make an examination of fecal matters so as to know the extent of digestion that have taken place in different kinds of food, he must have some way of dividing the meals that the man is eating; he must know what portion of fecal matters he must take for analysis-- for example he puts a man on a strict diet of milk for one day, then he makes a careful examination of fecal matters discharged from the body , and when it comes to the time for the milk diet to be discharged there is a distinct line for careful examination. The fecal matters are of a different color so that within a short space there will be a change and he makes a division right there; then he commences giving the patient food which he wishes to analyze, and when the change of color takes place he begins to make his examination of the residues from that time on. The fecal matters are made up of the residues of food, and the previous meal taken pushes the contents of the alimentary canal along by setting up the peristaltic movement, and when it gets down into the colon which is the depositary and store-hourse of the digested food-stuffs which

are being stored up for absorption, then they come incloser contact and become more solid and compact.

You can readily see that if a person neglects to take breakfast and dinner, there would not be enough to fill the colon, and there wouldnt be stimulation in the alimentary canal sufficient to pass it along. Now would it be a good plan for such a patient to take cold water at meal time? ("Yes.") And if you can't find anything else to eat you can take a meal of water, because that would furnish peristaltic activity,-- and there might be something better-- and what is that? ("Eat some fruit") Yes; and then there might be bulk enough to move the food along. So if a person would drop off breakfast and dinner, he might eat some fruit. I think we understand now why being regular at meals is necessary. It is not important simply in relation to the nutrition, but it is of the highest importance in relation to the daily evacuations of the bowels,-- it disturbs their functions.....

The dropping out of meals is a mistake, and you should not do it. Patients should be instructed to be regular at meals, also in regard to the quantity. If you fast a day, you must remember that the natural rhythm of the bowels will be interrupted, and that will be restored when you return to your regular two meals a day in the regular way. What other cause for this difficulty have we? ("A sendentary life would produce inactivity of the bowels.") ("A person's business might be such that he would neglect the emptying of the bowels.") It would be well for such a person to attend to the moving of the bowels before commencing his business, and be careful in regard to this matter. Many are careless and have no regular time to attend to the movement of the bowels; they never

think of it unless there is a pressing demand for it; otherwise there is a total neglect of the demands of the body. It is surprising how many are neglectful in this respect. Why does a sedentary life cause constipation? ("There would be weak adominal muscles.") Yes.

Sitting is a bad and an abnormal position,-- I am convinced of that it is a very bad position. The only normal position for man is that of standing, or reclining. That is my honest belief; I don't find any very good argument against such an idea. The greatest argument that I have ever seen against such an idea is, that the dog sits up,-- that is about the only animal-- the dog, the lion, and the cat and the monkey sit down, but you never saw a horse sit down- unless it is taught to do it.

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A. The pulp of sweet corn is very good, but it would not have a laxative effect, it is so completely digestible.

Suppose you had no nuts,-- what would you substitute in their place? ("Milk.") Milk seems to be constipating but when you take thick cream or butter, that is better, because the lack of fat is one of the common causes of constipation. When yougive the patient a diet of cereals and a little fruit, there is no fat in that dietary, or almost none,-- and you must have some fat. There is a litttle fat in the yolks of eggs; but if you have a diet made up of fruits and grains there is no fat and so you must add fat of some sort-- what would it be? ("Olive oil.") It would certainly have some effect. You must add fat of some sort.

Suppose you hadn't any of the things that have been mentioned,- you might give the patient some roast almond or puree of peas taking care to exclude the skins. With some persons potatoes have a tendency to loosen the bowels; potato meal or potato porrige has a tendency in that way. I think kumyss and milk are slightly laxative on account of the

acid; kumyss, kumyzoon, and buttermilk might be used. ("Bran bread might be useful?") Yes+- a teacupful of bran and a little water. We will continue these studies next time.

I wish to offer a prize, not a very big prize, but a series of prizes. I want to offer $2 for the best Bible beefsteak. I propose that we use meat in the Sanitarium in the Bible way. We won't have any more bloody beefsteak, but if a patient has meat we will grind it up and soak it until the blood is all extracted, washing it out with cold water and then turn boiling water on it for ten minutes and soak out the uric acid and the poisons, and then it will be so far as health as is concerned, just as wholesome as eggs-- I don't know but it is a s wholesome as eggs after the poisons have been all washed out of it,-- but still it is hard on the ox. In a case of emergency, if you want to eat meat and must have it I want you to eat it in this way. I would like to have you make some experiments and see who can prepare meat in that way and make it palatable. Of course it would be pretty dry, and it might be combined with white of eggs or the juices of proteids, or possibly nuttolene, and it also might be preapred in the form of agravy as you prepare cod-fish-- and cod-fish is sometimes used with tomatoes; it could be prepared in some of these ways and I am going to offer $2 for the best specimen or sample, a $1.50 for the next best, a $1 for the next, and fifty cents for the next best,-- and if you get up something really choice and good out of it we will give you something better than this offer. If some of you can prepare something that will take the place of beef without meat being eaten at all it will be just as good as the beef itself. One man ate protose for three weeks and thought it was a new kind of fowl. When protose was first brought out, Dr. Kress had some and he smacked his lips and said, "That is the best thing that I have tasted for years," and then he smacked his lips

again, and said it was the best thing that he had ever tasted. I asked him what it tasted like, and he said, "Beefsteak." It takes a good while to get away from old appetites. If any one can prepare protose so as to make it better than beefsteak, it would be acceptable to the people. I will show you a copy of "Hydrotherapy" the next time we meet .

THE FOLLIES OF FASHIONABLE LIFE. Sept. 12, 1901.

J. H. Kellogg. M. D.

Stereoptican lecture.

---X---

I wish to talk to you a little while to-night about the deformities of fashion. It is strange how tamely and how supinely people submit to the evils of modern civilization. When you bring the savage of the forest under the conditions of civilized society, and shut him up on civilized houses and put civilized clothes on him, and if he survives for six months it will be because he is uncommonly tough. The savage has such tremendous vigor of life that it takes seven bullets to stop him in his attack, according to the testimony of an English officer. The houses in which we live and our surroundings are so far removed from the normal and the natural conditions in which man was intended to live that they are capable of killing off the North American Indian or a South American monkey in six month time as a rule. We have an illustration of that a few miles south of her, where there was a colony of Indians left behind when their tribe removed to the far West; they had a tract of land left down here, and some of them came back and settled about fifteen miles south of here. They sometimes came to town to see Buffalo Bill and his "Wild West" show. They came back about six years ago, and they are now diminished to about one-third of their original number. They returned about five or six years ago. What was the cause of this rapid dimunition? It was because they were educated in the habits of civilization, and conformed to the customs of civilization. The civilized man is able to endure more of the hardships of civilized life than is the Indian, although he could not endure so much in the forest,--he can bear the deforming influence of dress, etc? better than the savage can-- they have become immune, to a certain degree, to these

things,-- and typhoid fever and other diseases-- the people of Chicago have so long been accustomed to these things that they are able to live, and to live very well, in the midst of these unfavorable surroundings.

In the first place, so far as health is concerned, it is unwholesome to wear dress,-- and yet we must dress so as to be modest; beside it is necessary to dress in order to keep warm. Man was naturally a tropical creature, and to live where he does not need to wear clothes,-- that is his natural habitat; and when he moves to a climate like this, he is a belated person, and he finds himself under the necessity of wearing clothes, and clothing that is borrowed from some of the creatures about him.

Clothing is not so necessary as it seems. A civilized man once met a savage in a snow storm; and all the clothing the Indian wore was war paint and a loin-cloth. But the Indian seemed to be thoroughly enjoying himself while the white man was shivering, although clad in warm clothing and furs. The white man asked the savage if he wasn't cold. "Is your face cold", asked the Indian. "No", replied the other. "Well, the Indian is all face." He was really all"face", so why should his back or limbs be cold any more than the other man's face should be cold? Every part of the Indian's body was so full of vigor, vitality and activity that itcould take care of its self and keep warm, as well as the face of the civilized man could take care of itself.

If we must wear clothes in order to be civilized, let us wear our clothes in such a way that they will not deform and abuse our bodies and interfere with their functions. Men have escaped some of the evils of fashionable dress, although I must admit that our masculine dress is not so healthful as it ought to be. The dress reformers have gotten ahead of us, so that women can dress more healthfully than men if they desire to do so; for men must wear suspenders, or be subject to all sorts of inconvenience. The blacksmith throws off his suspenders and ties them around his

[waist

in order to support his pantaloons while shoing horses. I saw such a man some time ago, and asked him if he ever had worn a corset or a belt, and he said he had not. Then I asked him how his kidneys could have gotten out of place. Then he told me how he had thrown down his suspenders and fastened them around his waist in order to sustain his pantaloons. It was by this means that he got a floating kidney. I at one time saw an office in the same condition, and asked him if he wore a belt. He said he did; that he had a heavy sword which had been presented to him, and that when drilling soldiers he wore this heavy sword and belt, and that had done him harm and gave him pain in the region of the waist. There are many men who meet with accidents of this kind,--and such accidents are incident to their profession.

Now the average woman is in the situation, for, unfortunately, women, as a rule, have not adopted the more wholesome dress (suspending the weight of the clothing by the shoulders), so that, generally, the stomach, liver, kidney, bowels and other internal viscera are out of place,-not because of their profession, but because of fashion,--not because she is a woman, but because she is a slave to fashion. It seems to me that this question should be understood, for I believe it to be a fact that three-fourths of all the suffering imposed upon women are due, not to the fact that they are feminine, but to the fact that they wear feminine clothing, but to the fact that they wear conventional garments. Now I am not going to say a word about tight-lacing; I am talking about the dress that the average lady wears--including the washerwoman--the dress that all women in all civilized lands consider it necessary to wear in order that they shall not be considered conspicuously odd. (Screen.)

This view represents the Venus de Milo. This as you know, represents a famous statue, which is universally regarded by artists as the most

perfect model of the feminine figure that was ever made; it represents the highest achievement of Greek art in the representation of the female form.

XVI (Screen.) Here is a contrast to this representation,-- it is a copy of a cut in a fashion magazine,-- it is a fashion-plate. Sometime ago I saw something that looked just like that going down street in Chicago. She was just wriggling along,-- she couldn't walk; she couldn't get up grace of movement; she was just going along in rambling sort of a way. Now take an inside view(screen)-- this is the picture made by Prof. Ziemssen, one of the most famous anatomists in the world; he has taken the pains to find out the exact location of all the internal viscera of a healthy human being. The flesh between the ribs and skin is supposed to be cut away so you can see the inside-- here is the stomach. Please observe how high the stomach comes up. Notice these ribs (counting them.) This is the fifth rib, and you will see here that the stomach rises up to the level of your fifth rib, so it comes up a great deal higher in the body than most people suppose. (Locating different organs.) Sometimes the liver gets tranferred to the wrong side; it is good to have the heart and liver in the right place. Here is the colon, the small intestine and the kidneys-- all entirely above the lower border of the ribs on either side. Here is the spleen and pancreas all behind the stomach. Here are the transverse colon, stomach, liver and pancreas-- all these important organs are between the diaphram and the lower border of the ribs. Now if a pressure were applied here, it would force them down. I have had a diagram made which represents all these important organs. Here is a case where a woman had worn what is called "a health corset," and you can see by comparison of these figures that she was not fashionable at all; if she had been fashionable her width would have been about half as large as it

is. This woman wore tight clothing only. It is not tight clothing but tight lacing which makes the constriction that reduces the waist measure.

XVIII (Screen.) Here is the liver; you see it is away down below the ribs; the stoach also is entirely below the ribs,-- and here are both kidneys floating around in the abdominal cavities. Here is the colon prolength of the lapsed to way down half the abdominal cavity. I met a case some time ago in which the colon lay clear down below the pelvis, and it was all doubled up in a knot. No wonder that patient suffering from intestinal obstruction. I will put this pointer right across the picture here,-- please notice now and see how many organs there are above it. On this side all the important organs are above, and on the other side below-- the pancreas, spleen, colon and part of the liver are below,-- and why? Because the chest was compressed by the clothing to such and extent that there was not room for them, so they are turned out doors and are all wondering about. Now dislocated kidneys, bowels etc. are certain to do more harm to the body than a dislocated shoulder of knee. A shoulder or knee may be dislocated and the body may still be healthy, but a dislocated stomach is a pretty serious thing for when foods get into such a stomach they cannot get out. A liver that has been compressed until it is almost cut in two, (as I will show you further on is a prey to such troubles as gall stones and other inconveniences. (Screen) Here is an outline. For sometime I have been studying outlines and I have devised means for obtaining the outlines of people, by which the individual can stand up against the apparatus and his outline can be almost instantly made. I have made many outlines and my assistant has made many for me in this manner,--and this is one of them. This is the outline of a normal woman, having a normal waist Here is the Venus de Milo, and here is the outline of an Italian woman who lived in Paris, a lady who made her living by posing to an artist who

took her figure. I found the young woman one day in the studio of one of my friends in Paris and I got her outline in this way. This is the outline of an Abyssinian woman,-- notice these large waists. Some people think it is a terrible thing for a woman to have a large waist. It seems to be the common opinion that a woman must have a very small head, waist, and foot,-- they must be small at each end and in the middle. Now I can't understand why a woman should have this concession to beauty, for there is not the least foundation for it,--not the slig test. When we come to study the models of great artists of ancient times, and of modern times, we find that whenever we have an undraped ~~figure~~ female figure, it always has a large waist. I have taken the trouble to measure the waists of Greek marbles, and I find that the average measurements of the Venus de Milo and other Greek models, in proportion to the height, to be 47.6 per cent.,or a little less than half the height,--you can almost say that the waist measure should be half the height. That is the normal proportion, nearly, as shown by the Venus de Milo. I have been taking the waist-measurements of the Apollo Belvidere and several other model masculine figures, and I find the average waist-measure to be 45 and a fraction, per cent of the height. So that the waist of the average woman is larger than that of the average man. I have also found that the universal testimony of the great anatomists who have made a study of this matter is, that the viscera of women is larger than that of men, and that women have more liver and less heart than men. Woman has a small heart because she has a small fist, the heart of a man or woman being just the size of their fist. So if a man has a large fist, he has a small heart. Woman has a smaller heart and fist than man because her strength is only about half that of man, on the average. But she has a large liver and other visceral organs, because she has to eat and di-

gest for two, consequently abdominal viscera are larger in women than in men, so the waists of women should be larger than those of men. So you see how preposterous it is for women to try to make their waists as small as possible./ I once said to a woman who had a small waist, "You are certainly wearing your clothes too tight." "No", said she, "I never wear my clothes tight; my waist is naturally small." Women are naturally proud of their small waists, but that is a mark of vital weakness-- of constitutional weakness; so if you have a small waist, it shows that you are a weak woman and cannot endure very much; you are not fit to be a mother; you not not fit to take up the duties of life if you have a small waist. In order to be the woman you should be you must have a large waist, large viscera, and large stong vital organs; you must have these if you expect to endure the hardships of life which married woman are subjedt to in this world. So I would like to have you dissipate from your mind the idea that a woman must have a small waist. I read a paper bearing upon this subject before the great medical convention in Washington, and when I had finished my paper a doctor got up and said he was very much astonished to be told that a woman should not have a small waist,--said he, "My mother and my sisters have always taught me ever since I was a boy that it is an element of beauty in a woman to have a small waist." But nobody cheered him for his sentiments, and immediately a woman who was a professor in a medical college, who said, "I am glad we have had this discussion, because I can see now more clearly than ever the evils of the conventional dress; I believe a woman has just as go d a right to have a large waist as for a man to have a large waist," and every body cheered her.

Most people suppose it is necessary to breath with the top of the chest. Sometimes I ask a woman to take a deep breath, and she does so in this way, with the top of the chest, (illustrating). Why does she

do that? Because her chest is tied up down below and she can't get air in there. So the only way to get it is by stretching up--the muscles pull the chest up as well as they can.(Illustrating by articulated chest.) When the chest rises in front please observe what happens at the sides. Now take a deep breath and see if you can do that. I fear there are very few men who can do that--I mean ladies-- there are very few ladies who can breath as much as they ought to. (Illustrating with a tape-line.) Now please observe that the chest rises in front and all around. I sometimes tell a younglady that is the way she ought to breath, and if she will take exercises in the gymnasium she can do it, and she says, "Must I breath like that?" "Yes", I answer. "O, I couldn't think of breathing in that way". "Why not?" I ask. "Because when I go home all the girls would point their finger at me and say, "She breaths just like a man." At one time I was in a certain dancing school,-- I wanted to find out something about the waists of little girls, and I found a whole lot of little girls there, all the way from ten to twelve years old, and I measured their waists and found the average of their waists to be 23 1/2 inches. I then looked at some of my statistics and found that the measurements of the Wellesley College girls was 24 inches,-- and they were about twenty years old. This is one of the girls whom I measured and she was only about 3 1/2 feet high and her waist measurement was 23 1/2 inches. (Screen.) Will you tell me how it is that a woman continues to grow in every other direction except in this particular spot. This girl is two feet taller, almost, and yet her waist is only half an inch larger than that of the other girl. Every part of thebody was doubled in size except this particular spot, and it increased only about half an inch in ten years. There is a reason for that. When this girl was twelve of fourteen years old, the dressmaker said to her mother, "We must be careful about forming this girl's figure." There is nothing said about boy's waists,

but the girls are supposed to be born with a bad shape and that it is necessary to call in a modiste or dressmaker to give the girl a shape,-- and what kind of a shape must she have? The fashion plates are consulted to see what kind of a shape she shall have and that girl is put into that shape, and she is supposed to grow into it as a cucumber grows in a bottle and takes the shape of the bottle. I tried that experiment when a boy, putting a cucumber into a square bottle and by this means I had a square cucumber. I took it to school and the boys asked me what variety of cucumber that was and I told them that cucumber grew in a bottle. So we find in the United States a new variety of woman-- a woman that God never made, men made them-- men make fashions and fashions make women. Women are called the weaker vessels, but whenever we have medical conventions doctors always have this particular toasts at their banquets, "Woman, God's best gift to man, and the chief supports of the doctors."

Now I am going to do just what I did in this dancing school,-- I am going to ask one of those little girls to come up here and let me examine her waist. (Little girl comes up.) Now take a deep breath-- that is just splendid; that is just the way this model breaths-- breath again- that is very fine. Now I am going to put this tape-line around her waist and see how much she breaths. I see these ladies are all interested in her waist-- she don't know where her waist is,-- there is no dividing line there; there is no such thing as a waist in the natural form; if there is a waist in the female form the dressmaker made it; God never made the waist. This young ladies waist measures 24 1/4,-- how old are you? ("Not quite twelve years old.") Two inches of waist for each year,-- now when shes is twenty she will be eight years old er and how large ought her waist to be then. (Laughter.) That would be forty inches. I will apply this tape-line and ask her to breath in and out,-- see how this line [illegible]

travels-- she has expanded he waist four inches when she breathed. That is beautiful. Now I wonder if some twenty year old girl will come up here and let us take her waist measurement? (Young lady comes up.) The waist measurement of this girl who is not quite twelve years old is just the average of the Wellesley College girls. You see there is someth wrong about that,-- the young ladies simply have not permitted their wais to grow after they are twelve years old; everything about them grows but their waist, and that is not permitted to grow because it is not the fash ion. Now is it right for us to put oursleves into such forms as this. Young mothers in savage tribes in Washington Territory, when their babies are about six months old tie boards to their heads with strings so as to make their heads flat,-- and that is the way they get their flat heads, and you say this is awful cruelty. And when you see the mothers of little Indians babies bandaging their heads to form them into the shape of [redacted]ne about the region of self-esteem, you say, "What awful cruelty tha is." And when you see women in the Orient who put bandages about their feet and keep them tied up so that their feet are only three of four inches long,-- all shrunken up and the toes doubled under and their is only a few cords and bones left of the feet you say what a horrible thing that is. I have several shoes at home which have been worn by these ladies, and the shoes are only about three inches long. Now consider how much worse it is to bind the body in this region where the vital organs lie-- where the organs which are the very engines of the body and the source of life-- the liver and stomach and all the other organs upon which life depends-- remove the kidneys and death occurs in twenty-four hours; or if we interfere with the functions of the other organs and death soon follows. The head can be bandaged, but the brain is soft and pulpy and can still perform its functions; the feet can be cut off, if necessary and

still one can live. A Chinese woman once said to a missionary, who told me about it, "How terrible it is that you English women bind yourselves about your body,- why this is where we live. Now the Chinese believe that the soul is somewhere in the region of the stomach. (And I have known some people besides Chinese whose souls appeared to be in their stomachs.) The chinese look upon this part of the body as the vital part, and as sacred-- and so it is.

Just look at this figure-- here is a natural outline-- an outline of a perfectly natural figure. (Screen.) Here is a front profile of a natural figure. Now do you see anything uncouth in these figures? This woman has a figure that is normal in proportion and it is so of this figure here-- they represent a woman of the natural proportions -- so you see anything uncouth about it?

I would like to have you look at these figures (referring to charts)-- which of these is the more beautiful? Here you see just what fashion does- look at this figure and compare it with those. This is certainly a thing that we ought to consider,-- that after women have gone to all this trouble, wearing fashionable clothing, they have not made themselves more beautiful but more uncouth than before.

Most of you invalids come here to get well, and I find a large proportion of you are women, and you come here to get well. Now while in this Institution I beseech you all to adhere to natural and healthful customs, manners and principles. Let your ambition be to be healthy instead if fashionable. Why should any one say what shape the body shall be? God made us, and we have no right to change the form of the trunks of our bodies any more than we have a right to change the form of the head or the feet. God has put us here and given us our bodies, and if we care for them they will do their duty well. We find that disease comes

through some departure from the natural order. Now let us conform to God's principles and God's order, and in so doing we shall reap the largest possible harvest of health.

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FOLLIES OF FASHIONABLE LIFE, Pt. II.

Stereoptiscon Lecture, Sept. 19/01.

J.H. Kellogg, M.D.

--- X ---

Ladies and Gentlemen : I will refer to this same picture (Screen) that we had last week, for a review a moment or two. This picture shows the viscera in their normal position. This picture shows the liver is entirely above the lower border of the ribs and the stomach rises up to the fifth intercostal space, the lower border of the stomach falling about two inches above the lower border of the ribs, and the transverse colon the same. (Screen.) Look at this picture,-- the lower border of the stomach falls about two inches below the lower border of the ribs; the stomach, liver, kidneys and transverse colon are all below this limit. This is the ordinary result of the ordinary dress-- not ofthe "tight" dress-- not of tight lacing, but of the ordinary dress, sush as the common laboring women and even washerwomen wear in civilized countries. It is almost impossible to find a civilized woman in the world who has not a displaced stomach or viscera. A lady said to me the other night, "Oh this terrible pain in my side!" Upon examination I found that there was a floating kidney, and something must be done with it. I said to her, "Next week I will have to cut a little slit a little ways from the backbone and reach inside and hunt up that kidney and bring it home and tie it up and fasten it in its place by putting in some sutures and secure it so it cannot be pushed out of place any more." Here are the lungs; the confinement of the ribs at this point (the waist) restrains the most important movements of breathing; the most important movement of respiration is such as produces expansion of the sides. If you notice a

dog who has been running swiftly for a long distance, you will see his sides play out and in; this is the most important movement of breathing. The breast bone restrains the movement of the upper part of the chest, but the lower part of the chest in unrestrained; the ribs are attached to the breast bone by long, flexible cartilages, so there is freedom of movement of the ribs. The muscles constitute the bellows of the stomach, and the ribs answer to the handles of the bellows. Suppose you tie the handles of the bellows together; it is cold and you wish to start a fire; you can't use the handles of the bellows, so you seize the bellows by its body and endeavor to wrench its sides apart, in order to blow the fire into a flame,-- how would you get up a fire in that way? Newthat is exactly what our mothers and sisters are trying to do. They get up in the morning and dress,-- their clothing is to their bodies like tying up the handles of a bellows,-- what an absurd thing to do! A little boy wrote a composition while in school on the subject of "Breath", and it read like this, "Breath is made of air. If it wasn't for breath we could't keep life going for an hour. Breath comes through the nostrils while we sleep. There is a poison in breath which is poisoner than mad dogs; it is called carbonicide. One night there was a carbonicide got into a black hole in Calcutta and killed a hundred and forty-six Englishmen before morning. Girls can't run and holler much because their corsets squeeze their diagram . If I was a girl, I would rather be a boy, so I could run and holler and have a big diagram." (Boy laughs.) That boy sees the point, so I am sure the rest of you will do so. He will probably tell some of the girls that, so there will be a small reformation.

Now the necessity for breathing is so great, and the ordinary dress is so little adapted to the purpose of breathing that the ordinary woman finds it so difficult to take a little exercise that the bicycle

woman is compelled to adopt a special duit of clothing for the purpose of riding her wheel. A woman, when going out on her bicycle would no more think of wearing the ordinary dress in which she makes her calls than she would think of flying in it,-- she could not do it; she could not ride up hill or a long distance rapidly, because there is not room in her dress for the extra breath required by the exertion and exercise. It is for the same reason that when a woman faints away in church or in a crowd, (and it is always the woman who faints) every one knows that her clothing must be adjusted quick or she will die. But nobody thinks thinks of undressing the man who faints, or in any way interfering with his clothing, and no one says, "Unfasten his clothes," or "Rip up the back of his vest" Every one knows that when a man faints away it is a pretty serious case and needs medical attention, but if a woman faints away, every one known that when you adjust her clothing she will come to-- and so she does.

What is the harm of the stomach being down here? (Screen.) Here is the stomach where it does not belong and there it belongs. Now suppose I show you what is underneath: Here is the gall-bladder, and here is the liver. The gall flows down hill into the small intestine just below the stomach when the stomach is in the normal position. But when the stomach is prolapsed, then as the gall enters the intestine at this point, flowing down hill, when the stomach is prolapsed below this point the gall flows down hill into the stomach instead of flowing into the intestine. So the patient suffering from prolapse of the stomach wakes up in the morning with bile in the stomach and she says to her doctor "O,doctor! do give me something to get this bile off my stomach." What she needs to do is get the stomach up, so that the bile which flows down hill will flow into the intestine instead of the stomach.

What harm is there when the kidneys are displaced? They are

continually pulling upon the sympathetic nerve. The abdominal walls are weak and the visceral organs hang upon the nerves and muscles which run along the membranes, and which act as mooring ropes of the internal organs to hold them in their places; but in these cases they are weak and fail to sustain the weight of these organs, and the consequence is that they are dangling about in space in the abdomen, and when a patient is on her feet she has a constant feeling of strain-- a strained feeling in the top of head, a pulling at the back of the neck, a pain between her shoulder blades and a dragging sensation across the back, and she says, "I feel as though I were falling apart, and I must have something to hold me together," and so she wears corsets. She says, "When I take my corsets off I feel as though I were falling to pieces; I must have something to hold me together." I suppose I have heard a thousand ladies say the same thing about wearing corsets,-- they say, "I cannot get along without corsets, I must have something to hold me together; it seems as though I wer falling apart,--" and she is falling apart without the corset, because that holds these organs in place in this weakened condition of the abdominal nerves and muscles, for the organs are out of place, and instead of being held in place by the proximity of other organs, the abdominal muscles are relaxed and so the organs are all loose and jostling about in the abdominal cavity; they have too much latitide; the ligaments being weak, are stretched to two or three times their normal length, and so the organ are traveling around like a horse who is tied with too long a halter. Th experienced horseman ties his horse with a short strap so that the horse won't get all snarled up in the halter, because, in wanderingabout he might get all tangled up and choke himself,or hang himself,-- I have known of such cases. So it is here: when the stomach gets its ligaments stretched and the colon, liver and kidneys get to wandering around in the abdon

inal cavity they are in danger of getting into trouble, and they do get into trouble. When the kidneys are dragged down with the other organs, the ureters which carry the secretions of the kidneys and bladder get compressed and kinked up so thatthe secretions of the kidneys cannot flow downward first, but flow upward first, which results in stretching and injuring the kidneys. Some years ago I found a bunch in a ladies right side, which was very tender. Upon examination I found an enormous discharge of pus at that point, which occurred every day and was attended with great pain with chills, and blood poisoning was constantly present. I saw that something must be done at once, so I made a careful investigation, and I found this bunch to be an enlarged kidney. The lady had had a floating kidney for years, but had neglected it, and it became an enlarged and suppurating kidney. The patient was very miserable, and was a complete invalid and confined to her bed with feverand chills, and frequently she had great pain and was emaciated and looked as though she could not live but a short time. I had to perform an operation and remove the floating kidney. I found that it was filled up with a hard rocky mass; the kidney was so large that I had to amputate the last rib in order to get it out. When I discovered the kidney I found a stone half as large as my fist inside of it; it was one solid stone, weighing four and a half ounces; it was the largest stone that I ever knew of being removed from a kidney when the patient was alive.

Now that is one of the consequences of a floating kidney. There are other symptoms of the same thing,-- palpation of the heart, sick headaches, constant pain in the back of the neck, and depression and constant local pain. These are some of the symptoms, commonly induced by floating kidney. Sometimes a floating kidney gives no pain. Of course it does

not do any one any particular harm just then, but by-and-bye it will be painful and troublesome. So it is a serious thing to have a floating kidney. It first comes out from under the ribs and we can feel it, it is called a palpable kidney; when it comes out and goes back when we breath out, it is a movable kidney; when it comes down and remains down, just like prolapsed bowels and other organs, then it is a floating kidney. These are the three degrees of a displaced kidney which are recognized by the medical profession.

(Screen.) Here is a displaced colon. What harm is there in that? By-and-bye it collapses like a rubber tube and the opening is completely cut off and we have a pseudo stricture; the upper part of the bladder comes in contact with the lower part of the colon and then we have the fecal matters remaining at this point and the result is, catarrh or an inactive state of the bowels, chronic constipation, catarrh of the colon, apendicitis and sometimes chronic intestinal catarrh which is an exceedingly troublesome thing; so it is a very serious matter to have a displaced colon.

(Screen.) Here is a compressed liver and colon. Now the compression of the liver by falling too near the gall-bladder prevents the proper discharge of gall, and the result is hardening and gall stones. I have seen a gall-bladder that contained as many as forty gall-stones,-- I have sometimes opened up the body and taken out more than forty stones,, out of the gall-bladder, some of them being as big as my thumb. It is a fact known to all abdominal surgeons that the gall-bladder is affected in this way, by gall stones, four times in women where it does not occur once in man; I have never had occasion to operate for such cases in men-- not one case. When I was an assistant to Dr. Lawson Tate, of Burmingham, England where I assisted in abdominal surgery, I saw a case of a man who

seemed to have gall-stones, and the doctor remarked, "I have operated upon a number of cases of this nature in women, but I have never had a case of a man." I expected to find gall stones in that case but we didn't find any, so it wasn't a case of gall stones after all.

The cause of this trouble is found in a compression of the liver and an obstruction of the gall-duct from the upward flow of bile. These are a few of the minor penalties which women suffer in consequence of the use of the conventional dress. I am not talking about tight lacing, but the ordinary dress,- the dress that a moman says is perfectly comfortable, and a skin fit-- just comfortable, loose and healthy, as women speak of it.

(Screen.) Here is a normal feminine figure, with a waist a little larger than that of man. This represents the figure of a healthy woman. This shows the effect of inspiration of breath; when a healthy woman take a breath the whole abdominal wall moves forward; the chest and the entire abdominal wall move outward. When a corset was applied in the same case,- not tight, but reasonable comfortable, as ladies think, but there was a restriction here (waist) and an expansion there (abdomen). (Screen.)

This represents normal respiration; this is abdominal respiration Some people recommend abdominal respiration, but this is only useful as a means of reenforcing the other muscles, in the case of singers and public speakers-- it is necessary to re-enforce the abdominal muscles in this manner. This is a movement along the whole line of the body. This shows the movement of the chest-- the lateral movements in ordinary respiration (screen). This line indicates the form of the chest after it has been emptied, and this line represents it when full.

(Screen.) Now notice the movement of a woman who wears a rigid corset, when she tries to bend forward. As a rule, this fettered and

embarrassed woman don't try to bend over much; but when these ladies want to pick something up off of the floor, they scrooch down in a rather ungraceful manner, finding it impossible to bend the body over in a flexible manner. Now let us sit down in a chair and bend forward,- if we assumed the natural outline of the body there would not be any embarrassment in bending forward at this point; it is important that there should be an opportunity of bending here without inward pressure, because that forces down the viscera with greater force than before.

Now I want to show you some outlines of cases that I have actually encountered, and of which I have made a record. These are photographs copied life size, and were taken directly from the subjects themselves.

(Screen.) Here is the picture of a man who has nervous difficulties and has travelled in various parts of the world for relief, but found no benefit. He went to Philadelphia and took rest cure, without benefit. Finally he came here and spent three months with us, but, I am sorry to say, he did not get much benefit here; he became somewhat improved; he was as much better as could be made by baths, diet, and such general tonic measures as we then understood and practiced here (that was sixteen or seventeen years ago), but he was not radically better. He went away, was gone for a time and came back again. In the meantime we had learned some things. We have a chance of learning by experimentation, for we have many patients, and, as Dr. Parker well says, "Every new patient is a new experiment." Every patient is a new case, and the doctor should learn something by his experience with every patient. So as I have said, I had learned someting of the importance of sitting up straight, and the evils of enteroptosis, and the mischief coming from the displacement of the important visceral organs. So I said to this gentleman, "You must

sit up straight;"you must stand up straight." I showed him how to sit and stand straight, and this black line shows the result of his improved positions in sitting and standing after he came here, and this dotted line shows his outline when he arrived here. After that he sat up straight and stood straight all the time; he made a business of it, and I never caught him once in his old collapsed position-- those relaxed positions assumed by the"City Fathers" with the abdomen projecting forward and a great hump in his back like the hump of a camel. This gentle man was very enthusiastic on this subject and in six weeks he was so much improved that he pronounced himself a new man and went home. I afterwards saw him in Boston. He came to see me at my Hotel and I found him enjoying splendid health.

(Screen.) This was a poor,nervous, hysterical, melancholy, wretched woman. That was the condition of this woman when she came here. By-andbye, by observing proper positions she was greatly improved and straightened up, and this dotted line indicated her appearance; she was not so old but what she could assume the correct position and maintain it and correct her deformities.

(Screen.) This shows the position of the internal organs-- the stomach was down here (locating organs.) This is an enlarged kidney; it is the one which I removed and of which I spoke just now; the patient made a splendid recovery. Two or three years ago she came back to see us with only one kidney, but she was the picture of health.

(Screen) This represents another young woman who had always worn a"health corset;" and she thought she was superatively good for doing so, but here was the position of her stomach, liver, and kidneys (prolapsed). This is where they were when she came here and she was as wretched as a woman could be; shewas in constant ill health, suffering from

headaches and nervous attacks of various sorts, sleepliness and depression and was a very poor wretched woman; but by giving careful attention to exercise, proper position, development of the muscles and the application of the abdominal supporter she made an excellent recovery. I saw her a few days ago looking the picture of health.

(Screen) This drawing was made ten years ago. Hereis an inside view of a number of cases of patients who have come under treatment ment here, showing abnormal figures resulting from bad positions, neglect of exercise and also neglect of development of the abdominal muscles. This drawing represents a sewing woman; by sitting at her machine and constantly bending forward she has produced this depression of the abdominal viscera. Every woman who has this shape and outline has a prolapsed stomach and other abdominal viscera are prolapsed, an there is, in such cases plenty of occasion for backaches, headaches and other nerve aches of various sorts.

(Screen.) Here is another outline of a poor broken-down woman. She was a nervous young woman when she came here- nervous, weakly and feeble. (Screen.) This is the figure of the same woman, after two or three years reformation. This young lady's aunt had said to her, "Now you are getting to be fourteen years old, and you must have your figure formed," and the poor girl was naturally strong and vigorous, but while her figure was being "formed" she became depressed and wretched. After she had been here a short time this depression and wretchedness disappeared and she became strong, vigorous, and healthy under the rational regimen to which she was subjected while here.

(Screen.) This woman's mother said that ther daughter had never worn anything tight, (she was sixteen years of age); she said her corset wasn't tight. I took the lady's measurement with her corset not loosen-

ed, and then I took her measurement with her corset loosened and found that she measureed three inches more inside of the corset than outside of it. That showed that the corset had squeezed a portion of the contents of the upper part of the chest into the lower part, and so the viscera was all tangled up.

(Screen.) Here is the figure of a man,- here is the place where his stomach was when he came here, and here is where it is now.

(Screen.) Here is a representation of a lady,-- the stomach should have been here (locating organs) other organs were also out of place. (Screen.) Here is a lady whose spleen had been cartied out of place. One day she thought her waist was too large and that something had gotten in there, and she laced tightly at night as well as in the morning, and after three weeks she heard something pop, and her waist bec me beautifully small but she had a lump below it in one place (locating it) and in the morning I examined it and it was in another place. The next day I examined again and found it was in another place so I discovered that it was moving all around, and that it was the spleen that had gotten into the abdominal cavity, the ligaments having been stretched so that it was out of place.

(Screen.) Now I want to you to look at this picture, and then on this and tell me what you think is the better looking picture. Do you think an artist would make such an undraped figure as that for a model? I don't believe that there is an artist on the face of the earth who would accept of such a model as that for a study. Yet the very same artist would make a picture of a woman in a dress that would produce such a kind of figure,-- he would choose a dress for a woman that would produce such a kind of figure. What sense is there is that? Now this drawing , and this drawing were made from the same person, but a year apart. The young

lady whom this outline represents arrived here when she was about twenty years old; she was a school teacher. This outline shows the result of tight waist bands; she would not wear a corset but she wore waist bands, and"health skirts". At the end of a year, this was her figure (screen). She had be n engaged in gymnastic exercises as a trained nurse for the last ten or twelve years , and enjoys excellent health.

(Screen.) Here is another young woman who came here in a wretched nervous state, and this was her figure. At the end of the year, she had this figure, (screen); she had taken a course of training, as a nurse and became well and strong, and for a while she to k care of her consumptive sister in the Rocky Mountains, sent her to school, paid her board and took good care of her besides supporting herself as a nurse.

(Screen.) Look at some of these figures. This is the Venus de Milo. Look at this figure (screen). This shows the position of the liver of a woman who wears her clothing too tight,-- notice the shape of this liver. A woman wearing a dress with a waist like that is surely getting into this state. Here are the ribs. I have seen a liver, which belongs almost entirely on the right side, carried clear over on the left side. I once attended a post-mortem examination of a minister's wife, who ought to have been a model for the rest of the community, but she had worn her clothes so tight that the liver was forced clear over to the other side , and then lapped over and had started to come back again, and it was all ridged and furrowed in consequence of the pressure of the ribs upon it, showing the marks of the ribs.

(Screen.) This figure shows the shape of the skull of a flat-headed Indian. The flat-headed Indian thinks he is handsome when he has a flat head, and this flat head is produced by compressing it betwe n

two boards and fastened by a cord.

Not let us lok at the dresses of some ladies of other countries: Here is a representation of some Japanese ladies (screen). See how beautifully loose their garments are, and how graceful they are. Here are some ladies engaged in laundering. This lady is ironing clothes; this is a board leaned up against the wall, and the clothing is spread out upon the board and smoothed with the hand. This lady's dress allows her to move freely; there is nothing to restrict her movements; she can bend over the top of a tub with ease. A lady who wears her clothes tight told me the other day that if she didn't have a tight corset on she had the backache when she scrubbed the floor. She had been getting out of shape and so she had to have a corset to keep her in shape. What she needs is gymnastics and exercise which will give her proper development instead of wearing a corset which will do her further injury by an abnormal depression of the waist.

(Screen.) Here are three dancing girls. This was taken on the Midway at the World's Fair. I studied the woman of seven different nationalities at the World's Fair, and I found that they had just as large waist as men-- and a little larger in proportion to their heights. The dancing girls are noted for their strong abdominal trunk muscles and wonderful strong muscles of the back and sides, and the perfect control of their other muscles, so I was glad to get their pictures. What large nice waists these woman have; this is an indication of great vitality and strength, and there is no lack of grace or of beauty in these outlines.

(Screen.) These are some Malay women. There is a curious custom among these women; they are restrained or constricted(below the waist?) There are some evils customs prevailing even among savage tribes. There is one tribe in India inwhich the woman tie a cord across the waist,-- and some woman in Mexico do the same thing; I found in Mexico that there

were many with prolapse of the bowels, and not of the stomach, because the restriction is below the stomach.

(Screen.) In this picture one wonders whether the lady has a stomach at all or not,-- and if she has where it is.

(Screen.) This drawing was made from a womanwith a good normal, natural figure-- a woman of the same proportions as the Venus de Milo. And here is a woman with fashionable proportions; she has no room for lungs nor stomach, nor breakfast, dinner nor supper nor anything else except clothes-- and that is worth very little.

(Screen.) This is the most serious picture I have; this is a fashionable outline. Observe what this fashionable woman has to do,-- she has to piece out her clothing, because they would not look well hanging straight down; she has to balance up her outline before and behind. Now this figure (normal) requires no such accessories because the natural outline affords a foundation for natural and graceful drapery. Now what is the fashionable woman trying to do-- or rather what are the fashion makers trying to do? They are trying to make a poor fashioned deformed woman look as well as they can by various devices. We have been talking about this matter for years and so the fashion makersare allowing the ladies to go about more freely, and yet with a rather overdrawn pose-- the chest well forward and the hips well back,-- and really I think we have made a great stride towards physical reform in the partial conversion of the fashion makers.

(Screen.) This copy was made by a modern painter-- he makes a good sized waist. The modern painter does not make a small waist for a model any more than the ancient artists did,-- in other words the modern artist believes in a large waist, and so he makes a large waist in proportion to the rest of the figure.

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MUSCULAR MOVEMENTS. Oct. 3, 1901.

J. H. Kellogg, M. D.

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We will talk about muscular movements in general. A muscle is a machine, and also a magazine of energy. A machine is a thing by which enegy is applied when the source of energy is outside of the machine; it is a mechanism for applying energy, and for utilizing energy. A muscle is not only a machine for utilizing energy, but also a magazine of energy. The energy contained in a muscle is in latent form,--what do you call that? "Potential energy." What do you call it when in operation? ("Kinetic energy.") There is energy stored up in the muscle in the form of fuel,--what do you call that? ("Glycogen.") And when glycogen is burned in the muscle and is converted into energy, there is something left behind,--what is that? ("Carbonic acid gas.") What else? ("Water.") What else? ("Heat.") What else? -- Sarcolactic acid-- What else? ("Urea.") What else? ("Creatin.") Yes, creatin, creatinin and xanthin bodies in general--uric acid, urates, and something else that is especially important for you to remember-- Fatigue poison; it is very important not to forget that; that is probably a proteid compound. There is a special fatigue poison-- what does that resemble-- we will pass that now.

A muscle uses energy,-- it is a magazine of energy and a machine for using it, and when a muscle contracts, fuel in the muscle is consumed and we have the products of combustion;,these products interfere with the further work of the muscle,-- but we will pass that also.

When a muscle, or a group of muscles is put in operation, not only that muscle operates but many other muscles which are associated with it operate also, and we must always remember that. Put down "associ-

ated groups of muscles--", for example I am standing here,-- now watch me while I am standing here, and sightacross the end of my nose and stike a point on the blackboard exactly in line with my nose or some portion of my face, and fix a point on the blackboard exactly in line with it. I am going to stand as straight as I can, and at the same time I am going to reach my hand forward-- do I change my position? ("Yes.") Now I bring it back again, but is my position changed? ("Yes.") I put both hands forward-- does my position change? ("Yes.") Now I will put my leg forward,-- has my position changed? ("Yes.") I am trying to hold myself as still as I can, and my position has changed a little,-- and why. (Because the center of gravity changes). And so with every movement of the body.-- any little movement changes the center of gravity; wehave a good way to illustrate that: If you are lying in a hammock at some time, by moving your hand you can sway yourself back and forth simply by a movement of the hand, if you are perfectly balanced, and the same is true if you are sitting in a swing,-- by a simple movement of the hand or foot back and forth you can keep yourself moving back and forth in the swing by changing the center of gravity. So if you are floating along in a boat it is easy to change your position,-- when sitting in a boat the very slightest change of position will make a movement in the boat.

Now these changes in the position of thebody are connected with muscular movement. When I put my hand forward in this way, my head naturally goes back to balance the movement of my hand. When I reach my hands forward my head must move backward, and that backward movement is accomplished by a re-adjustment of the muscles of the trunk and limbs,-- they are adjusted to this change of position. This association of movement is very marked when we come to consider the action of the groups of muscles,-- for example when we contract the biceps we are at the same time

contracting the triceps. When we exercise our extensors we exercise the antagonizing muscles, the flexors; we cannot exercise one group of myscles without exercising the antagonizing muscles. Now flex the forearm with one hand on the biceps until you feel a strong contraction of the biceps muscles,--I trust you are able to feel something move, and you find a little change in the size of the muscles. Follow the muscles down as far as you can, --put your hand on the back side of the arm, and do the same thing--do you notice a little swelling of the muscles and a har - dening of the biceps,--and you also feel a hardening of the triceps. This association of movement extends to other parts of the body besides the biceps and triceps.

But this association of movement becomes lessened by training-- it becomes lessened to a considerable degree by training the muscles. By training, the work of the muscles can be isolated. This association of movement is greatest in childhood. When a child begins to walk , it walks with stiffness in its movement, and does not seem to be able to to control its limbs, and walks very awkwardly. Here is a boy learning to write: He clenches his pen with very great firmness, and as his pen goes up and down, his chin goes up and down, and when he makes a round letter, his head goes round with his hand ; and if you watch his body while he is writing, you will see that he will wriggle dround on his seat as he writes, and his very toes will turn down as he makes a "g" or some other letter that is rather hard to make. This stiffness is recog- nized by all beginners, before the muscles are brought well under con- trol. The piano teacher says to the little girl who is beginning the study of music and the use of the instrument, "Don't keep your limbs and fingers so stiff." This stiffness is universal in the beginning of

training. But, as the muscles come under the control of the will, this stiffness gradually disappears. When the muscles are trained, they are like an army of trained warriors who are ready to obey any command instantly. Stiffness of movement disappears with training.

Another point of great interest in connection with the association of the muscles is, in reference to the amount of work required. When a person first begins a course of training, the exercises which he undertakes to execute, he finds to be difficult and laborious, but after a little, this difficulty disappears, and he finds that the exercise becomes easy for him, and that he can execute it in a remarkably short space of time. There has not been time for his muscles to grow and become very much more vigorous than they were, but he accomplishes the necessary effort with less expenditure of nervous energy, with less expenditure of nervous energy, and at the same time, without utilizing a large number of muscles. Of course the larger number of muscles used, the greater will be the amount of energy expended. When a boy has executed his writing lesson with the smallest number of muscles possible, he uses the smallest outlay of labor possible, and there will be a correspondingly less degree of fatigue; but if a boy writes with every muscle in his body, there will be a much greater expenditure of energy than if he used the smaller number of muscles possible.

There are two forms of contraction,--static and dynamic. When the muscles become stiff by contraction, that is static contraction. When a muscular movement is rapid, that is dynamic contraction. Static contraction is far more laborious than dynamic,--in other words,--in other words, it takes more effort to hold the muscle in a contracted condition. Take a weight weighing ten pounds, and raise it up, and hold it for a minute,--it requires a greater expenditure of energy to do that than it does to lift a weight of ten pounds during that minute. This

fact has been proven by actual experiment, noting the amount of combustible products eliminated during the lifting effort. So one should labor, as far as possible to get rid of stiffness, and bring the individual groups of muscles under control and to acquire agility and flexibility. Muscular training involves not only the development of the muscles, but the education of the muscles senses by which we get the great agility and dexterity that a juggler gets by which he keeps six balls in the air by giving each one the right a mount of force to give him a chance to toss another one into the air, and so on with all six of them so that neither of them comes to the ground. This is a wonderful illustration of the degree to which the muscles can be developed. The tactile sense as well as the muscle sense can be developed. The muscle sense is that by which we balance oursleves. When the muscle sense is lost, and a person cannot balance himself, what is the matter with him? ("He has locomotor ataxia.") It may be some of the forms of ataxia,-- let us try the experiment of touching our fingers by placing our hands over our heads. ("Trying it.") I didn't do it, because I was talking -- you can't be thinking of something else and do this exersise-- let us all see now if we can do it the first time. Touch you fingers above your head (trying it) a good many of you didn,t do it,-- you mustn't feel after your fingers, but bring their two ends right togethter,-- you can't laugh and do it-- you have got to concentrate your mind right upon it. Now suppose you make the exepriemtn of putting your hands behind your head and touching the ends of the fingers-- it is not so easy to do that. we are able to do it by neams of the muscle sense,-- it is the muscle sense that enables us to locate anything. If a man has not the muscular sense fully developed, he is like a child,- - the little child tries to put a bit of bread into it's mouth, but it does not go there; he must educate his hand and

fingers before he can put his food into his mouth. So the education of the muscle sense is one of the first things that a child has to do. In a very young infant the muscle sense is very feeble. It is only by long practice and training that the muscles are developed so that a child is able to walk. It is by the development of the muscle sense that a man is able to walk in the dark; if the muscle sense is lost, he cmot walk in the dark. It is supposed that it is by the muscle sense that we can close our eyes and walk to a certain fixed distance,-- that we can fix a distance and a particular spot and close our eyes and walk in that direction and keep on walking untib we come to that particular spot, and know when we get there. The blind man has this muscle sense developed to a great degree. The blind man who lives in town can turn every corner, and knows when he gets to the right spot, and this is done with little effort.

We make great use of this association of muscular activity, without knowing it, or stopping to think of it,-- A pugilist for example, does not always know how much depends upon other parts of the body besides his arm and hand for stiking power until he has lost his legs. A soldier who has lost his legs by a connon ball once said that when he had his legs he couls stike a good blow, but that he had found out that he could not strike a good blow without his legs. A pugilist strikes with his legs as welll as with his hands. I met a man the other day in Chicago with only one arm, and I said, "Can you run?" I wanted to see how much the amputation of his arm had to do with his running power. He said, "Not very well; since I lost my arm I cannot run fast." We do not think how much we depend upon our arms for running; we run with our arms as well as our legs. If you don't see that just try the experiment of running with your hands held tightly behind you. We use are arms in running; swe could hardly run if we did not.

One of the most interesting of all the phenomena of associated movement is what we call "strain". When a man tries to lift, the first thing he does is to take a deep breath-- he breaths out completely ... after taking a full breath,-- when a man prepares himself for a lift with his arms, or for a violent effort of any sort, he first of all must fill his lungs,-- why? ("It helps support the trunk, the spine and the back.") What does? ("The bulk of air that is in his lungs helps to support the trunk.") Yes; he fills the lungs, and then they back up the ribs and support them so that they are held firmly. Suppose there was no air in the lungs when the effort is attempted,-- there is no tension of the lungs, and hence it is impossible to fix the ribs; if you want to fix the ribs they must be braced yup from behind by the lungs. When a man lifts there is a strong compressing power brought to bear upon the lungs and chest. If there were no pressure from the inside to antagonize that on the outside the chest would collapse more and more. So we must first fill not obly the chest and the thorax but the whole inside of the chest and lungs viscera for when you fill the lungs the diaphram contracts and forces the ~~air~~ down, and so more air goes into the abdominal cavity as well as into the chest cavity. (Diagram). Suppose this represents the diaphram. Now, as the diaphram is brought down to this point the chest is made to swell out in all directions; it is enlarged by the lowering of the diaphram, and the abdomen is also enlarged, because it will swell out in the same way. When the diaphram comes down, the space formerly occupied by the viscera is occupied by the air. Suppose this is an imaginary line and this space is occupied by the viscera,-- we take a deep breath and the place occupied by the stomach and liver is filled with air, because the diaphram has pressed them down. Now before making a lift, if we fill the lungs we increase the tension of the abdomen and chest, because the thorax

is fuller and the abdominal cavity is fuller, the chest capacity is increased and the tension is everywhere increased, and the intra-abdominal tension is also increased and the intra-thoracic tension is increased.

Now let us see how minutely this associated movement, "srain" enters our physical operations: Here is a man trying to cut a piece of beef,-- h commences to talk-- he stops cutting beef; then he commences cutting beef; then commences to talk-- he stops cutting,-- he says,"It is very pleasant this morning." He can hardly say, "It is a very pleasant morning." The strain of cutting beef stops his breath, and of course it stops the movement of his muscles. So a man trying to crack a nut with a nut-cracker,-- when it comes oto a place where the nut sticks, and does not crack easily and he must bring a little extra strain upon the nut-cracker with his fingers and thumb, he stops talking, -- he cannot talk and crack nuts at the same time. You have often seen the sme thing manisfested in this way, I am sure-- a lady starts out in the morning to go shopping, or to go to church; she is a little late and she has not yet put her gloves on; she coves out of the door and walks onto the sidewalk, putting her fingers into her gloves; she is talking to some one and her fing er sticks in the glove and she stops until that difficulty is overcome; then she walks on until she comes to another finger that sticks and then she stops again-- she cannot walk and put on a tight fitting clove at the same time. Why can't we breath when making such efforts? Simply because of this fact,-- in order that the muscles shall be exerted to the fullest capacity, it is necessary that the arm bones should be fixed. Now these muscles which operate the fi-ngers are attacked tothe forearm and the forearm is connected with the body, and if you want to lift something you must fix the forearm; that is fixed to the shoulder, and that must be fixed,-- and that is attached to the chest, and

in order for it to be fixed, the chest must be fixed, and in order to fix the chest you must fill it with air and hold your breath,-- there is a tendency to throw the obdy out of balance when you try to lift or push something and then the muscles of the trunk begin to come into play, and the muscles of the limbs also, because they are connected with the muscles of the trunk. We will illustrate this: You all have pencils,-- take your pencil between your thumb and finger; now take hold of the forearm with your hand,-- now relax and contradt the muscles in compressing the pencil- you find that both the flexors and extensors contract; you can feel the muscles contract. Put your hand up here (the middle of the arm) you don't feel any contraction here. Press a little harder, and you feel t these muscles swell up. Now press the hand against the side of the chest; put the hand down over the pectoralis major and minor muscles; now press the pencil a little harde-r-- harder-- harder. Now you feel the muscles come up-- you feel the pectoralis major and minor muscles contract. Now put your hand back of your neck and com-press the pencil,-- if you press it hrd enough you will feel the muscles of the neck contract. Put your hands right over the quadratus lumborum muscle and press the pencil-- now stand up and try the experiment again (class tries experiment) Press the pencil very hrd; if you press it hrd enough you can feel the quadratus lumborum muscle. Now if you had some one feel the muscles of your legs for you, they would feel the muscles of the leg contract when you pinch the pencil hard, for when you ;pinch the pencil it takes the muscles of the legs as well as the other muscles; it takes all the muscles of the body to do it, and you have to hold your breath when you do it; this is what we call "strain". You have noticed a man pulling on a tight boot,- he pulls, he grunts; he can't talk very well while pulling on his boots; he is interrupted by his work, and always has to stop in the middle of a

sentence; his boots won't go on unless he puts all his power into this chest and trunk muscles, and he must fix the points of his shoulders so that he must stop breathing in order to do it. It is very interesting to study this phenomena of "strain".

This is the situation in "strain",--first of all, the chest is filled with air and the lungs supported and when any person exercises any group of muscles with vigor, there must be a compression of the chest,-- because that is what we fill the chest for,-- it is to resist the outward pressure which is brought to bear upon the by muscle action. You fill the chest up to brace the ribs a gainst the compression that is brought to bear on it. Let us see what that involves: the chest is filled fwith air, what is in the chest beside the lungs? ("Air.") What else? ("Large blood vessels and arteries.") There is the diaphram; the pressure is exercised on the diaphram and abdomen the same as inn the lungs and thorax because the abdominal cavity and the thorax are one, so that whatever pressure there is in the chest cavity is in the abdominal cavity at the same time, so that if one is under pressure the other is under pressure. What is in the abdominal cavity? ("The liver.") Yes, that is a very vascular organ, and we have also a large vein which carries off all the venus blood from the stomach, pancreas, spleem, intestines-- what is it? ("The portal vein.") Where else does it carry the blood? ("To the liver.) NO,-- in one sense it does-- what else-- the lymphatic glands, the mesenteric glands, these are very important glands-- what else-- ("Gall bladder.) Yes, these six organs-- the portal vein gathers up and carries the blood from all these organs. When the chest is filled with air and pressure is brought to bear upon the chest so that the air in the lungs is compressed, what will be the effect on the hea rt, which is in the center of the chest. ("It will compress the heart. Will it be more or less difficult then for the blood to get into the hea rt? ("More difficult.")

The tendency then would be what? ("To stop the circulation.") It would impede the movement of the heart-- what would be the effect upon the blood vessels? ("The pressure on the large vena cava would fillit he heart.") The tendency would be to compress the vena cava and force the blood into the heart so long as it could not get back the other way, would it not? ("Yes.") The tendency would be to compress the vena cava and hold back the blood so as to prevent from entering the chest, to some extent-- what would be the effect upon the aorta? ("There would not be much effect upon the action.") The tendency of this pressure would be to drive the blood out of the chest and to keep it from entering the chest,--if the blood was prevented from entering the chest, what would be the tendency in the head. ("Congestion.") It would hold the venus blood back and it would accumulate in the head because it would be difficult for the blood to get into the chest. The pressure is abnormally increased in the chest, consequently it would be more difficult for the venus blood to get into the chest,-- the blood accumulates in the head. Did you ever see an illustration of this kind? When a person lifts, it is a strain,-- you see the turgid condition of his face; when a person is under a strain, a child for instance, the face becomes blue. So in a strain, during a violent effort the entire body is more or less influenced, the circulation in the brain is interfered with,-- there is, to some degree, a stoppage of the circulation and the blood is held a back in all parts of the body for a moment.

There is another thing that takes place in strain-- what is it? ("In strain the circulation of the muscles is interfered with.") What is the special condition? ("The muscles are tense.") You overlook the simplest thing of all-- you hold your breath. ("Respiration is suspended.") Yes, and consequently the oxidation of the blood is suspended, and it be-

comes blue-- that is the reason the face becomes blue is a strain,-- the aeration of the blood is diminished. While performing a surgical operation I always know the condition of the ptient by the color of the blood; I alwaye make a careful examination and note the color of the blood while I am operating, and the moment I see the blood changing color I look after the anesthetic; I keep careful watch of the person who is administering the anesthetic, at thesame time observing the color of the blood. The same thing occurs in a strain-- the blood is filled with CO_2. Strain is abnormal and should not be long continued.

A word further about the training of the muscles. This trainig is accomplished by the muscle sense not only on one side tof the body, but also on the other side. When we train a part of the body on one side, we also train the other side of the body through the association of the nerve centers. The training of the muscles invdlves the training of the nerves connected with the muscles,--for example, if you train the right hand you also train the left hand at the same time, because the nerve centers which have charge of the two hands are connected and associated in the brain, and the education which you give to the nerve centers on the left side of the brain and which have charge of the right hand, is whispered, so to speak to the nerve centers of the right side of the brain which have control of the left side of the body. How long did it take you to write?

("I havn't learned to write yet.") Well you can write in a certain way at any rate,-- how long did it take you to write as well as you do? ("I couldn't say.") Some of you have been teachers,-- how long did it take you to teach a class to learn to write? ("About three years.") It takes quite a long while to teach the right hand to execute the necessary movements,-- how many have tried to write with the left hand. (Several hands

raised.) Now take a piece of paper and write the word "Sanitarium " with your left hand-- lets see how well you can do it. (Class writes.) You find the left hand has been learning to write while the right hand has been learning. So it is with all the movements of the right side of the body-- the other side has been learning to make the same movements-- it has been"taking notes", and in cases of emergency the left side of the body can come to the rescue of the right. The question has been raised whether it is best to train both sides of the body or not. We used to think that we should be ambidextrious, but I am almost persuaded to think it is not best to be ambidextrous; it is a good thing to be so to a certain degree I think, but it is not altogether necessaryor best that we should try to compel one part of the body to be equally dextrous with the other part,-- it would require too much time, but it is well to train one side of the body sufficiently to enable it to assist the other side if necessary,-- but that is going on all the time. We do out thinking with the left brain;,now if the right brain is trained to the same degree as the left brain, by training the two sides of the brain equally it it has been supposed that it would cause confusion of thought. We have two brains,-- the left brain and the right brain, which are duplicates. A man once lost a large part of his right brain and still could do businessthe same as usual. So with an expert bookkeeper,-- he had a timor in his left brain as large as an egg, and he had a serious attack of convulsions, but he did the business of a bookkeeper for fifteen years after he had the tumor; so it is possible for either brain to do the work of the body. If a child has paralysis or apoplexy in either the right or left side of the brain the other side will take up the work and carry it on, because of the education of the collateral fibers which communicate between the two brains. So the whole body is represented on each side of the brain, so it has

been thought that if the two brains were educated equally, one brain might not act with the other or act at the same time with the other, so we could not decide as to what to do, so one side of the brain should be more educated fully than the other, so there may be definiteness of purpose and unity of thought.

Exercise

TALKS TO MEDICAL CLASS (SOPHOMORES.) ~~Sept.~~ Oct. 10, 1901.

J. H. Kellogg, M. D.

---X--

We are talking about fatigue; to-day we will talk about breathlessness or respiratory fatigue. A person may engage in some form of exercise which will put him out of breath when he is not tired; a person may run ten rods and then be out of breath; a person may run a quarter of a mile to catch a train, and when he gets on board he will find himself suffering from respiratory distress. Persons in that condition breath in a peculiar way-- a long inspiration and a very short expiration,-- why does a person breath in this peculiar way-- why is he out of breath? ("Deficiency of oxygen.") Yes, and no,-- in a certain sense that is true however. ("The muscles are tired.") But suppose we should try some simple experiement,-- suppose we have one of these young men go out into the other room and run up and down stairs and then come in. (Student goes out.) While he is gone out we will see how much work he is going to do. This room is about fourteen feet high,-- let this student stand up against the wall and breath (experimenting with pneumograph). Are the muscles of your hand tired? (No). Are your arms? (No?) Or your legs? (No) Why does he breath so fast? ("The tissues are oxidized".) It is because of the sudden increase of CO_2 in the blood,-- there is still an abundance of oxygen in the blood, but there is a great increase of CO_2 and the cause of the breathlessness is the urgency to get rid of the CO_2-- he already has enough oxygen but the CO_2 has accumulated and he must get rid of it, for carbon dioxide is poison. There is a respiratory center in the brain, and this center is sensitive to carbon dioxide-- and extremely so.

What is the explantion of the mechanism of respiration? Why do we respire and expire regularly and rythmically? (Various answers given.)

There must be something to originate the action, although it is automatic-- there must be something to bring it into activity-- what is it? ("It may be the blood.") You have the right idea; tell us more of it. ("The presence of CO_2 circulating in the blood stimulates the muscles.") The respiratory center is stimulated,-- it is the contact of the air with the nose. There is also another reason why it is better to breth through the nose than through the mouth-- but we will consider this later on. The real cause of breathlessness is the accumulation of CO_2 in the blood, which stimulates the respiratory centers. Under ordinary circumstances the amount of air taken in is sufficient to supply the demand, and the amount of CO_2 is not much in an inspiration and the amount is kept down to such a degree that the stimulation of the respiratory center is not excessive, but as soon as the CO_2 accumulate the stimulation of the respiratory centers is increased. How long can you hold your breath? ("A minute".) Now fill your lungs with air and when you have finished taking your breath hold up your hands,-- now we will all take a breath together-- forty-five seconds-- there are very few of you holding on now-- I see one of you is holding his nose. ("Case-- I held mine a minute.) One minute is about as long as it is possible to suppress the reflex movement.

The thing that produces breathlessnes s is thirst for air. What is air for? Not to get more oxygen, but to get rid of the CO_2. One can breathe longer in an atmosphere of nitrogen than in an atmosphere of CO_2 because the nitrogen helps carry off CO_2. The urgency of breathlessness is the sensitiveness of the respiratory centers-- the inspiration is the result of the stimulation of the peripheral nerves by CO_2.

Breathlessness depends upon the amount of work done and the amount of CO_2 produced. A man uses his hands or arms and does not get out of breath because the amount of energy expended is not great; but if one exercises the legs he can get out of breath quicker than if he uses his hands and arms,

because his legs are larger. (Student comes in.) We will say this man weight 12o (?) pounds. The room is 16 feet high, or a little less. The man lifts his weight at every step. The work was done in 10 seconds, or 360 foot-pounds. In a minute that would be almost two foot tons, a tremendous amount of work to do,--and in an hour, 660 foot-tons, or 1,320,000 foot-pounds--how large a day's work would that be? ("He couldn't work at that rate all day.") No; but I only wished to find the work represented--1,8000,000 foot-tons.

The real cause of breathlessness is the amount of CO_2 in the breath; and this, and the degree of breathlessness, will depend upon the amount of work done. In five seconds he was very breathless: Suppose this increased for one minute,--he might be entirely out of breath then. So the amount of breathlessness depends upon the amount of work and the amount of CO_2 thrown into the blood. Simpson (?) shows that a horse makes CO_2 three times as fast when running as when quiet. Experiments have shown that when the marmot was hibernating or asleep, the amount of CO_2 was only one-thirtieth the amount that it was when he was awake and active. The marmot was inside of a bell-glass connecting with air and CO_2 and the marmot lived several days in the bell-glass; but something awakened him, and in a few minutes he was dead ,--showing the effects of asphyxiation. So long as he remained asleep there was oxygen enough to support his inactive life, but as soon as his muscles became active tit produced so much CO_2 that he was asphyziated by the CO_2 produced in the blood. It has been found that a swarm of bees in a hive produce CO_2 twenty-seven times as fast as when at rest.

An eminent French physiologist has made some experiments for the purpose of determining the cause of breathlessness when running. Hewas con-

because his legs are larger. (Student comes in.) We will say this man weight 12o (?) pounds. The room is 16 feet high, or a little less. The man lifts his weight at every step. The work was done in 10 seconds, or 360 foot-pounds. In a minute that would be almost two foot tons, a tremendous amount of work to do,--and in an hour, 660 foot-tons, or 1,320,000 foot-pounds--how large a day's work would that be? ("He couldn't work at that rate all day.") No; but I only wished to find the work represented--1,8000,000 foot-tons.

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An eminent French physiologist has made some experiments for the purpose of determining the cause of breathlessness when running. Hewas con-

vinced that the cause was fixation of the spine which caused and interfernce with the respiratory movement. In running, one uses both his arms and his legs, but the legs afe mostly used, consequently the spine must be held quite firm in order that the muscles shall be able to move the legs with vigor. The muscles moving the legs are attached to the trunk, and unless the trunk is held with some degree of rigidity, it would be impossible to move the legs with full force, and so the muscles must be fixed, and the fixation of the muscles will produces fixation of the chest, and this is one of the causes of breathlessness in running. We know that certain forms of movement have something to do with breathlessness. There is an old saying that a horse trots with his legs and gallops with his lungs. The horse is quickly out of breath, when he gallops; and the reason the horse can trot hour after hour continuously without getting breathless, while a horse cannot gallop for a great length of time without being very much winded-- why is that? ("Because the automatic centers for trotting are more developed.") I think there is a better reason than that. ("When a horsegallops he lifts his weight.") Yes, when a horse gallps or canters, he must lift his burden right up; he must rise, and every time he rises he must lift his burden. When a horse trots, he lifts one foot right after the other, and he keeps his burden on a level, but the cantering horse is constantly lifting his burden. It is for the same reason that running is so much harder work than walking. When one runs, he throws himself into the air, because he springs from one foot to the other. Now will one of these young men let us see him run across the floor. (A young man runs.) Notice the top of his head,-- hus head rises and falls so that every step he takes he throws his body into the air, and this lifting fof the body increases the work of running. Can you run without this movement of lifting the body? I will show you how to do it-- see me run. (Running) I learned this way of running ~~by~~ the

girls . A famous Englishman has written an article on"How to run without rising." Ifyou simply lift your legs from the floor you will not lift your head at every step and thus save a great deal of labor. I practiced this method of running, in Chicago when I was running to catch a train. The more you exefcise your muscles, the more CO_2 you will produce and the sooner you will get out of breath. This will be a matter of more consequence to you when you are old than itis now,-- keep your feet close to the surface of the ground, and without raising yourself up. Thatis the difference between the movement of the trotting horse and that of the galloping horse, the trotting horse moves his feet right along under him while the gallop-horse raises himself. ("That is the reason thepacer goes easier than the galloping horse.") Whenever you lift your body you have done that amount of work. Suppose the body weighs 144 lbs.,-- you lift the body one inch and that is equivalent to lifting a weight of twelve pounds a foot high , so every time you repeat that, you are walking two steps a second, and that would be 24 foot pounds a second, and in a minute you would do a good deal of work at tha trate. ("The knees are not bent; the movement is at the hips.) Yes, the movement should be as nearly level as possible, because, as soon as you raise yourself upon the toes, it makes a great difference. One of the exercises I would prescribe for patients is the spring step,-- rising upon the toes-- and thus you will do much work is a short time. You can increase your work by rising higher upon your toes; in this manner you can increase your work as much as you like.

There are certain conditions thatit is very important for a physician to have in mind when dealing with persons who complain of breathlessness, and it is important to keep these facts in mind. When a person has carried exercise to such a degree as to produce extreme breathlessness, he may fall insensible; sometimes a racerm at the end of his course, falls

insensible and sometimes dies. Sometimes a carrier pigeon will drop dead as soon as he reaches home. I have seen birds fall upon the deck of a ship completely breathless and exhausted, so that you could pick them up in your hand. Young birds get exhausted in thatway. Inexperiences singers become fatigued because theyare breathless through the unusual movement and effort which he is making. There are some conditions in which persons are prone to breathlessness,-- will some one suggest one? ("Obesity.") Yes, obese perwons are easily out of breath. ("A rapid heart.") Yes-- what does that mean? ("A weak heart.") Can you think of another? ("Small capacity of lungs.") Yes,-- a small chest-- give us another condition of the chest. ("A rigid chest.") A small chest and a rigid chest-- can you think of anything else? ("Small lungs.") How can you make the lungs small? ("Round shouldered.") ("Poor respiratory development.") ("Bad position.") That may be corrected. A person would get out of breath more quickly with his lungs compressed than if they had a good chance. ("Small chest, weak muscles.") Yes-- weak chest muscles-- what else will produce this doondition? When the air cells are filled with tubercular deposits-- what else? ("Pneumonia.

Let us consider this diminished respiratory field -- what is the extend of the mucous membrane of the lungs? ("2000sq. ft..") Suppose the patient who had pneumonia had only 15.00 instead of 2000,-- he would get out ofbreath sooner than a person with a full respiratory field. The respiratory field is the door through which the CO_2 escapes, and if we narrow the door, the outlet would be lessened, so he could exercise only three-fourths as much, because this 500 sq. ft. is surplus, andit is already all gone, so thatalmost as soon as the man exercises, he gets out of breath,-- what is another caused? ("Consumption.") Yes; another cause is pleurisy, which will sometimes tie up the lung and compress it; and dropsy of the chest.....

We may have diminished expiratory area by collapse of the chest wall. When a person has large tubercular deposits, or pleurisy, there is a cicatrization and an adhesion takes place and the result is compression so that control of one lung may be lost-- do you think of any thing else? ("Hampering dress.") Very good,--corsets,-- compression--, anything else? ("There might be worry in one who is running to catch a train, as to whether he will succeed in reaching the train or not.") Yes,--will call it emotion. We will next consider the relation of these things to respiratory fatigue.

Exercise

TALKS TO MEDICAL STUDENTS. (SOPHOMORES.) Oct. 11, 1901.

Dr. J. H. Kellogg, M. D.

---x---

I will put on the blackboard a pneographic tracing of a healthy person (making tracing). Here is another tracing,-- of asthma. Do you you notice any characteristic difference between these tracings? (Yes.) Now let some one run up and down stairs three or four times,-- until he finds himself really winded. (Mr. Knapp goes out.) Let some one put a chair here. (Mr. K. comes back.) Now we will get a pneographic tracing of a healthy person,-- the inspiration is naturally longer than the expiration.

The thing that I wanted to call your attention to is the fact that in asthma we have a shortinspiration and a long expiration (illustrating asthmatic breathing).

You have it just the opposite with the dyspnoea that comes from vigorous exercise.

We were talking about the conditions under which one is likely to become breathless: let us take the normal conditions in which a person becomes breathless,-- thereare as follows:

Normal

Hard muscular work.

Unaccustomed exercise.

Emotional excitement.

Altitude.

Heated air.

We first write"normal conditions" which produce breathlessness--" whatis the first thing? ("Violent exercise.") We will say it is violent muscular work; the exercise of a large amount of muscular work in a short time-- we will say, hard muscular work-- that is one of the normal conditions which produce breathlessness. What is another normal condition which pro-

duces breathlessness? It will take one a long time to get breathless by this kind of exercise-- (working the fingers). A person can make rapid movements for a long time with his hands and arms, but suppose one should exercise by jumping up as high as he could,-- it would require only a short time to produce breathlessness, because the muscles of the leg do a large amount of work. What is the cause of breathlessness? ("The accumulation of CO_2 in th blood.") Yes,-- besides this, the larger the amount of muscular work done in a given time, the greater will be the breathlessness. ("Is there not a lack of oxygen?") Let us see if that is true,-- that it is because there is a lack of oxygen-- the amount of oxygen which we have in the body at any one time is a large amount. The blood is charged with CO_2, and there is a large amount of oxygen stored up in the tissues and this is not all consumed. Here the man using his legs,-- in doing this he does not use up the oxygen stored up in his arms, chest and trunk,-- there is oxygen in these tissues. You get rid of the CO_2 by displacing it with oxygen, but the thing we want is to get rid of the CO_2, and it is CO_2 that acts specifically upon the respiratory centers. A lack of oxygen is a negative way of saying there is an increase of CO_2, but it is better to have a positive statement. The percentage of CO_2 in the blood is continually increasing and it is this which disturbs the respiratory center. When one takes in oxygen it dilutes the CO_2. (The oxygen does not go in.") If the oxygen went in it would dilute the CO_2 and keep it down to the normal limit. The density of CO_2 and the lack of blood or the lack of water makes an impression of thirst, we say such a person is thirsty, but it is not that-- it is the increased specific gravity of his blood; it is the thickening of the blood that makes us thirsty. Of course water will thin the blood, and in that way lessen its specific gravity. Just as soon as the specific gravity of the blood rises, then the blood ca not circulate as freely as it ought to do, and ex-

tract water fmm the tissues, so it is a lack of oxygen, but thatis a negative side of the question,-- the active thing is the CO_2 Stop and think a moment: here is the respiratory center, and that cannot recognize the absence of something, it cannot be excited or irritated by the absence of something-- it is excited by the presence of something. The only reason that oxygen is necessary is to remove the CO_2 and take theplace of it. But the presence of oxygen is not the thing that quiets the respiratory center,-- it is the removal of CO_2. A person can breath an atmosphere of nitrogen for a time. (A certain amount of CO_2 may take theplace of nitrogen, and still one may have symptoms of dyspnoea,- so Foster says. I am glad you mentioned this.

There is another thing associated with CO_2- that is, that a certain amount of organic poisons pass through the lungs, and of which the CO_2 is the measure, as it is claimed-- but there is some dispute about that. When I was in Paris some years ago, I did some experimental work with Dr. Brown Sequard. He had a series of jars and had a rabbit placed in each one of them,-- sippose this is a rabbit, (blackboard). The air enters through this first jar and passes from that to the next one and so on. The first rabbit got along well enough, because he had fresh air all the time, and this rabbit (the next one) died after two or three months; and this rabbit lived only a week or two; and this rabbit lived only a few days, and the last one only a few hours. This was an interesting observation made by Dr. Brown Sequard,-- he had a bottle containing sulphuric acid, and he allowedthe air to pass down through that bottle, and then over here to the rabbits in cages. This rabbit died early; but this rabbit was in perfect health, and I saw him in his little cage after six months and he was perfectly well while the others died. Here is a rabbit still further on than theothers. The CO_2 was just the same; this rabbit lived six months , because the organic

poisons had been burned up by passing through the sulphuric acid. This is conclusive proof of this fact.

Now there have been recently made some experiments which seem to contradict the experiments of Dr. Brown Sequard, but I think he is perfectly correct. I made some experiments myself, some eight or ten years ago, upon this point: I had two men breath into bottles encased in ice and salt and they breathed until there was accumulated a large amount of condensed moisture from the breath. Someof this was injected into the veins of a rabbit and he very quickly died, showing that condensed breath contains a large proportion of poison. Some investigators have repeated these experiments lately but they claim that they do not get these results. But my experiments correspond with those of Brown Sequard, and I think his conclusions are correct. I think the CO_2 is really only the measure of organic poison which is so subtle that it cannot be accurately measured. Many men in mining coal inhale large quantities of CO_2 and so not suffer very seriously.

We will write, "Unaccustomed exercise,--" we all know that will produce shortness of breath,-- mention something else. ("Excitement.") Yes, emotional excitement,-- what else? ("Difficult movements.") Yes, movements to which we are unaccustomed,- difficult or unusual exercise. Hard muscular work produces breathlessness by the production of a large amount of CO_2, or we will call it the produt of muscular work-- the products of combustion. Unaccustomed exercise is about the same thing as hard work,--one makes hard work of doing things that he is not accustomed to do,-- such as learning to swim, ride the bicycle or a horse which he is unaccustomed to ride-- he is worried, his mind is concerned for fear he will not succeed; and emotional excitement willl produce the same thing. I have a friend who once frightened me when I was talking with him,-- after I had talked with him a few minutes, I noticed that he was breathing like this (Breathing hard and fast).

We were talking on a scientific subject and I was very much concerned when I saw how he was breathing. I had occasion to talk with him again a short time after that, we were talking about hydrotherapy and some experiments that we were making, I think-- and I noticed that he breathed in the same way. I said to him, "Doctor, what is the matter with your lungs?" "Nothing", he answered, I said, "Well, I thought from the way you panted that you were short of breath, or had tuberculosis or some other disease of the lungs." Whenever he is especially interested in anything, he breaths in thatway. You will notice the same thing in emotional excitement. If a boy (or anybody else for that matter) is enjoying something, he is likely to lagh. Now what is laughing? It is a spasmotic action of the diaphram, a cachinnation which is the result of the movement of the diaphram, up and down. When a person feels very badly what does he do? He sobs. If a boy feels bad, he sobs. That is because of an interference with respiration. Sobbing is not very different fron laughing, only one sheds tears in one case-- and sometimes in the other case-- but I think the principle difference is, that when a person sobs, the corners of the mouth are turned down, and when he laughs, they are turned up. In sibbing, themovements are not so rapid as in laughing. When one is suddenly struck with fear, he may become absolutely breathless through fear. I heard of a case in which a man was fencing,-- hewas a trained fencer-- he was accustomed to such exercise; he expected to fight a duel the next day, with a sword, and while he was fencing, he became anxious and worried, and the result was, that he very quickly became breathless.

Now let us consider some of the abnormal or morbid pathological causess of breathlessness. It is important for us to understand these, because we have to think of them in making prescriptions ofor our patients. ("Would you not bring in altitude." Yes,-- I am glad you mentioned that--

altitude will produce shortness of breath -- why? Because of the condensed state of the air; that is evidence of a lack of oxygen,-- that is the real cause-- note my position: he don't have a lack of oxygen positively,-- that is the negative side-- the oxygen is needed to replace the CO_2; we don't have to wait for a specific action of the respiratory center,-- we don't have to wait, in other words, until the amount of oxygen stored is entirely consumed in the body before we are notified that we need more air. As soon as the amount of CO_2 in the blood reaches a certain point, the respiratory center gives us notice to provide for more air,-- is there any thing else? We have something that means the same thing as altitude-- what else will dilute the air-- what will heat the air? A man becomes breathless through shortness of breath; when the air is heated there is shortness of breath or dyspnoea, because dyspnoea will be produced by excessive heat. A dog shut up in a heated chamber will pant; on a hot day he will pant all the while the same as though he were running.

Now we will consider the pathology of this condition,-- what next causes shortness of breath? ("Obesity.") Tell us how obesity interfers with respiration. ("Because the obese has so much more work to perform than the normal man.") Here is a man weighing 250 lbs. whose normal weight is 150 lbs.- that is carrying another man on his back-- a dead man. The man who weighs 250 lbs. has 100 lbs. on his shoulders, and he must carry that weight wherever he goes, but we don't appreciate that until we try to carry off a man. It is astonishing how the obese man gets along as well as he does; his muscles become exhausted and weak under the extra load that he is continually carrying, and it is surprising that he gets along with it as well as he does. The fatter the obese man becomes the more he wants to eat, and the more work he has to do, and the large amount of exercise he has to put forth in going up stairs and down stairs or wherever else he

may wish to go-- the amount of work is so much more than what the ordinary man has to do creates a demand for food.

There is another reason for this condition,-- there is an excessive amount of work done by the obese man,-- and what is it? ("There is so much tissue that they get warm.") Yes, the temperature of the blood rises , and the elevation of the temperature of the blood produces breathlessness; that is the reason a person gets breathless in a heated chamber. A hot day causes a rise of temperature. The elevation of the temperature of the body increases oxidation, and an increase of oxidation increases the amount of CO_2 in the blood, because the thermogenic apparatus in the muscles is excited by the elevation of the temperature of the blood, and the elevation of the temperature of the blood stimulates the thermogenic centers so that oxidation is increased.... Now why does the obese person get overheated sooner than a person who is not obese? ("Because fat is a non-conductor.") Yes, he has an overcoat of fat, and hence the amount of heat elimination is lessened. The fat person is smaller in proportion to his weight than a person who is not fat, because the skin area is less in proportion to the cubic contents, in alarge person than in a small person. The side of a circle, in proportion to the area is much greater in a small circle than in a large circle. The same principle applies to a ball,-- the surface of small ball in proportion to its cubic contents, is greater than the proportion of the surface to the cubic contents of a large ball. The fat person has more tissue to provide for; he has a lower respiratory coefficient because he has so much more tissue and there is a resulting contraction.

There is another very important reason,-- what is it? ("There is no chance for the expansion of the chest.") Yes, expansion of the chest; the chest is weighted down by the fat-- ("the abdomen also.") Yes,-- and there is something else-- there is an accumulation on the inside.

("The abdominal muscles are weak.") ("It increases abdominal pressure.") Yes. (Diagram.) Here is the spine, and here is the diaphram and the chest. Now the chest wall of the fat person contains an accumulation of fat away up on the inside, does not the pleura become fat as well as the skin? ("Yes.") So all round the inside of the chest there is an accumulation of fat,-- also on the diaphram, also on the mediastinum, so the chest is compressed by the intra-thoracic fat. This fat person has 50 per cent more tissue that beforehe became fat, while his lungs become smaller by the diminution of the thoracic cavity; this fact should be kept in mind.....

There is another pathological condition causing breathlessness. ("If therewas fat around the heart, it would cause it.") Yes, that diminishes the size of the chest cavity, and this fat would also diminish the ability of the heart to force the blood through the lungs. Then we will write among other causes "weak heart". Now let us see why aweak heart will produce breathlessness: when a person begins to exercise, the blood is forced along more rapidly int the lungs,-- the venus blood accumulates in the lungs, the cells of the lungs arefilled with fat, and thus the air cells are contracted. The chest cavity normally has a fixed quantity of blood, and if there is more than that amount of blood there, there will be less room for air; the blood cells are filled, the air cells are compressed, and the opportunity for air to enter will be diminished, so if the heart is weak, it will not be able to give the proper amount of force tothe circulation through the lungs,-- thatis, the right side of the heart will not be able to force the blood through the lungs sufficiently vigorous, , and for that reason there will be a stasis of blood in the lungs, so there will be breathlessness-- what will be the tendency in regard to low blood pressure-- is low blood pressure always indicative of a weak heart? ("Answer--no.) When a person has been exercising for some little time, is the blood pres-

sure lowered? ("Yes.") It is lowered by exercise. When the blood vessels of the skin are dilatedso as to permit the blood to enter the skin, that lowers the blood pressure; it increases the area of these vessels through which the blood can escape through the arterial system,-- what is the effect of the hot bath. ("The same-- it lowers the blood pressure.") Yes; that explains, perhaps, one of the reason why breathlessness comes on when it does whn a person begins to take exercise,-- if a person begins to take exercise, he is troubled with breathlessness, which disappears after a time. When one starts to run, he soon has a sense of lack of breath sysphoea, and if he walks on for a while his breathlessness disappears,-- what do you call thatordinarily? ("Second wind.") Yes, thatis the common expression,- if a bicycle rider falls behind, he says to those who are ahead, "Wait till I get my second wind, then I will be all right," and this is true, and the distress disappears.

There is another condition that I wish to bring in here,-- what is it? ("It is the adjustment of the system.") Yes. There are portions of the lungs which are not fully used, ordinarily,-- the apices is not fully expanded, and when one first begins exertion, these cells are not in operation, and the blood is carried into the lungs and in a short time the lungs get into full play, the air cellsare expanded, and the lungs are doing their work and the circulation can be kept up; the heart itself is excited, and tha is carrying the blood into the lungs, the lungs are keeping up with the heart, and after while they play more freely and the difficulty is relieved, and if we keep on with this exercise the accumulation of carbon dioxide in the-- ("in sleep, when you take a deep breath, you get some of the carbon dioxide out of your brain.") After one has pursued this exercise for a time, until the CO_2 begins to accumulate in the blood, then the effect upon the heart is depressing-- the CO_2 accumulting, paralizes the heart to some

extent and lessens its power, and then a stasis of the blood in the lungs occurs again the second time and breathlessness comes again, and when it comes the second time, it comes tostay, because there is no opportunity for increased lung capacity now, and there is no chance to increase the blood pressure, so that each heart contraction has less force than before. That explains to us why the heart's action is quickened by exercise-- I will repeat that -- some of you may have been listening, but I am afraid not: if you deal with people by the natural method, and by physiological means, these are the very things you need to know about. I find this is the tendency in our school education and training-- it brings us into this state of mind where we want a formula for things, and we get them by heart; so doctors get their prescriptions of other doctors, and theyare ready to go out and attack the public, but that is not our method; our method is to get at the roots of things, to get at the physiological facts, and it is only by this kind of study thatwe are trying to do here that we can get in the habit of doing thorough work, and I hope you will all become interested and you will see the importance of what you are studying by-and-bye. If I had had some one tell me, twenty-five years ago, what I am telling you, I would have been the happiest man in the world, but I have been creeping along year after year and digging after these principles whichare of the utmost importance, so it is worth while to give a little careful thought to them.

We are talking about second wind,-- we remain breathless while the exercise continues; this is because the CO_2 increases while the exercise continues; it is because the CO_2 increases and the lung capacity cannot increase any more uniformly, but the CO_2 increases until the movement cannot be uniform, and the person is winded because respiratory activity cannot keep with his circulatory activity, so that after a man, or an animal finally

comes to rest, it is a long time before the breathlessness ceases, --he continues to pant for a long time, but the heart action will probably remain excited for a long time before the respiration is restored.

Now let us take the conditions in which we have a weak heart,-- we always have a weak heart sooner or later; the man who is breathless has tired out his heart, and the weakness of his heart causes breathlessness; the heart has become paralyzed by CO_2 and the circulation is interfered with by increased blood pressure through the dilitation of the blood vessels,-- that is the reason the heart's action is decreased; the heart's action which is 60 or 70, normally, may be increased by exercise so that it may run up to 160 and 170, and thatgreat increase of heart activity is responsible for the breathlesshess and will continue for a long time after the breathlessness ceases.

What is another pathological condition which will produce a weak heart,-- and by this I mean a physiologically weak heart. Now we may have a weak heart at the very beginning, so we will say, at the beginning of exercise this man becomes breathless because his heart is weak; now what are the conditions by which his heart is weak? ("Organic disease.") Yes. ("There is the tobacco heart;-- put that down,-- also the alcoholic heart-- anything else? ("Lazy people,-- sedentary work.") Yes, sedentary people,-- sedentary habits of sedentary people; but some other people have weak hearts, how is it about people who are just becoming convalescent from fever,-- they always have weak hearts. Do you think of any other conditions in which weak hearts may be acquired? ("From bicycle riding and over work.") Put that down-- overworked heart, or overtrained heart. ("An excess of any kind.") Yes; some have a neurasthenic heart also.

Perhaps this is enough on that subject ,-- now lets have another. ("Small chest.") Yes,-- of course where there is small chest there will be

small lung capacity, or less power to supply the body with air than there would be with large lungs ; but we will take up this subject when we study respiration.

But there is another condition,--what is that ? ("Rigid chest. ") It is a small chest chest, which is sometimes called a consumptive chest,-- we will speak about a small chest a moment; it is called a flat chest or a hollow chest,--what does this condition mean? ("Round shoulders.") Yes, and a posterior curvature of the upper part of the spine, which means carrying the chest behind, instead of carrying it in front ,where it belongs.; and as we have the weight of the shoulders falling upon the upper part of the chest, that part of the body is restrained or restricted. A person with this sort of breast or chest is said to be "pigeon-breasted,--there is a compression of the breast,and what is the cause of it ? ("Ricketts.") That might be one cause of it,--what is another cause ? ("Mouth-breathing.") Yes,--enlarged tonsils, an obstructed nose-- the breathing through the mouth iscaused by obstruction of the nose through nasal catarrh, and is a common cause of this condition known as "pigeon-breast", that is a compressed chest. Now the rigid chest--in what condition do we find that? ("In tight lacing.") I think tight lacing has the effect to keep the chest flexible. Every old man has a rigid breast,— and why? The cartilages become rigid by ~~rigid~~ ossification, but the young man may have a rigid chest for lack of exercise. If a person keeps his arm or his elbow in one place, it would become stiff. I have seen limbs put up and kept in one position,-- if a person does not flex it occasionally it will become stiff; I have seen two or three men trying to bend a flexured limb that had been bandaged for two or three weeks,-- it was stiff because it had not been used and the deposits of lymph were insufficient to supply the cartilaginous surfaces. The ribs must be kept constantly flexible, but there is something else-- (articulation). Yes, every

rib is articulated to the spine, so we have a joint in every rib, in the rear and, in front, instead of joints, we have flexible cartilages, so we might say we have a hinge joint behind and a spring joint in front.

Ther is another class of cases in which the chest becomes rigid -- does rickets produce this? Consumption produces a rigid chest, also chronic pleurisy. The chest becomes rigid when there is a tnedency to restrain its movements; that is one of the tendencies of tuberculosis, and that is one of the reasons that lung exercise is of such advantage in pulmonary tuberculosis, as it has a tendency to check rigidity,-- what is another? ("Improper position.") Yes, improper position has that tendency-- any thing else? Emphyzema, or a condition in which the air-cells have become obliterated. (Diagram.) Here is an air-cell, for instance, or a lobule something like this. Now, in emphyzema, this is what we have-- the air-cells obliterated-- all these little partitions are obliterated and the tubules press upon each other; when the cells enlarge this compression occurs; the dilitation of a portion of the cells obliterates other cells; so that, in emphyzema the respiratory area is diminished, and consequently the opportunity for the output of CO_2 is diminished-- anything else. ("It causes adhesion of the lungs and chronic pheumonia.") Anything else? ("Obstruction of the air passages through catarrh and nasal diseases. Yes, what else? ("Destruction of the air-cells, as in tuberculosis.") Yes,-- consumption, pulmonary tuberculosis, the corset-- anything else? ("There is aneurism of the gland.") Yes, disease of the blood vessels , tumors in the chest,- put that down--("chest-tumors"). Anpther?-- ("We might have an enlarged heart, or a weak heart.") Yes, organic changes cause a weak heart-- anything else? ("Asthma.") Yes,-- that may be or may not be associated with emphyzema; they have diseased muscles of the chest; muscular rheumatism, tight lacing, etc. Next time we will take up the subject of "The stiffness that follows exercise."

Exercise.

TALKS TO MEDICAL STUDENTS (SOPHOMORES.) Oct. 14,1901.

Exercise,--evil results.

J.H.Kellogg, M.D.

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One of the ill consequences of exercise is overwork. We may have acute overwork, subacute overwork, or chronic overwork. Overwork may be carried to such an extent as to produce immediate death. An animal, for instance, may be made to make such violent exercise, such as running, as, a rabbit when chased by dogs, a deer chased by hounds. An animal may make such violent exercise as to fall dead in a very few minutes, or at the end of a few hours chase. You know that when experienced hunters-- "sportsmen ", as they call themselves-- with them the idea of hunting was to chase the animal until he was brought to bay and could not run any longer, and was just ready to die and they ended his life just before he could expire otherwise, but very often the animal dies before it is shot,-- the hunter does not shoot the animal, although he could do so, until the animal has been chased until it is so tired it cannot run any longer, and it gets its death wound before it gives it's dying cry, and sometimes it dies before it receives the shot. The hunter sees the deer getting stiff in his legs so that he cannot move them much longer and he says the animal is "on its last legs"--" thatis where the expression, "on its last legs" comes from; secendary fatigue sets in, the muscles have become paralyzed and stiff and he falters and falls and the hounds are upon him. It is a cruel spectacle to see an animal in that condition; it seems as though it might appeal to the hunter, but it does not, and the animal is killed by a blow or a shot, just before it is ready to die. It is often the case that the deer is found the next day after he has been chased dead in the woods. Very often dogs chase bears to death. Not infrequently the dog runs himself to death to death trying to keep up with bicycler. In such a case as that, what does the animal die of? (Auto-intox-

ication.") The animal dies from asphyxia as though it had beenthrottled; this occurs when the animal runs until it is out of breath. If he were allowed to stop running until he got his breath again, he would be refreshed. What method does he use to accomplish that?-- What do they call the trick? ("Doubling.") Yes. The animal waits until the hounds come very close to it and then shoots off with great velocity in an opposite direction, and while the hounds are making the turn the animal gets a pause; if the animal can stop for a minute only, it will be refreshed. So if you hold your arm out until it is tired and rest it it a minute you can keep it in that position a longer time,-- why is that? Because the muscle is locally asphyxiated by the accumulation of CO_2 in the muscles and the products of combustion. Now let a person engage in an exercise by which he gets out of breath,-- for instance if he is running-- and continues this exercise until he is tired, if he will stop and rest a moment he can run again. The Hindoos runners carry their dispatches with great speed in this manner; this custom is also in vogue in Mexico. It was used in Mexico 500 years ago, long before the discovery of Mexico by Cortes; they had stations all through the country and one carrier at each station and one afterthe other carried the dispatches over the royal roads with great speed. These roads which were constructed for this purpose, are there now although they are worn down into the level plain some thirty or forty feet, they have been travelled over so many years by so many people. Now along those roads were stations about five miles apart, and a runner who took the royal dispatches was placed at each station and the first runner would carry the dispatches to the next station, and so on, and so dispatches were carried across the country in a short time two or three hundred miles a day. The same custom still prevails in some parts of India, and those runners have wonderful speed; they have a plan of stopping when they are

out of breath until they count sixty, and then they are quite recovered, and run again. Why is that? It is because in that minute that they stop, the lungs have time to throw out the surplus carbonic acid gas-- the accumulated poisons are thrown out of the body so that the threatened asphyxiation is avoided, for the breathlessness is simply due to partial asphyxiation from the accumulation of carbonic acid gas in the individual's body. The breathlessness caused by overwork, but it is overwork from which recovery can be had very quickly. Now if a person engages in moderate work, although it does not make him out of breath, yet, if long continued, it results in breaking down the tissues. It is this that produces the stiffness of the deer's legs after running several hours. It is the same thing that makes a man tired, as one can see, by his staggering gait when he comes home at night. The laboring man starts out in the morning with an elastic step, but he comes home to his dinner with a weak and staggeringwalk "broadening his base" as it is termed. Many times a man has been digging for several hours in a pit, or working on the railroad and you can see that he has lost the power of his muscles he has lost the power to co-ordinate; his nerve centers are paralyzed , and he wobbles in his walk when he comes home; his nerve centers are paralyzed by the toxins developed in his own body. When a man continues at work for a good many hours his muscles become so weak that he cannot stand straight, and he feels giddy and can hardly stand up; loss of sleep means the same thing. This sort of intoxication (autointoxication) is the result of long continued moderate exertion. Violent exertion for a short time produces overwork and the condition which he calls breathlessness but that is quickly recovered from. More moderate but long continued exercise results in the accumulation of what? ("Fatigue poisons.") ("Nitrogenous wastes.") Yes, uric acid is one-- what other? Urates.

There is also urea but that is not nearly so poisonous as uric acid, because it is perfectly oxidized; uric acid is an imperfectly oxidized product and one of the poisons which is difficultly soluble. That is a sort of overwork that you see a large number of persons suffering from: laboring men, and particularly laboring women, who do not get sleep enough are among this class. The poor laboring woman has to rise early and get her husband's breakfast and take care of the little ones, and perhaps they may have to do a big washing and bake and perhaps do sewing and mending,-- and perhaps after the husband is asleep she is sewing. Add to this the anxieties of this laboring class,-- you can see many pale overworked mothers who have little opportunites for taking out-door exercise and drinking tea and coffee until they benumb and dissipate the sense of fatigue,-- they also use tobacco, opium and other narcotics for relief from this sense of fatigue by benumbing the nerve centers and lessening the sense of pain. They continue in this manner striving to obliterate the sense of fatigue, and yet this does not rest one,-- it only covers up the sense of weariness. But this is simply adding to the poisons already in the body-- the tea adds another poison similar to uric acid poison. This is subacute overwork such as we see many people suffering from, and which may be followed by fever.

Chronic overwork is what people suffer from by such work as laboring in the harvest field; they work too hard and too long, and lose much perspiration, and suffering a little fever the next day, also suffering from lassitude and languor. The invalid might be overworked in a short time by walking, while one accustomed to this form of exercise-- a mail-carrier for instance-- walks twenty-five miles a day without being overworked, while the man who is not accustomed to walking is wearied by walking less than half the distance. A man who is not accustomed to walking, walks five or six miles one day, and the next day he cannot

walk at all,-- the same is true of sports or other forms of exercise.

Chronic overwork is something that you can see among sedentary persons-- especially business men. You will find examples of this especially among artisans, and this is the kind of work with which we are concerned. Fatigue, comes more from the work of long hours than from hard work, and the reason why is because the repair or the restoration from the consequences of overwork only takes place during rest. The state of the muscles, during rest, is favorable to repair, while the condition of the muscles during exercise is unfavorable. The presence of waste substances which are poisons, interfere with the metabolic process of building up the system. In a condition of rest, the process of washing out thepoisons of the body, and of te accumulated poisons, and the building up of the body and of new tissue, is taking place. It has been shown that the condition favorable to repair of the brain in one in which there is a lessened supply of blood-- an outflow of blood, and an inflow of a large amount of lymph,-- why? Because the presence of a large quantity of blood stimulates the activities by which the muscles of the brain are broken down,-- the inflow of a large amount of blood to the brain stimulates heat production and its effects, whereas the presence of a large amount of lymph alone stimulates repair by rapid assimulation. This has been proven to be true as the brain, when it contains a small amount of blood and a large amount of lymph, that this condition is most favorable for repairs. The brain is within the skull and contains large cavities-- what are these called? ("Sinuses.") They contain venus blood-- what else? ("Ventricles.") There are many ventricles-- there are five of them at least-- what are they for? They are lymph spaces; they communicate with all parts of the brain. Now when the blood flows into the brain, the lymph flows out; it must do so because the brain cannot get any larger; and when the blood flows out

the lymph flows in, keeping up an equal pressure on the brain-cells-- that is the reason they are not ruptured. So in inflow of lymph means an out-flow of blood, and this condition as I have said has been proven to be favorable to repair of the brain; and that involves rest. When the blood flows out, the activity of the brain ceases. So if the heart ceases to furnish a sufficient amount of blood into the brain the person becomes unconscious, and when the blood flows in, the activities of the brain commence breaking down the tissues.

The same thing is true of the muscles. When a muscle is commanded to act upon the brain, the blood vessels dilate, the brain is filled with blood, and then the brain is prepared for action, but it is not prepared for repairs; a rest is necessary for that. So if a man does not work hard, but works only moderately, but if he works many hours and does not take time to rest, he may suffer severely for want of rest, whils the man who does much harder work would be maintained in perfect vigor. This is important for students and doctors and all classes of laboring people to understand; this is a practical point which peopls generally do not understand,-- they think that if a person has worked six or eight hours and has worked hard, he has done more work than others who have worked ten or twelve hours and did not work hard. The fact is that the person who has worked for a long time, resting occasionly has done more hard work, as a rule, than the person who has exercised more vigorously and continuoisly, and worked for a shorter time. It is rest that repairs; it is not simply a matter of differnece in the amount of work but a difference in the amount of time consumed inthe work actually done.

Now a thing of wonderful interest in connection with this question of exercise, is the change that takes place in a man when he is trained,-- in other words, the difference between a trained man and an untrained man, so far as endurance is concerned. Here is a man who is

untrained and we strike him a blow-- it is not a very hrd one but he suffers from it; but when a man is trained if you strike him a hard blow, it gives him no trouble, because his muscles have become like a rubber ball-- they afe soft and elastic. The tained man will receive from us blows and smitings which would knock us senseless, ad break a rib or an arm, but it does the pugilist no harm, because his tissues and muscles have been trained, and even pounded until they have become firm, soft, and elastic, and he suffers no pain or trouble from it, unless he gets a blow in some particularly sensitive part, as the nose, the eyes, or the jaw.

We see a difference between ~~men~~ ~~and~~ animals also, by comparison of ~~men~~ ~~with~~ certain animals,-- for instance here is a rabbit--he lives a quiet, and rather inactive life; he grazes on grass, eats herbs and leaves, and hps once in a while when he is frightened. Now the dog is running all the while-- unless he is the house dog or lap-dog and loses his power to run through his sedentary habits-- such a dog is treat ed like a baby, and he ceases to be a dog-- he is not a respectable dog- he doesn't do enough to be called a natural dog; but the natural kind of a dog is a running dog. Did you ever feel the muscles of such a dog ? The first time I felt the muscles of one of these dogs, I couldn't find them, and I thought he was all bone; the animal seemed to be as hard as wood; in every part of his body his muscles were smooth and hard as wood- you can make no impression upon the muscles of such a dog. If you have ever dissected a dog of this class you found that you could hardly cut the muscles of the dog with a knife; they cut just like cords, or tough grisly tendon. On the other hand, the muscles of the rabbit, or any other sedentary animal are very different-- they are very soft; it is just the same difference as exists between the work ox and the stall

fed ox. It is seldom that the work-ox is sent to the butcher's, for his tissues are tough and hard; such an ox would not be bought for his flesh would not be eaten; but few butchers would buy such an ox,--what would they do with such an ox before they sold him? ("Put him in the stall and fat him.") Yes, they would feed him until he is fat and sick, so his flesh is tender.

Now see the difference between a man that is trained to exercise and one that is not trained; the first time the man exercises there is a great waste poured out of his body, while with the trained man the urates and other wastes do not appear in exercise. Now see what that means in the stall-fed ox and the sty-fed pig,-- their flesh is tender nand juicy, whereas the flesh of the working animal is hrd and dry and very little fibre--why? Because there is little or no waste matter in it. We find, the more we study physiology, and the deeper we look into it the more we see the value of these wonderful truths that we have possession of-- the wonderful light that we have gotten hold of,-- and that we have come to the point where we are making a thorough-going application of these principles of natural dietary and natural treatment. The Creator knew what he was doing when he gave man foods in their original and pure state, and there has never been any change in this respect,--although man has been permitted to eat inferior food, but when he takes the flesh of an animal, he is taking into his body the waste substances of the animal, adding those poisons to those which he already had in his body. Now we see why the workingman can eat flesh without trouble, while the sedentary man cannot do so without injury, and ~~thinks~~ he would not be able to eat meat without seasoning, or with the addition of mustard, pepper, pepper-sauce and rich sauces. Now the hard working laboring man can eat meat,-- he can take it just as it comes from the animal--

he can eat it raw because it is more easily digested then than when it is cooked; the butcher often cuts off a slice of flesh and eats it while warm,-- it is very tender then-- just after the occurence of rigor mortuis. It is interesting to note the effect of overwork upon an animal. I might mention, in connection with this fact, the following,-- take an animal that has been run until it is just ready to drop, and then kill it, and the flesh is so decomposed that it is said to be very toothsome and tender, but it is certain to make one sick. Liebig made some observations upon this subject; he observed that when a fox had been running until he stood at bay, the muscles contained ten times as much creatin as do those of the quiet fox,-- in other words that the body of the running fox contains ten times as much broken down muscles as do those of the animal who has been resting and quiet. This is what makes the flesh of animals that have been exefcised toothsome and tender, and this fact has been taken advantage of . Gormands like game that has been chased because it has a high flavor; the flavor sometimes gets so high that one cannot eat it unless his appetite has been specially trained for it. Soldiers sometimes have cattle driven with them on their marches, and they eat the cattle and in consequence, typhoid fever breaks out among them. Numerous outbreaks of epidemics have been traced to the use of cattle who have been overdriven. Did you ever hear of the milk of overdriven cows making children sick? The poisons contained in such milk, frequently make children sick. There was once a butcher in Limoges, France, who is very celebrated for his pork, had the finest pork known. It was found that he first burned the eyes out of the pigs, and then burned their bodies with cinders until they were tortured to death; their flesh was wonderfully tender. In Southern France they made the geese tender. They plucked the feathers all off before they kill the goose,

and that painful process resulted in making the flesh tender, because they strain their muscles to the highest degree, and this violent exertion of the animal under torture makes the flesh tender. In the South Sea Islands, the practice has prevailed until recent times, of lifting oxen up by their heals and horns and whipping to death. What did the ox die of, not by loss of blood,-- what then? ("Autointoxication.") Yes, autointoxication resulting from its violent exertion. Of course every blow of the whip was an appeal for violent exertion, and the sting of the whip, and the whipping continuing for hours finally results in the death of the animal from autointoxication. In Southern Italy it has been, and still is, the custom, to chase the bull which is to be slaughtered until it is nearly dead. It used to be a law in England that the bull which was to be slaughtered should first be bated,-- the bull was put in an enclosure and the hounds were put after it, and it was chased until the blood rushed from its nose, and then on being slaughtered its flesh was very tender; it was very juicy matter, because the living matter had been rendered partially soluble by oxidation. In that condition we say that that juice of the animal is the extract of dead flesh. All these juices are poisonous matters; this is true of all flesh extracts, -- theyare all waste matters of animals that are on the way out of the body when the animal is killed or dies.

The trained man eliminafes the poisons of the body. They say of such a man that his body has become accustomed to fatigue,-- is that so? Does any one ever become accustomed to pain? Would you ever get used to having a pin stuck into you, so you would not mind it? One can cultivate his will power so as to keep his arms still while the pin was being thrust into it, but that would be a development of the will,-- would you say that person was accustomed to pain? ("No.") Now the man who is trained is not accustomed to fatigue-- ("He does not get

fatigued.") He has no fatigue; he is so accustomed to work and exercise that he has become a different sort of man from what he was. Suppose you should set an engine at work,-- does it improve as it continues its work? Does the locomotive on the railroad grow better as it runs from year to year? ("No.") Of course when a locomotive first leaves the shop it is not in perfect running order,-- it is stiff and its wheels work upon their bearings-- but take a locomotive that is ready for work at its highest capacity? Does that machine improve by work? ("No.") Every day it runs, it is a little nearer its end. Now the body is a sort of engine that improves with work and the hard work that it does to-day prepares the body for harder work to-morrow. The body is a self-creating machine. There is a divine power within the body,-- the spirit that made us creates us and dwells in us, repairs our bodies and makes us betfer each day, morally, mentally and physically, and makes us to-day better prepared to meet the duties of the next day.

This is a great physiological fact,-- that the activity of an organ prepares it for still greater activity. God rewards a man for the hard work of yesterday by giving him harder work to-day; he does not give him harder work to do, however, and unless he is prepared for it; the hard work that he does prepares him for still harder work; that is a great physiological law. But it is necessary that a person should use his faculties to their fullest extent of activity in order to be prepared for harder work. If the capacity is not employed to the fullest extent there would be no additional capacity given. We receive more than we give,-- in giving up our energy, and in utilizing it in useful ways, we receive a larger supply.

It is interesting to study the changes which take place in the trained man,-- the changes that take place as the result of training.

I hope when you get through you will see that the work of a missionary physician is to do the work for a man that needs to be done,-- to do for a man everything that he needs to hae done for him,-- physically, mentally and morally. It is far more important to show people how to keep well than how to get well; it is far more important to prevent disease than to cure disease. The method of knowing how to prevent disease has been recognized as being very important in our sort of medical work. When we have simply helped our patient to get well, we have done but little for him; we have not done much for him unless we can show him how to keep well. After we have lifted the sick man out of the pit, we have done little for him unless we can put on his eyes glasses that will enavle him to see the pit that he fell into and keep out of it. I will go further and say that we never can really cure a man; of course I use the word "cure" in the popular sense, and unless we know how to teach the patient how to keep well we have done him but little good; we must teach him that the things that are necessary to cure him are the things that are necessary to keep him well after he is cured. I was talking with a lady who had bowel catarrh or intestinal catarrh, and she said to me, "Doctor I have been leaving off cold compresses because I don't think they do my diarrhea any good,-- I am suffering from loose bowels, and a friend of mine was suffering from constipation, and the cold compresses helped her, and so I am sure it couldn't make my condition any retter." But I said, "Your case is a good illustration of the old adage, 'A little knowledge is a dangerous thing'". But I had to go into the subject and give an elaborate explanation because the lady was very bright, and I had to come down to first principles and show her that what we wanted a cold compress was, not to cure constipation or diarrhea, but that if a person has these troubles and ever gets well, it is be-

cause the bowels cure themselves. I said "Here is a sore on the skin,-- how does it get well? The healthy skin grows out into the wound until it is covered with healthy skin. If we should take the healthy skin off the arm, it would never heal; there must be healthy skin enough to cure itself. So if the wound is very large we must put on grafts of skin, and so the skin is healed by the skin,-- if there is any injury to the skin, it healed by the healthy skin that is left. So if there is a diseased condition of the mucous membrane, it must be healed by the mucous membrane; the body must help the mucous membrane, but the mucous membrane must do the healing; so we must restore normal conditions to the body by encouraging the circulation of the blood until the skin is reddened when the skin is reddened it shows that there is more than the usual amount of blood present; the same thing happens to the mucous membrane, showing that it is supplied with healthy blood and is able to heal itself by bringing in an abundance of healthyblood that heals the constipation if that is what is the trouble or heals the ulceration, if that is what is the troble, or heals diarrhea or looseness of the bowels, if that is the difficulty. So that no matter what the trouble is, all we can do is to restore normal conditions, and nature does the healing. So, in everything else we assist nature in the cure of the patient by lifting him to a higher level.

Exercise helps in this work. So every sick man must be brought into the condition of the trained man. Notice what a wonderful change takes place in the body by neans of training. We can tell, by the examination of the bones of a man or an animal whether he is an athlete or not, whether he is a working man, an invalid of sedentary man,—and you can tell it by the locks of the bones? See if you can imagine some difference in the bones of an athlete from those of an ordinary man. ("They will be larger, for they would receive more nourishment.") Yes, they

would be larger because the same exercise that brings blood to the muscles brings blood to the bones, so if we increase the blood of the bones and of the muscles we cause them to grow and this is done by fresh air and exercise, so when we cause the body to grow by exercise and air we at the same time cause the bones to grow. One lady said, at one time that one of her children was mostly legs,-- she had not grown yet. I tild her she would grow more. Her waist was away up here; she had a short trunk and very long legs and I knew she hadn't got her growth. The lady said "I have noticed that my children's hands grow one year and feet grow the next. The bones grow by exercise, and the largeness of the bones depends upon the amount of exercise,-- they will not only be larger, but they will be denser-- they will weigh more-- that fact has been ascertained by horses exercising in the circus who have been accustomed to most violent exertions-- their bones weigh more than those of horses of the same height and general build who are not accustomed to exercise. There will be something else in the bones of the athlete or trained man-- what is it? ("The joints will be larger"). Yes, because there will be more nutrition present; the muscles and tendons are attached to the ends of the bones, so the stimulus would come to them to the joints. There is another thing that we have as the result of exercise,what is it? ("There would be more circulation.") You could tell by the outside appearance of the bones,-- outside of the bones of the sedentary person,ithey are round and smooth, while the bones of the person accustomed to vigorous exercise would be rougher,-- the points of the attaching muscles would be more prominent and conspicuous and sharp.

Now if a man should get his shoulder dislocated, and it should drop forward under the clavicle, for example, what would be the effect upon motion? ("Very little motion.") Suppose a person dislocates his

hip and the end of the femur slips out of the acetabulum and slip behind the sacrum-- what would be the effect? ("Lessened motion.") Now suppose with the most persevering manipulation of the limb, motion should be secured after a time. ("Yes.") Yes, I have met a number of cases in which what is called a false joint was produced by constant effort of this kind. Nowthe wonderful thing about that is this,-- that where this false joint is formed there is also formed a cartilaginous socket after years of work, a synovial membrane was formed-- a capsular ligament is formed, , and you have something that corresponds to the original joint that is no longer used; the old socket and synovial membrane disappears because there is no longer any use for them, and after years have passed you cannot find any of the old joint. The same thing that happens to this joint will happen to perfect joints when fixed in one position for a long time,-- for example, a boy puts his arm in this position (illustrating) and it is kept in that position by a bandage for six weeks, it will be permanently fixed and the arm can only be extended by moving it with a great deal of force, because the joint has become rigid and fixed and has begun a process which have carried on for several years, will result in complete ossification and obliteration of the joint. I havehad cases in which the joint has actually grown together.

There is also a local change which takes place in many organs of the body-- for example, in the lungs,-- we might consider the muscles for a moment, and the changes which take place in them: the soft part ofthe muscles of a rabbit, for instance, becomes hard, while the dog's muscles become soft-- we will examine the difference between the muscles of the trained and the untrained man. Some of you have got hold of the muscles of a trained man or woman and examined them and compared them with you own, and you have seen the same difference--that the muscles of

the trained man are firm. The man who is in training loses something, and he also gains something,--what he loses in fat, he gains in muscle,--and that is the thing men in training are always anxious to do--gain muscle and lose fat. But they do not often change in weight, because the fat is used up in muscle, and thus the muscle grows. Do they get an increased number of muscle fibers? ("No.") No, the fat forms thin layers between the muscle fibers, and thus they grow to be large and thick and strong,-- and that is the way the muscle grows; the fat does not increase the fibers but increases the thickness and size of the fibers and their capacity for work and thus the fat disappears.

It is important to see that such patients are gaining in strength while losing in fat. If a person loses fat and loses strength at the same time he is in a bad way. If you are treating people for obesity, and if they lose fat and strength at the same time, the treatment is wrong, and you must stop it, because you are tearing down the constitution of the patient and bringing him into the condition of chronic overwork of the muscles and organs. Chronic overwork of the heart or muscles results in a shrinking and weakening of the muscles. So we sometimes find persons overtrained in this manner. We sometimes see an account of a pugilist who meets an antagonist in the prize ring, and he fails, and the explanation often is that he was overtrained. You will often see this fact announced in newspapers concerning prize fighters who have failed, also of boat runners. What is overtraining? It is an exhaustion of the muscles.

Now let us get down to the physiological and anatomical fact of what this overtraining is: It consists in working the muscles so continuously, and to such an extent that we have used up not only the reserved material or stores of energy and heat that was in it, but we

have, in part, consumed the muscle itself, and the opportunities for rest have not been sufficient for complete repair of the muscle,-- it has not time for complete restoration, and so it gets smaller and smaller, and shrinks away. You often find a man who is suffering from overtraining, has a weak heart-- that is the way it becomes weak; the overtraining of any muscle causes a shrinking of the muscle, and so overtraining the heart causes an actual straining and weakening of the heart, and a thinning of the walls-- it is not because the heart gets so big. Some years ago I could not understand why our bicycle rider had such a weak heart,-- I did not understand that his heart was actually weakened; I supposed that his heart was big and strong because it had had so much strain, but that was not the fact. An overtrained muscle is a weakened muscle and an overtrained heart is a weakened heart, so we must be careful about overwork and overtraining. The muscle which has been properly trained, gets bigger each day, and thus you have prepared it for the work of another day. But if the fat diminishes, there is a dimunition of muscular weight, and the weight must remain exactly the same. The muscle finally reaches its maximum; that is the time when the trainer watches his pupil to see if he has been brought to the point of maximum improvement, and when he has done so, he watches him to see that he makes no more progress, because he has reaches his maximum and cannot improve any further. The trainer watches to see that there is no additional gain of his subject. If he can run no further without getting out of breath; if he can engage in an encounter with the punching bag for no longer time, without showing symptoms of exhaustion, you know that he has got to the top notch of his development.

There is a wonderful change which takes place in all the organs of the body by means of thorough training,-- the skin becomes whiter and

clearer. In England they say of a pugilist who is thoroughly trained, "His skin is as white as a woman's,--" he is so thoroughly trained, the excretaory organs are so active, the blood so pure and the skin so thoroughly washed out every day by the large amount of oxygen introduced, that the body is in perfect condition.

Now think of living is such a state,-- what a beautiful thing it is! The trained man is like a rippling mountain brook, the water of which is clear and pure; but the sedentary man is like a stagnant pool filled with slime, with frogs croaking in it, full of all kinds of abominable things and the hole of every unclean and hateful germ,--that is the state of the sedentary man-- he has no power to resist men or germs. The physically trained man, on the other hand, is capable of meeting anything that comes; he is prepared to fight a germ; he is just as well prepared to fight a germ as he is to fight a human antagonist. The man who is prepared to fight the world's champion is prepared anything in the form of disease. You never heard of a fistic performance being put off because one of the performers has got a cold. The man who is able to fight a Fitzsimmons or a Corbett is hardly ever troubled with a cold, it is almost impossible for him to take cold,-- of course he might take cold with a sufficiently great exposure, but he is not likely to do so, or to be troubled with diptheria, scarlet fever, mumps, measles, chicken-pox or typhoid fever. He has great power of resistance; his muscles are hard and wirey, and all the muscles of his body are in good fighting trim, and all the cells of his body are in just as good fighting trim as his muscles. I would like to live in that way, but I am too much of a slave that I a cannot do it and I have to shut myself up a great deal. But there is no reason for your shutting yourselves up; there is nothing to prevent you from doing what is right in this respect,

and if you don't go to work and make yourselves as strong and well as you might, it is because you are too lazy and shiftless to do so. You have no right to go round looking weak and feeble and sickly; we don't want such doctors. We want doctors that are rosy cheeked, strong and hardly and that show evidences of health in their countenances, and then people have more enthusiasm and confidence. If a doctor can hardly drag his slow length along, he cannot enthuse other people. We want to make ourselves strong and manly and able to make a great uplift in the world wherever we go; we should cultivate health so as to be always full of enthusiasm, vigor and joy,-- and it seems to me I would give the world if I had sich an opportunity. But you have that opportunity, and I advise you to make the best possible use of it. Although you have but small apartments, you can get all sorts of exercises in them,-- and you should do so,-- why? Because the greatest thing accomplished by exercise is to improve the breathing power. Don't forget to sleep. Sleep slows down the vital functions, and lessens the activity of the brain, and of the heart from seventy beats to sixty per minute, and the respiration of the lungs from eighteen to twelve per minute, lessening the amount of CO_2 produced to one-half the ordinary amount; it slows and digestion with the action of the skin and kidneys and all the vital organs-- the rest. That is the reason a person cannot digest a meal that is taken just before he goes to bed--because it needs vital activity in it s highest capacity to keep the stomach going while digesting food.

Next time we will consider the functional effects of exercise.

Exercise

TALKS TO MEDICAL STUDENTS. (SOPHOMORES) Oct. 16,1901.

J. H. Kellogg, M. D.

Functions of Exercise.

Difference of Amount of Air Used in Lungs in Different Position

In lying down, it is	1.
In sitting up	1.18
In standing	1.33
Walking at the rate of two miles an hour	2.76
Running at the rate of six miles an hour	7.

A rabbit in a passive state,-- the outflow of CO_2 is one-half the amount of oxygen taken, and in work the outflow of CO_2 is double the amount of oxygen taken in. When the animal was exercising, the amount of CO_2 that went out exceeded the amount of oxygen taken into the body,-- it was not taken into the lungs, but taken into the body; the amount of CO_2 exhaled was larger than the amount of oxygen absorbed-- would that mean that there was less oxidation ? ("No.") What would it mean? ("More oxidation.") From the whole statement of facts, what would you conclude? ("During rest the body stores up oxygen.") Yes, and during exercise the body consumes the oxygen taken in, also some that was stored up in the tissues,-- the oxidation is not direct but indirect.

Exercise has the effect, then, to burn up the reserved tissues in the body. When the reserve tissue has accumulated beyond a certain amount it smothers the vital fires. Professor Bouchard has written a

very interesting work, the title of which in English, "Slowed Nutrition". This is the first book ever written on the subject, and calls attention to the very important physiological fact that the reserve tissues not oxidized by exercise, are a source of poison and an incumbrance to the body, because, when the body is filled with these reserve tissues or elements, and the oxygen taken in is not used-- what does that mean? What is the result of that as regards the entire body? ("There is an accumulation of poisons.") Is it desirable that oxygen shall be stored up in the body? ("I should think it was, to a certain extent.") When oxygen has been laid aside, and not used, there is some tissue not oxidized,-- suppose your body contains a large amount of residual tissue not used and no oxidizing process-- there is such a great excess of this residual tissue that the oxygen taken in is not consumed, for the same reason,-- what does that mean? ("It means that there is not enough exercise taken.") It means that the whole body is filled with partially oxidized substances,-- let us have an illustration of that: we have a stove and we put coal in it, and we have a srtong draft; when we put in a moderate amount of coal, the coal will be completely consumed and converted into smoke and ashes, in the body, what corresponds to smoke? ("The, fluids-- carbonic acid gas etc.") Will the ashes dissolve? ("Yes) They are soluble in large part. Oxidation renders coal soluble,--it that true of the body? ("No.") No, if the body were soluble, it would be dangerous for any one to go in swimming, as one would be dissolved; but the body is insoluble; but when it has become oxidized, then it becomes soluble,-- it is like coal after it has become oxidized. Suppose the coal in the stove is oxidized imperfectly-- what would we have then? ("There would be an accumulation.") What do we call the accumulation? ("Ashes and cinders.") If we fill the stove so full that the draft is obstruct-

ed so that it is not suffcient for the combustion of such a large quantity of fuel , therewill be an accumulation, because of course the draft is adapted to a certain amount of fuel, and if you put in more fuel , what would be the consequence? ("You would have an additional amount of ashes and cinders and an additional amount of fuel and smoke.") What are the ashes? ("Uredis ashes in the body.") What are the cinders of the body? (" Poisons stored up in the body--uric acid, fatigue poisons, etc") I don't know that we should call fatigue poison a cinder, but uric acid would be a cinder,-- does the body contain moreuric acid than urea? ("Yes.") It that true of creatin and creatinin? ("It contains less.") Yes,-- these are the products of imperfect oxidation; if there were perfect oxidation there would be more urea-- urea is an ash, but creatin and creatinin and all other imperfectly oxidized nitrogenous substances are cinders. Now if the amount of oxygen consumed in the body is insufficient, or if it is simply stored, and not used and these reserve substances accumulate, that means that the body is filled up with cinders- it is just like a stove full of cinders, and the draft is expected. The first effect of exercise is to clear out the cinders of the body through the circulation, and while the cinders circulate through the blood they create an irritation causing fatigue,-- and this is secondary fatigue. When a person is living an idle life the cinders are continually accumulating , and by-and-bye the man gets hat is called, "a dingy sclerotica" that means a dirty skin. When the cinders in the skin and the mucous membrane cover the sclerotica-- when the skin is dingy the mucous membrane covering the sclerotica is dingy or dirty-- and what else is dingy? ("The brain.") Yes, every atom of the body is contaminated with these cinders when one is in this condition and it is no wonder that we find many people suffering fromdespondency, melancholia, etc--- it is quite natural that a man with his blood filled with these poisons should be

depressed, and it is no wonder that the student who take no exercise and studies all day and sits up late at night, and does not have the proper opportunity for rest, and as a result has an accumulation of these substances-- it is no wonder that he loses his clearness of perception and memory, and becomes stupid and dull. This is a very important matter and we should thoroughly understand it,-- that exercise is a regulator of nutrition; it prevents the undue accumulation of reserve or risidual tissue, so it is in the highest degree essential. Every animal exercises until it has become perfected. I have oftened noticed my parrot as he was going through his daily exercises. He gets daily exercises in great variety, although he lives in a very small cage; he goes up to the top round of his cage and hangs by his feet; he goes through with trapeze pefformances of all srts; he does a great amount ofoverhead work; he hangs by his bill and puts himself through every kind of contortion, and he keeps up his gymnatics for hours, and sometimes until he pants for breath-- and this he does habitually. This is true of every animal; they have a thirst for exercise. Take a person accustomed to exercise and shut him up so that he cannot go through with his accustomed exercises and he is wretched. But you let a man stay in bed for six months, and he gets used to it, and it is next to impossible to get him out; he becomes accustomed to idleness and hates exercise, he acquires an appetite for rest; he has lost his power to live in a vertical position. I remember the case of a lady who had been in bed about three years. The first time I got her on her feet her suffering was so acute that she could not endure it. Her limbs became purple and mottled, the walls of the blood vessels had become so weak that they could not support the pressure of the blood, and the veins and arteries were distended and the limbs were swollen, she was giddy and the heart palpitated. So she had to be put through the proper exercise in bed,-- raising limbs, head, etc.

Another effect that exercise has upon the functions of the lungs is to increasd the depth and the completeness of respiration. When a person does not exercise vigorously he does not produce the necessary thirst for air and does not take deep breaths and the consequence is that the lungs become fixed in the position of expiration instead iof inspiration. Now in expiration, the chest is flat-- there is a hollow place under the clavisle,-- the chest becomes flattened and almost hollow at times, whereas by inhalation the chest is swelled out, and is vaulted in front as well as in all other prts-- the sides ofthe chest are well drawn out, and the chest is enlarged. Now when a person takes exercise to such a degree that he is in the habit of stetching out his chest fully, it acquires that form naturally. So you will notice that runners always have a full chests. Rafe horses also always have large full chests, and the ability of a race horse to win a race depends not so much on his legs as on his full chest and lungs. A great many horses can run at the rate of a mile in two minutes-- or at the rate of a mile in two minutes for a hundred rods, but cannot keep up that pace for a a mile, although they can travel a short distance with great speed,-- they lack chest capacity. Many men can run twenty yards at the rate of a hundred yards in nine or ten seconds, but cannot keep it up for a hundred yards; the ability to do that depends upon the lung capacity,-- keeping up that tremendous pace depends upon the ability to expand the lungs sufficient to take in air enough to displace the carbonic acid gas present, and so prevent asphyxiation. It is asphyxiation that stops the runner; he gets asphyxiated, and it is asphyxiation that loses the race for the runner, and causes the race horse to come in second-- it is that cause, rather than lack of strength of limb, in a majority of cases

Now there are certain actions of the body that become automatic by practise. The new born child does not breath at first; the mo-

ment the air strikes the lungs, it sets up reflex movements which provoke respiration, and this movement by habit becomes automatic. Now this automatic movement of the lungs is chiefly carried on by the action of the voluntary muscles. Most of the muscles of respiration are voluntary muscles, but they are under automatic control. When one has learned to walk, he does not have to think about his feet,--when he proposes to walk, he says, "I will walk," and sets his feet going, and they go right along without thought. So one can walk, and at the same time study and talk, and be utterly unconscious of the fact that he is walking. He can go round a corner, and step over obstructions--his feet take care of themselves. It is not the feet, however, that do the thinking,--it is the spinal cord.

Now the lungs partid pate in this automatic training. So, when the lungs are habituated, by voluntary efforts, to deep breathing movements, they acquire the habit of making those movements, and keep it up during sleep. Claude Bernard, of the Joinville Military Academy of Paris, once tried an experiment with young soldiers: He tested the amount of air breathed by these young men during sleep. He then put them through gymnastic exercises during six months, and then he found that the amount of tidal air--the air moving out and into the lungs in automatic respira~~spira~~tion during sleep, was twice as great as during sleep before the exercises were taken. This fact means a great deal for the life of the body, because we live as we breathe. The frog goes down into the mud and stays there until the ~~purity~~ oxygen (?) of the air is exhausted, and then he comes to the top and breathes the air out. You can see the little bubbles rising as he comes to the top, and when you see the tip of his nose, you can see a couple of openings, which keep winking or opening and shutting--he shuts the valves and swallows the

air, forcing it down into its throat; you can see his throat going up and down as the valve opens and closes in alternation with the movements of the throat as the air is forced down into the air bag. The frog uses so little air that when he has filled and shut up his little air bag he goes down again and stays an hour. Now the bird requires very large lungs, and hence it has an enormous chest,-- the chest constitutes the greater part of the body of the bird, and is large enough for the tremendously swift and prolonged movements and activities of the bird's life. The bird also has hollow cavities in its bones which are connected with the lungs, so that the bird not only uses its lungs but also its bones as a resovoir for air. So as you might say, the bird breaths nearly to the tips of its toes. Hollow bones are best adapted to flight as well as strength and are also useful as a resovoir for air.

Now note the difference between the lives of the two animals, the bird and the frog: the frog breaths but little and has but small breathing capacity, but he lives a low, ,lonesome life, making a house of the stagnant pool while the bird soars aloft and inhales large quantities of air and has an enormous chest. And if you live like a bird you must also inhale large quantities of air and soar. A frog requires but little air, but the life of a vigorous man requires much air so he should not live like a frog. The body is fed with vital fires, and you know that the intensity of a flame depends upon the intensity of air; if you want the fire to burn more intensely you apply the bellows. By increasing the draft to a still greater intensity you supply a larger amount of oxygen to the body. By simply improving the draft we can enormously increase the intensity of the air, hence the blacksmith uses the blowpipe for this purpose. You blow the fire with your breathesometimes in the morning when you are building a fire,-- but it is not the breath that

stimulates the fire,-- it is oxygen (?) which is drawn in along with the breath-- the carbonic acid gas is more than compensated for.... so we live as we breathe.

In breathing notice how the abdomen rises and falls, in either a child or a man. What does that rise and fall of the abdomen mean? Simply the movement of the diaphram up and down,-- but this is diaphramatic. The chest, in this manner is increased in vertical diameter, but in no other way, in this diminished respiration in sleep, but when a person exercises vigorously, the whole chest is expanded, particularly the upper part of the chest and side. You see a person who has been exercising vigorously,-- the whole chest is lifted up.

For development of the chest, it is necessary that one shall take sufficient exercise to create a thirst for air. The popular idea that exercise of the muscles of the arms will develop the chest is a mistake; the exercise of the arm muscles will not develop the chest much. The best means of doing this is by exercises by which the legs are brought into play, because, by the use of the legs in running, there is created a great demand for air, and the chest is developed from within, and not from without. The swelling out of the lungs,-- the compelling of the lungs to expand--raises out the ribs and chest, and expands it. We are now speaking of the permanent effect; of course the only way we can expand the lungs is by the expansion of the chest.

The effect of exercise upon the blood: Experiments made by Thermes(?) some time ago, and confirmed by Winternitz, shows that exercise increases the blood count; that if you count the number of blood corpuscles in the blood before and after exercise you find that there is a larger blood count after, than before exercise,-- why? Simply because the increased movement of blood and the opening up of all the vessels of the skin has brought out from the liver, the spleen, and other parts

of the body where the blood cells have become concentrated and accumulated-- it has brought out these blood corpuscles from the nooks and corners of the body in which they have been hiding, and has gotten them into the circulation. The blood count may be increased by exercise from ten to fifteen per cent. I would like to have you make some experiments on this subject, and repott; see what you find in reference to the influence of exercise upon the blood count. You must take a person that is pale,-- take him in the morning before he has had any execise, and get his blood count; then let him exercise vigorously, and take the blood count again. You should do this, either all before breakfast, or all after breakfast,-- that would be the best time.

Of course the influence fof exercise upon respiration has something to do with the blood: the sedentary man has less CO_2 circulating in his blood for the time being, than the man taking exercise, but the man who takes vigorous exercise will have more highly oxygenated blood than the manwho is sedentary, because of the increased activity of the lungs which continues after the production of CO_2 has ceased-- there is an inceased absorption of oxygen, so that we have the blood more highly vitalized, and more highly oxygenated.

The influence of exercise upon the stomach has been carefully studied, and proved to be very interesting. It has been found that exercise has the effect to inceased the amount of hydrochloric acid produced; the effect of exercise upon the motility of the stomach is not so great as would be naturally expected but there is an increased amount of hydrochloric acid produced by exercise, unless the exercise is carried to the extent of exhaustion....Moderate exercise increased the production of hydrochloric acid.

Now, with reference to the influence of exercise upon the brain:

(Diagram) Suppose this represents the brain, the medulla, and the spinal cord, and so on. The front part of the brain is devoted to intellectual functions, and the back part of the brain is devoted to the reception of sensory impressions, and the registration and storing up in the occipital lobes. The anterior convolutions are devoted to the intellectual functions; but here is an intermediate area extending around the front and top of the brain devoted to certain portions called the motor areas. It is found that this portion of the brain is connected with every part of the body,-- that every group of muscles in the body has its representation in this portion of the brain,-- for example, we will say the lateral portion of the brainhis charge of the organs of speech, while other portions have chatge of the legs, etc; so we have all the different groups of muscles represented in this area. This curious fact was observed many years ago,-- as long as twenty-five years ago I found the observation in a work by Dr. Lyes(?) on the Brain and Nerves-- the fact was observed that when a man had lost his leg on one side, there was a vacuity on the other side of the brain that when a young boy had been injured in the leg, he had a deficiency on the opposite side of the brain,- there was a vacuity there, but the significance of this fact was not fully understood at that time. There was a suggestion made that that part of the brain might be somehow disconnected with the other part of the body that had been injured. One boy had lost his right leg, and on his left brain there was a portion of the brain not developed. Later on it was found by experiments upon monkeys, and later still, by experiments made upon men, it was discovered by Horseley and Farrier, who went into France, where there was no testiction on vivisection and they removed part of the skulls of large numbers of monkeys-- have you made a study of the motor areas? (No.) They found that by stimulating different portions

of the brain by electricity they could cause contraction of the muscles- and they found themselves able to produce contraction of different groups of muscles; that they could cause the monkey to make up faces by causing a contraction of the muscles of his face; that they could cause them to contract a leg or an arm, and for some little time. That by experiments upon men in cases where it was necessary to remove a portion of the skull, it was found that the same thing was true of men as of monkeys, also that in some cases in which it was necessary to operate upon tumors of the brain for paralysis, it was found that the tumor in the brain had given rise paralysis of the leg, or to spasms in the leg. It was also found that in cases of Jacksonian epilepsy, a form of epilepsy in which the spasm begins in the extemities of the body,-- as the foot or the hand-- first the hand will feel numb, and pretty soon the hand shuts up, and then it shakes, and shortly afterwards the spasm extends through the entire body; or it might be a fit, in which the same thing would be true. It was found that by making an opening in the skull over the area corresponding with the pain in the arm or foot, or wherever the indication might be, on removing it, it was found in performing an operation upon that part of the body that there would be a small tumor or inflammation in the opposite side of the brain. A number of years ago a clergyman brought his son here to be operated on for Jacksonian epilepsy. The epilepsy occurred in the right foot,-- first the right foot would begin to shake and feel numb, and the shaking would continue until the boy became unconscious and had a terrible fit. I performed an operation upon this young man, making an opening in the skull and removing about an inch and a quarter of it, and right in the center of the place which it had occupied I found a tumor about the size of the thumb projecting right up in the center of the opening. This shows how exactly

we can localize these motor areas. I made exact measurements upon the skull and localized the tumor and took it away, and the fits disappeared and the young man was relieved. Some of you saw this operation. I performed an operation of this kind in the Hospital last year; Dr. Mc Gugan of Kalamazoo was present at that time. That young woman made an excellent recovery, and the fits were cured. It was quite a serious operation, because of the fact that the longitudinal sinus was spread out more than usual, and to an extreme degree, so that in making the incision the longitudinal sinus was wounded and we could not stop it,-- fortunately the pressure was not much and it was controlled by paralysis. This was on the right side. The left leg was completely paralized several days, and so, in the treatment, it got badly burned, because the patient could not feel the hot bag and it had been lying against her side for half an hour; the other side was not burned, because of the slowed circulation and the deficient vitality of the leg. The young lady recovered, not only from the operation but the spasm as well.

Now in a muscular movement of any sort, one is exercising both those the muscles, and those of the motor areas of the brain. The action of the arm, for example, is tremendous compared with that which orignates in the motor area of the brain. It has been suggested that his movement is like an avalanche; that the movement originated by the nerve centers has but lit'leforce when started, but increases like the avalanche,-- the avalanche is made of snow and ice, and is so delicately poised that a pistol shot may be sufficient to start it. Landslides are often occasioned by a simple blast of a horn or a thunder peal,-- something which disturbs their equilibrium; so it is with these motor areas,- they are the servants of the will. The will wants to move an arm it sends word to the arm center and an impulse is sent down from the brain into the

arm and tht sets it going. This is a kind of key-board upon which the mind plays, and thus brings the five hindred muscles into action. See how delicate this key-board must be,-- you can move the smallest part of the finger by this means, and this is true of the large as well as the small areas. In small areas, even minute subdivisions of large areas-- every little group of muscles has something to do. Perhaps a sufficient amount of training might make it possible to exercise even the smallest section of a muscle. Exercise, then, is the training of the brain, and the brain that is not trained by exercise fades away and becomes degenerated. The largest brain that has even been measured is the brain of a London brick-layer; he was a hard working man, but his brain was larger than that of Cuvier,--and his brain was supposed to have been the largest brain ever recorded-- but the London brick-layer had a brain which weighed several ounces more than that of Cuvier.

There is another advantage to be derived from exercise of the muscles,-- it has a tendency to develop the will;-- the tendency of exercise is to make the body the servant of the will. The country boy walks into a hotel parlor which contains a number of people, for the first time,-- he don't know what to do with his hands and feet-- they have not been trained to fine work they have been accustomed to coarse work. This boy could handle a spade, or a hoe, but he does not know what to do with his hands, unless he has got something in them. Good walkers are very scarce. People who walk gracefully are not women usually; they cannot walk gracefully because their limbs are trammeled by their clothing. The majority of women are much afraid to walk in an assembly of people, in a hotel parlor, or wherever there is a number of people standing about. There are few ladies who can walk well-- and they know it-- I am not speaking of our ladies, because they do not belong to the average class

of women. When a horse runs away with a carriage and its occupants, and dashes down the street, who has the courage to catch him? Who is ready to do it? It is not the sedentary business man who has been sitting over his books until he is stiff and rheumatic and pale and hollow eyed,-- it is some boy from the country, or some laboring man, or some one who is accustomed to very severe and active exercise who rushes out and catches the run-away horse, but it is not the sedentary man, the scholar or the student, unless he is raised on a farm-- he would not undertake to do such a dangerous thing-- he would not think of making such a great exertion as that. So that the exercise of the muscles develops courage as well as will.

Exercise.

TALKS TO MEDICAL STUDENTS. (SOPHOMORES) Oct. 17, 1901.

J. H. KELLOGG, M. D.

Exercise and Deformities.

There are three classes of deformities that have a definite relation to exercise. One class is that of athletes,-- people who devote themselves to physical culture. There is the athletic stoop,-- some athletes seem to be flat chested and round shouldered; they generally sit down in this way (illistrating). You will see a great majority of athletic men who seem to be round shouldered and flat chested; but these men are not so flat chested as they look to be-- they have large chests, although their chests look flat; it is not because they are flat chested that they have this appearance, - it is because their shoulders are overdeveloped and allowed to droop forward; they are muscle-bound. It is not uncommon to see artisans,-- men with great shoulder muscles and gigantic arm muscles, carrying their arms in this way (illustrating). You will generally see the blacksmith walking along in this way-- you can generally tell a man's trade or occupation by the way he walks. If a man walks in this manner, you may be sure that he uses his arms while working at his trade. You will see an oarsman walking after this fashion. They have been in training a great deal, and have acquired this movement; the flexor muscles become overdeveloped. This is true of the muscles of the face,-- the muscles of the face get too stong for the other muscles by exercise. You see a person who exercises the muscles of the face by pulling down the corners of his mouth because he feels melancholy-- these muscles get too stong for the other muscles. You see a person with a scornful feeling,-- he gets in the habit of contracting the levator labii superioris alae-que nasi-- the muscle that lifts the upper lip and the wings or sides of the nose-- these muscles have become so trained

that the man's face looks like this (illustrating). The muscles that contract the upper lip and the wings or sides of the nose have been exercised so much that they become too short. So the flexors of the arm, by constant practice become overdeveloped and too short for the extensor muscle so that they do not evenly antagonize them, and the armsmight be called wrinkled, because they are drawn into a half flexed position habitually. It is the same way with the oarsman,-- the muscles of the arm do not antagonize each other symetrically, because one set of muscles is stronger than the other set so the body is held out of shape most of the time.

Athletic exercise has, more or less, the effect to deform men. Fencers are deformed for the same reason; in holding the foil in one hand while the other hand is active, the result is to develop the other side of the body and these athletes are subject to scoliosis, for the reason that one set of muscles are over-developed. It is noticable that men who have given great attention to heavy gymnastics generally have the upper part of the body well developed, while the legs and hips are rather sparingly developed. You see a gymnast who is famous, and you will see that he has tremendous arms, shoulders and chest, and small hips and legs. This man, as we might say, has retired his hips and legs and has accustomed himself to the locomotion of his hands; he has spent so much time in a gymnasium in the use of such exercises as have so developed his arms that the weight of the body has been carried by the arms more than by the legs, so his arms have become developed until he is really asymetrical. Nature knew what she was doing when she made the legs large, and the arms small in proportion,-- and there is no particular advantage in this disproportion.

A much more serious class of deformities is that which comes

from their occupations, as of the blacksmith, etc. The blacksmith who is not using the left arm, while the right arm is devoted to striking heavy blows with the hammer, as the result, has curvature of the spine,-- one shoulder becomes higher than the other. Now, if the blacksmith is right-handed, which shoulder will be the higher? ("The left shoulder.") Why? Because the muscles of the right side are disproportionately developed. The spine is a bow,-- with a right string and a left sting; if the right string is stronger than the left string, it will bring the right side of the bow below the left side. This is a deformity which we find particularly in blacksmiths-- we find the left shoulder higher than the right. You will find most all people have some little deformity of this kind, but which does not come from swringing heavy hammers, etc. but rather from sedentary habits; the majority of working people have the right shoulder lower than the left,-- tailors, for instance have the right shoulder lower than the left, because the right-hand is used more than the left, so it is stonger. On the other hand, the left leg is stonger than the right leg, because it antagonizes the right arm. This is one ofthe interesting features brought out by our study here, with the strength charts,-- and I think this chart was not known before our strength charts were known; but these things are becoming current items of the general fund of knowledge at the present time,-- for instance, I found a little article in a newspaper in reference to the curious fact that the left leg is stronger than the right leg-- and this is true, so that while we are right handed, we are left-legged. It is true of both sexes,-- that the left leg is stronger than the light leg-- but we will study the muscular system as a whole, later on. The deformities that come from inaction, or deficiency of work, are more serious in character than those which come from too much work. We find people who are round shouldered, or "chicken-breasted"- narrow chested, as the result of

wrong positions in sitting. Now, if one sits in this way (illustrating) his chest is behind instead of being in front. I never shall forget a young woman who came into the office for examination of her lungs, and sat down like this (position) and I said to her, "Why does your mother have any trouble about your lungs?" She said, "She is afraid I am going to have consumption." "Why?" I asked. "Because" said she, "she says I have no chest and she thinks I am getting consumption and am likely to die of it because I have no chest." Well apparently that was so. I had her stand up in this way (illustrating) "Now ", I said, "let us see if you have no chest,-- look up at the ceiling-- now bend over back and keep looking at the ceiling." She did so. "Now straighten up." She straightened up,-- and she had a splendid chest-- only she had been in the habit of carrying her chest behind instead of in front. The chest belongs in front; we should not go round dragging our chests behind us, but should carry the chest forward where it belongs. The chest is the breast work ofthe body; the chest is the seat of power; it is where the lungs and heart are located. This part of the body then belongs in front in man,-- and also in every animal. When a horse raises his head he presents his chest; when a cat stands up in an attitude of defence she draws her head back; and every animal does this, perhaps, except the bull, who lowers his head when he meets an antagonist, because his strong forehead and horns are his strongest point of attack. But the horse holds up his head , and almost every other animal does that; so man also should hold his head erect and present the chest, for health,-- and it makes a wonderful difference in one's personal appearance-- but we will consider that subject further on.

But we have not time to dwell upon this whole subject of deformities at present, we will speak of it further when we come to study the subject of disease,-- however I may pursue the subject a little further at present: we have three kinds of curvatures,-- and we may say, we have two

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kinds of curvatures of the spine, which come from muscular deficiency, from muscular weakness and lack of symmetry in muscular contraction, and these are posterior curvatures and lateral curvatures. We have still a third kind of curvature called rotation of the spine, but the rotation is probably the result of lateral curvature, so that we could not consider that as a distinct variety.

The spine has natural curves. we will make a rough outline of the body (diagram). We will start at the neck,- here is a little posterior curvature, then a hollowing of the back, and then another curvature below. Then in front we have this outline, forming pretty nearly a proper outline of the body. Here are two curves,-- a posterior curve at the top, and a posterior curve at the bottom, and a concavity in the middle, and also a convavity at the top where the neck joins the head. In front, we have just the opposite natural curves,-- the general outline of the back is concave , with a slight convexity at the top, which becomes exaggerated when the muscles of the back are relaxed. This curvature of the spine is maintained by muscles running along each side of the spine (the spinal muscles). There are a number of groups of muscles, but we haven't time to point them out now. These muscles are really like the two strings of a bow as I have said.

Now you can see what would be the natural consequence of the relaxation of a string of this bow,-- suppose we relax the skin-- the bow straigtens out. This is exactly what happens to the spine when the muscles of the back are relaxed-- The bow, or spine, straightens out. When the muscles of the back are made taut by contraction the curvature is strengthened in front,-- relax the tention and the bow comes down; the muscles may be relaxed, and the chest flattened to such a degree that the bow becomes straight. Now is there anything that will cause a tendency in the opposite direction? Suppose the bow is perfectly straight-- is there anything that will cause

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the bow to curve in the opposite direction? (Referring to digram.) Here is the spinal column. The vertebra are divided into sections here. We have muscles behind and what have we in front? ("Muscles.") Yes; here is the pelvic bone and the sternum-- this is attached-- the muscles are also attached all the way; this is a meshwork of muscles connecting the upper part with the lower part; so we have a bow here with a string on each side,-- now supp ose the bow is perfectly straight and the bow string would be s the same length as the bow-- suppose both these strings contract-- we have a flexible and a string on each side and both sides contract-- what would be the consequence? It would produce just this thing-- it would curve the bow. That is the reason the spinal column has these curvatures. Now if the bow string on this side should relax entirely, and the bow-string on the other contracted, what would be the consequence? It would be confex in front and concave behind-- that is exactly what we do when we drop the muscles of the back-- if we should flex the bow-string on that side and make it stronger than the bow-string on the other side, it would diminish the posterior curve and increase the anterior curve-- that is exactly what happens when you contract the muscles of the back-- you stretch the string on one side of the bow, andmake it a little more taut than that on the other side and you increase the convexity on the opposite side. Now suppose we release this string (behind(?) and shorten the string in front-- the tendency would be to increase this posterior convexity, and so produce a curvature of the spine backward.

This makes it look simple; and it is important that the subject of these curvatures should be simple, because the books in which we read about them make the subject seem very complicated; I have never seen the subject treated in just this way, but this manner of looking at it has been a help to me, so I imagine it may be a help to you also.

There may be three degrees, we will say of spinal posterior curvatures, one particular kind of curvatures being entirely disregarded, one which is due to organic disease, and that is what is known as Pott's disease, due to tubercles, a softening of the vertebrae, and a sharp posterior curvature. This form of curvature is very uncommon in young persons; it sometimes occurs among them, and sometimes in older persons; I have recently met such cases. That is the only form of curvature that you will find treated out in any work. I don't know of any text-book which treats on surgery that treats on any kind of curvature except this and similar curvatures.

I have endeavored to pint out and to describe three degrees or forms of posterior curvature due to weak muscles, bad positions, posterior curves, etc. The first is the result of constriction-- the normal posterior curvature of the upper part of the spine is exaggerated,-- we see that in persons sitting with their chins forward,--and that is the common position of persons who have this curvature-- the hips are forward, and the chin is forward-- and this must be so naturally, because the person who is in the habit of standing with the hips forward naturally throws his chin for-ward. The City fathers who wish to look portly, habitually assume this position-(illustrating). You will see their coat tails standing straight down behind; but these men are not so portly as they look-- there is lots of room-- behind; there are not such "solid men" as they appear to be-- there are rooms to let.

There are people who are extremely fleshy, and who ~~still~~ stand straight and are still portly, but that is not the sort of people we are talking about, but the people who carry their hips forward,- and this must be so as I have said, for when the hips go forward the shin must go forward also to balance the hips and preserve the center of gravity.

There is another feature of posterior curvature in which the hollow, or the concavity of the spine seems to be straightened-- you see a per-

son with a perfectly straight back; that is the sort of back that you generally see in athletes. Nearly all strong men have straight backs. One Professor of Anthropometry in physical culture, with whom I was talking some time ago, was laboring under the impression that a straight back was the right kind of back, because he said "Notice Mr. ... the athlete,-- he has a straight back and athletes generally have straight backs." I don't know why athletes nearly all have straight backs, but I do know that men in the forest have curved backs. The men who have all round training do not have straight backs; but the old cart horses have straight backs, while the fine carriage horse, or the all-round well developed horse does not have a straight back,-- he has a gracefully curved back-- the back is a line of beuty-- and the same thing is true of man. The symmetrical man has a good strong curve in the spine.

There is a third form in which the whole back has a posterior curvature. The first variety of posterior curvature is an exaggeration of the normal convexity of the upper part, or dorsal portion. There are three parts of the spine,-- the throracic region is the cervical-- what are the different parts of the spine. ("Cervical, dorsal and lumbar.") The first deformity of curvature is an exaggeration of the normal dorsal curvature,-- there is a normal convexity of the dorsal portion of the spine, and this is an exaggeration of it, which comes from a projection of the head forward, and the carrying of the hips forward. The second form is diminution or obliteration of the normal lumbar concavity-- a straightening of the normal lumbar concavity. Nowthis comes from carrying the head forward and at the same time carrying the hips forward. If you put the hips back and the head forward the lumbar curve will be restored, but if you put your head and hips forward you straighten out the lumbar curve; so a person who carried his head forward and looks down, hanging his head, going about with a hang dog look,

straightens the lumbar concavity. Now the third deformity is simply and exaggeration of the one just described--- the hips and the whole head are carried forward, naturally straightening the spine.

The last form of curvature, and which is the most frequently met with among business men of rather slight physique and many invalid women as well as business men who are accustomed to sitting in a rocking-chair. If you will straighten out in a rocking-chair, and notice the result, it will be like this. (Position). The back and trunk of the body strike the back of the chair. It is easy to diagnose such cases by the presence of two or three brown spots down the center of the spine, and you can feel of the skin oft hese brwon spots and find that it is thickened-- they are practically corns on the back-- I call them corns, so as to make the impression as strong as possible. We had a girl here some time ago who would not straighten up until I told her wshe had four corns on her back-- and then she straightened up and she has kept straight ever since. It is not uncommon when you examine such patients, to find the whole back in just this shape. In the lower part of the back you can see the prominences which are evidences that the vertebrae have been shrinking and the spinous processes have been pushed in, so that the muscles have slipped away and separated from them so that the muscles hide the spine. We will have a subject here to-morrow to illustrate that.

In these patients, the spine is pushed back so far that the muscles slip down so that the spinous processes stick up between the joints of the vertebrae so that they are easily visible and these spinous processes rub against the skin and the skin rubs against the back of the chair and thus becomes calloused.

I will recapitulate the three forms of spinal curvature.-- the first form is that in which the hips are carried forward and the ~~shin~~ head falls

down; the second, in which the head is carried forward; the third in which the hips and head are both carried forward. These conditions naturally result in different forms of curvature.

Now we have a lateral curvature-- but we will take that up at another time.

Q. Do you mean a lateral curvature of this kind? (Referring to diagram).

A. This is a painful position, but we see a great many people trying to get nowadays. I am glad you called attention to this, because it is important to get it right. When the hips are in this position-- this is the fashionable way-- the chest carried forward, and the hips lifted up-- it makes an unnatural strain upon the muscles of the back. I have met a number ofpeople who have had a constant strain because of this position; the curve should be like this (diagram). This is the natural curve of the back. Now the persons whom I have described have not this kind of curve at all-- they have this sort of curve. (Diagram). They have this exaggerated lumbar curve; the natural outline of the body is more like this(bow-shaped) . This is the fashionable crook, and this is the normal crook. This curve has an equal distribution of muscular action; it has an equal distribution of balance. The proper thing is to carry the chest forward and make the muscles equalize the weight; that is different from sticking the hips up. You want to feel that the body is suspended from the chest; put your chest dforward and make the rest of the body hang on that, not making the hips the center; make the chest the center , and let the rest of the body take care of itself.

Q. It is said that the Indians mothers always strap their papooses on a board to make their backs straight,-- is this so?

A. It is not for that purpose that the Indian babies are fastened to a board,-- it is simply to make it handy for the mother to take care of

them and carry them; by this means she can hang them up or carry them along,- it is very handy; the civilized mother has to have a cradle, but the Indian mother has the baby fastened to a boarrd, the child bring nicely done up in its little nest with its hands down by its side so that it cannot get into any kind of mischief,-- and they soon become accustomed to it. The baby's back is straight anyhow; the average baby has a straight back, and the curves do not begin to appear until after the muscles have become sufficiently strong and well developed to enable the child to stand up; when the child gets to standing up then these muscles have to contract in order to support the body, and then the curves begin to develop. The Indian has a strong form but he don't have a straight back ,-- he has a decided curvein his back; he stands ercet, it is true, but if you notice his curves you will see that they are very decided. Some of you have lived among the Indians, and you know that to be true do uou not? ("Yes, sir.") Next time I will bring in some pictures which will demonstrate that.

Exercise

TALKS TO MEDICAL STUDENTS. (SOPHOMORES). Oct. 24, 1901.

DEFORMITIES.

J. H. Kellogg, M. D.

---X---

We were talking, the last time, about external and internal deformities, and we will continue the subject for a little while. (Referring to chart). This is intended to show the natural figure. It is astonishing how erronenous and wide-spread are the errors respecting the natural form. You can find very few civilized men and women,-- especially very few civilized women who are not more less deformed. The special characteristic of civilized woman,-- that is of the grown woman or adult woman-- is-- a small waist. Some time ago I happened to be in Washington, and there was quite a little interest in Medical Societies then, in this subject, and I measured a large number of little girls at school -- I got the dancing-master interested ,and I measured the girls who attended his school; they were all well developed, and wore free dresses, for they were in training. They averaged from ten to twelve years of age, and their average waist measurement was 24 inches, nearly, some of them measuring 26 or 27 inches around the waist. Dr. White of the Wellesley College, has gathered statistics of the measurements of the alummae of Wellesley for some years, and he has found that the average waist-measurement of 11,000 women visiting Wellesley College to be 24 inches, about the same as the average of these little girls to wom I have just referred. The Wellesley girls had grown every other way except their waists, but there, they had not grown at all.

Now, what is true of the Wellesley girls is true of civilized women everywhere. You can hardly find a woman who can expand her waist,--and I dare say the same thing is true of our Sanitarium women. I called together a little class some time ago, which consisted of the chief pillars of the

Health Reform here, and I scarcely found one of them but what was wearing a tight dress, or wore belts which prevented the expansion of the waist; and I found there was scarcely any of them that could take a deep breath and expand the chest properly; their waists were nearly all constricted. When their belts were loosened they could breathe better than before, thus showing that their waists were constricted.

A woman usually thinks that when she is making her dress the same size as the body, she is doing a very noble and praiseworthy thing,--that she is doing a sort of work of supererogation, almost, if she has her waist made so that it is a "skin fit," as it is called; that is, she makes her dress as large as she is ,herself.. She never stops to think of the increased size that must necessarily result from the eating of her breakfast; she puts her dress on before breakfast, and does not think about the breakfast when she is measured for the dress,--she does not leave any room for breakfast or dinner, and she does not think of the necessity for any extra breath which is necessary in going up or down stairs or in lifting something, or the taking of a deep breath in shouting. There is an entire overlooking of the fact that the waist must be allowed room for expansion; because the waist is the most variable and flexible part of the body,--that is, as to size. The size of the head is fixed by the skull. The size of the upper part of the chest is, to a very considerable degree, restricted by the ribs. The size of the pelvis is also restricted by a sort of bony cage; but in the central portion of the trunk there is great opportunity for mobility of the organs. The upper part of the chest is not intended for mobility, because it is confined by seven ribs and the sternum, which enclose the chast-cavity,--the three lower ribs being attached by cartilages--seven variable, and three "floating ribs. So where would be the freest movement? ("In the lower part of the chest.") That comes in the center of the trunk,--and here we have the attachments for the purpose of expansion,--but we are not now studying this part, but the form of the body .

The popular idea prevails that women ought to have small waists; that because they are women,one of their characteristics should be small waists. They have smaller mouths, smaller noses, smaller hearts, and smaller feet than men ; but thay does not argue that it is necessary that they should have small waists. The hips are larger in proportion to the height, and the waist is larger and the shoulders smaller. But a careful study of the internal anatomy shows us that in comparing men and women of thesame size the same height, and the same weight, women have larger stomachs, larger livers, larger pancreas, large spleen, colon, and larger kidneys than men. This is a very interesting fact that has been determined by a number of anatomists,-- especially German anatomists who have made a very careful study of the subject,-- and in a little paper which I have prepared, I have given the authoraity, although I do not recall them now. These German anatomists assert tht the stomach, the liver, the kidneys, the colon, the pancreas and the spleen are all larger in women than in men,-- and there is a good reason why this is so. The organs of women sometimes do work for two,- during pregnancy, the nutrition of the child, the purification of its blood, separating (?) from the placenta, which communicates with the system of the mother-- so the mother's kidneys, stomach and other organs must do work for two, so it is necessary that these organs should be large. Now when we remember that these organs lie in the lower part of the chest, and in the central portion of the body-- they all lie above the lower border of the ribs (referring to chart) here are the lowermost ribs, and these organs, the stomach, liver, colon, pancreas, spleen and kidneys all lie above this point, (indicating) this is the point-- about the umbilicus-- this is about the point to which the lower part of the colon comes, and the body of the transverse colon runs above it; and the pancreas, spleen, kidneys and liver, all

lie above this point,-- this is what is called the waist. So these large, heavy, and important organs lie above the central cavity and above the waist line. So it is evident that the application of pressure at this point must be in the highest degree harmful; it is also evident that this portion of the trunk ought to be made large, and that if it is made small, it must be to the detriment of the body.

It is evident that these organs in women being larger than those of men, the waist of woman must be larger than that of man. A large waist in woman (unless it is due to an accumulation of fat) means large vital capacity. A large neck in man means the same thing. A long, slender, neck means a feeble constitution; you can see that the moment you look at a person,-- you know that such a person is feeble, and that their organs will be feeble, or not very strong. You never saw an athlete or a pugilist with that sort of neck,-- you never saw a pugilist with a long slim neck; the athlete always has a thick strong neck,-- and why? Because these are the important vital organs,-- the pugilist has a large trachea-- the strong man must have plenty of air, so he must hve a large trachea or chimney to furnish the requisite ingress and egress of air. And he must have a large spinal column, and vertabrae to support the strong, firm, large bones and muscles; and he must have large trunk muscles. He may have a small head, but he has got to have a big heart. It is a very curious fact that a woman has more liver, and less heart than men; she has a larger liver and spleen, and a bigger stomach in proportion to her size, but a smaller heart,-- and this is for the reason that she has a smaller fist-- and her fist is of the same size of the heart, and the reason the heart is small, is because it has to back up a small fist. A man has a large heart because he has a large fist, and the heart must back up the fist. The heart is a muscle and the engine that supplies the blood t the fist. And the heart of woman is smaller than that

of man as she is not accustomed to so much out-door exercise.

Now I want to show you some of the external deformities that we have been talking about, and which arise from neglect to develop the body properly; this is determined by outlines. A number of years ago , and before much was known on this subject-- I think it was fourteen or fifteen years ago-- I began to make an earnest study of this subject . At that time, we had not any thing like the literature that we now have on these questions, and did know much about them. The first question was, What is the correct standing poise? When I began the study of this subject I commenced studying figures but could find not correct standard, nearly all the Greek models being poses and not proper models for standing,-- the Venus de Milo is not in a good position for standing-- so I went to studying shapes. I have a little apparatus made for the purpose of making tracings of the body; it is a frame in which a person stands against a sheet of paper on the wall-- the person stands against the frame made with uprights in front and a long pencil supported by a sliding carrier that would work up and down and in any direction, so I was able to make out the outlines of the human body in profile by this means, and the side profile and the front profile-- and I made hundreds of them, and noted down the internal positions. i lovated the stomach liver, spleen, and other internal organs in connection with the profiles, and I wrote them sown on a sheet of paper. Then I would take these into the gymnasium when there was no one in it, and spread them out on the floor, and cover the space with them as big as this room, and I would walk back and fort forth upon them, studying them, and by degrees I began to see how to make connections between external deformities and internal conditions. These outlin charts are simply reproductions of some of those charts which I made long ago.

(Referring to chart) Here is the profile of a German mother of

about thirty years and brought up to hard work in Germany; she had been accustomed from the age of sixteen to twenty to carry heavy weights on her head,- ninety pounds of vegetables, four miles to market. A German farmer who supports his family from three or four acres of land can not afford a donkey or a horse to carry his produce to markmt, so he must send it on the head of his wife and daughters. Everything that a farmer can carry to market is free of duty, but if he carriks by a horse or donkey he must pay duty; this is the case not only in the city or town but in the country, the supposition of the government being that the man is so poor that he cannot afford to keep an animal, so he must not pay duty when he carries his produce to market by the aid of family. So you will not unfrequently see a woman trudging along to market with a load of a hundred and fifty pounds on her head . You will notice, if you have ever tried it that when you are carrying weights on your head you must walk very straight; if you don't you will soon become so weary and tired that you will waver, and your weight will fall off,-- you know if you havr got to carry anything on your head you must stand perfectly straight in order to balance it. It is common in Egypt so see people carrying everything they have to carry on their heads; and the same habit prevails all through Africa and south America. I was rather amused a couple of years ago when I was in Egypt strolling along the Nile on the road toward the pyramids-- I was amused to see a woman going along and carrying something in each hand-- she had been to market and was carrying something in each hand, and I noticed tht she had something on her head, and when she got close to me, I found that she was carrying her slippers in her head she had worn them in town, but as soon as she got out of town she shook off those trammels of fashion. In Egypt it is common to see little girls, perhaps four or five years old, at play, with a tin pan on their heads and a little boy three or four years old with a chip on his head, and so they were

playing together and takinggreat pains not to let these articles fall off; they were trained from early childhood to carry things on their heads,-- they were so young that they didn't know when they learned to carry things in this way, and the consequence was that they grew up erect, like this (chart).

These are the outlines of people who have a good, all-round training. I have studied the Indians of the West and of Arizona and the Yuma Indians and of the Indian Territories and the Indian reservations,-- Indians in their most primitive state. I went West at one time for the purpose of studying Indians,-- I had received a letter from one of the Indian commissioners in the interior, introducing me to all the "good Indians", and to the Indian agents and all others interested in the red man, and thus armed I went among the wildest Indians-- primitive Indians-- and I had some very interesting experiences among them, which I will tell you some time.

These figures (chart) represent a type of what I found among them everywhere,-- the Indian woman carries her papoose on her back, and that habit of carrying a weight upon her shoulders would naturally develop this sort of figure (chart).

Q.-- They stoop a little don't they?

A.-- Yes, but the stopp is at the hips, because the weight pulls the shoulders back, and lifts the chest forward; and you often see them with a very heavy weight upon their shoulders, and not withstanding this carrying of heavy weights, you see they have a good string curve in the back- you always find an Indian with a good strong curve in his back-- is not that so? (Yes) And that is what you find here (chart). When I first published charts, showing these outlines, Prof. Sevey, said it was a mistake-- that strong men must hve straight backs, and he took exception to my outlines. I will show you some little pictures of natural figures hereafter.

Q. Do you think if you have the weight suspended from the shoul-

ders, it would have a tendency to make the back curve so much as if it were suspended from the forehead,- don't the Indians have their loads strapped to the forehead?

A.-- Yes,- the muscles of the back of the neck would produce a tendency in the same direction and develop these muscles; whatever develps the muscles of the back and trunk will produce this figure, (Chart).

MR. CASE.-- When I was visiting the Smithsonian Institute, I saw there the figures of savages from the different tribes of North and South America, and each one of them had a strong curve in his back; they had twenty-five or thirty of these figures there.

DR. KELLOGG.-- Wherever you see a picture of a savage, you see they have a strong curve in the back,-- whether it is a Samoan, or a savage from the Congo, or a North American Indian-- wherever you see them, you will find that sort of picture; you would as soon expect to find a wild horse of the prairie with a perfectly straight back, as to find a wild man of the forest with a straight back.

Here are some figures I would like to call you attention to (charts) They are made from photographs. This is an outline of the Venus de Medici. This is the outline of an Abyssinian woman. This shows a large waist. This is theoutline of a woman who was an artist's model. In Paris, and in all other European cities, there are people who posr for artistx, and those people take good care of their figures. I asked this woman (referring to outline) if she ever wore a corset. "No indeed, I never do." "Why not", I asked. "Because my artist would not permit me todoit; he would not employ me if I wore corsets, so I have been strictly forbidden to wear them." This is because the wearing of corsets destroys the beauty of the figure. These models are paid as high as a dollar an hour for posing because they have a beautiful natural figure, and if the figure was spoiled, they would be useless to

the artist.

Now how ridiculous it is-- those people who are trained to pose in that way are compelled to stand, sometimes for several hours, (resting a few moments occasionally) so that the human figure may be represented in its most beautiful form-- they are never permitted to conform to the conventionalities of dress--they are not permitted to wear fashionable clothing, nor high heeled shoes nor tight clothes, but must wear simple, loose, easy garments, simply that their figures may present good pictures of undraped figures. There are many who do not pose for undraped figures but who pose for parts of figures,-- some pose for a face, others for an arm, the artist paying no attention to their clothes. others pose for the entire figure, and they are comeplled by their artists to take care of their figures. now it is strange that such care should be taken of the outside of the body to present a beautiful outline, while the body is cramped as fashion demands-- the waist is cramped after the latest fashion-plate and squeezed into the latest kind of degeneracy, and there is no regard for the needs of the body so long as it is covered up . It makes no difference what kind of shape it is, if it is only under cover. No artist could be found who would make a picture of an undraped figure that had a shape like this (chart) shown by these dotted lines, or who had a shape like this, or like this, (outlines). This was the shape of this youngwoman (chart) when she was in the habit of wearing corsets. This was her shape without a corset (chart). The effect of the corset was to make the waist as nearly round as possible,-- the corset is intended to make the waist as round as is a block of wood turned out with a turning lathe; bu the waist is not round; it is elliptical, with a slight concavity in the a back. Look at these figures (chart). Here is a figure which is deformed, partly as the result of corset wearing, and partially as the result of wrong physical development,-- the chest is flat,

and the shoulders round. Here is the same figure straightened up by ex - ercise,- Swedish gymnastics or some other form of exercise. This shows the relation of waist constriction to respiration.--But we will perhaps have an opportunity to speak of this at another time . This is a useful (?) figure (Chart.) Please notice this from an artistic standpoint. Here is a male figure, and here is a female figure; in man , it represents a single pyramid, and in woman it represents a double pyramid with the bases together . The man is widest at the shoulders, andthey steadily taper downward, while in women, the broadest point is at the hips, from which they taper each way. Now the anterior line (in women) is a convex line from the neck to the pubes, with a little dropping in at the waist. Now the corset breaks down this convex line here at the center,--see what a hideous outline it makes. These figures were drawn by an artist, and from the study of ancient Greek models,--this is an actual fact--this young woman had this figure; I had her put on a corset and she had this figure.

Here is the picture of a young woman (Chart) as she came to the Sanitarium some twelve years ago,--this was her position; she wore her cloths very tight to "keep her stomach down. The head nurse who was here, who was from St.Luke's Hospital, and who came here to see our methods, diet, etc.,-- Mrs. Baker was then head nurse in the surgical ward. After she had been here a short time, she said to Mrs. Baker, "I notice your nurses don't wear corsets." "Oh, no." was the answer, " We are not allowed to wear corsets here. "Dear me," said the other, "how do you manage to keep your stomachs down?" She seemed to fear that if not prevented, by some means, the stomach would rise and rise and rise, and that it must be kept down. There is a horror in women, and there should be in men, of a great accumulation of fat in this portion of the body (about the waist); it is an ungainly thing and a monstrosity; but women think to keep it down by applying a pressure here. This was

the idea of the ancient Saracens,--they used to put a brass band around their hips to keep them from getting too large at this point; so the women now put steel bands instead of brass ones around this region. So this young woman had been wearing skirt-bands to keep the stomach down, and to keep the fat down,--but it don't keep the fat down as they desire,--it simply crowds the fat a little lower down, and causes an accumulation below this region (the waist). So it is usual to find but little fat at the waist, and three or four inches of fat just below,--it is simply pressure-atrophy at the waist--you will frequently find a little depression beneath the ring or band. (Chart.) This is the very same woman two years afterwards--now compare these outlines: These outlines are lines of beauty, flowing, graceful lines; but this is a monstrosity. When this young woman was "dressed up," it is likely her figure looked fine, because of the various devices adopted by which to hide these deformities. But this young woman did not require any such devices, in order to have a graceful outline.

Here is another case : This is a young woman's picture. The whole spine is settled down, in consequence of the weakness of the muscles,--here is a lateral and a posterior curvature. This is the same young woman a year afterwards; she had been a dyspeptic. She is now strong, hearty and vigorous, and has become a healthy and useful woman. It is a good thing to have these models and different outlines in mind .

This is a modified form,--you see how easy it is to get the same sort of outline. Here is a man,--this was his ordinary standing-poise--I made him back up against the wall, and took his outline. Here is another man--the shoulders and heels touch the wall, but not his heels. (Chart.) This is the correct standard,--the heels and the hips touching the wall, and the shoulders forward. Next time, we will pursue the subject of respiration.

Exercise

TALKS TO MEDICAL STUDENTS,(SOPHOMORES) Oct. 25, 1901.

DEFORMITIES,-- CONTINUED.

J. H. Kellogg, M. D.

(Referring to chart) This chart shows one of the things that we were talking about yesterday-- the position of the internal viscera; this chart is made from Ziemssen,-- this diagram is an exact copy of Ziemssen's dia gram; Ziemssen is one of the greatest of German anatomists. Please observe that when the pointer touches the floating ribs,- this is the eleventh rib, and the twelfth is lower down; here you can readily see the colon and the abdominal viscera proper-- with the exception of the ascending and decending colon the abdominal organs are above this line-- the stomach, pancreas liver, spleen, kidneys-- all these organs in the normal figure-- the heavy viscera-- are all above a line con ected with the lowermost ribs-- the transverse colon, spleen, kidneys, pancreas-- all are at the top of the abdominal cavity-- the heavy organs are all at the top. It is like a room full of furniture, and heavy furniture,-- the desk, bureaus, sofas, etc. are all suspended from the ceiling,-- if they were hung up by cords, it would take very strong cords to hold them,-- it would take very strong cords to hold up the piano-- we will say the piano is the liver, and the stomach is the trunk-- or rather the whatnot I think would be the proper name for the stomach because a collection of almost everything goes into it. Suppose these things were suspended by elastic rope to the ceiling-- if that room were packed full underneath, there would be no strain upon the ropes, if the doors were kept shut,-- suppose we had this room full of sand and the furniture suspended to the ceiling - the sand would keep in place, but if you opened the door the sand would run out and there would be a strain upin the ropes. Now the abdominal walls hold everything in place, because the air is the packing--

the gas in the intestines is the packing which keeps everything full and in place, and is a constant balance to the pressure upon the abdominal walls,— when the gas is increased the tention is decreased. We had a case a few days ago of a lady with a large tumor. This was an old lady, and within a week after the operation she was almost as large as before; the abdomen was a enormously distended with gas and the pressure had to be kept up so as to take the place of the tumor, so that there should not be too great a strain brought on -- what? ("The stomach and liver"). How would there be any strain upon the liver when the patient was lying on her back? There is a very important reason. ("The intestines would become distended"). Yes,-- and how are the contents of the abdomen distended? It is the gas in the intestines. Now suppose the colon and the intestines slip out so as to occupy that space (?) it must be enormously stretched. That is the reason it is important that a "binder" should be applied for such a person, and also after pregnancy. The wild woman in the forest does not require any binder. There are some of our modern obstetricians, who are, we might say ultra naturalists, and they will not allow a woman to have a binder after after an obstetrical operation and after parturition, because they claim that nature furnishes the binder. But the civilized woman needs a binder for she has stretched her muscles to such a degree that they will not contract and follow up the abdominal walls and bring them up tense after parturition; this is where we get an enormous dilitation of the colon,- but we will take this subject up later.

Now notice the other side (chart). "Look at this picture and then on this--" where istthe stomach? ("It is all below that line.") Look upon this side and see where the stomach is-- it is enourmously prolapsed-- whereabouts is the liver? ("It is above.") I am calling your attention to each one of these little ponts, because I want you to go out and tell other peo-

ple about them; it is not because I think your stomachs and livers and kidneys are out of place, but I am anxious that you should get hold of every point, because I expect you will be chief apostles on these subjects one of these days,-- and these points are very important. ("Referring to chart) See where these kidneys are-- away down here-- and the colon and pancreas are behind the stomach and fallen out of place. Do you see any necessity for such a change of these organs? ("Constricted waist.") Can these organs go up when there is constriction at the waist. (No). HWhy? (Because there is not room for them.") No, the ribs form a bony cage-- the ribs and the sternum, and the higher up you go, the greater the resistance is, and down in this direction is the direction of theleast resistance,-- when there pressure brought to bear upon any body, where would it go? ("In the direction of the least resistance.") Yes, so when pressure comes upon these organs, gravitation aids the pressure, and down they go. This is not an imaginary condition,-- it is what I once actually found in a case-- and I have found this condition in hundreds of cases. In this little paper, "The Influence of Dress," you will find on page sixteen, begin at page fourteen and read pages fourteen to twenty, and you will find some facts that will be of interest to you. I have another paper which I have made you a present of,-- 'Illustrations of Natural Grace and Symmetry", and I wish you would read that through. Look at this one on the first page-- see what a beautiful figure; this a photograph of the "Venus de Milo". Notice the form of the waist, as compared with this waist, and this one (charts). This is from a photograph-- an outline made directly from a photograph of a Parisian dancing girl. See these wide hips, broad shoulders and splendid chest, and no "waist." When one looks at such a figure as this (fashion-plate), the wonder is where the stomach could be, and where the kidneys are. Where is there room for these organs? Just think of what a crime it is for a person, by main force and violence to force the organs of the body when normal, into an abnormal

shape. What an awful thing it seems when one thinks of the mothers among the Indians of the Northwest who take their babies and put a board in front of their heads and a board behind and tie the ends together, and compress the heads of the infants so they will be flat, for in this manner we have the tribe of Indians called "Flatheads". They are born with round heads, but their parents make their heads flat,-- have you ever seen such babies? ("Yes --a lady). I have seen infant babies where the pressure had been so great as to destroy the life of the infant. There are Indians on the Pacific coast who put bandages on the heads of their children and bring them into the form of cones, so they are very high in the region of the organ of self-esteem,-- and they do all look as though they were very conceited-- and I don't know but they may be, for they think their heads are very beautiful.

There seems to be, on the part of the human race this sort of disposition to deform itself; it is a kind of perversity that has gotten hold of certain portions of the race. A Chinese woman thinks she must make her feet very small,-- and they do make their feet so small that they are perfectly helpless; they bend the toes of their feet underneath until their is nothing but the great toe left, and then they walk on the ends of their great toes,-- the foot is all bound up and bandaged up; it makes the woman appear taller when the feetare very small. This is the same disposition that leads the American girl to wear as small a shoe as possible. I heard a girl say the other day, "I wish my feet were not so big." How absurd it is to want to make oneself into a different shape from what we are when we are normal,-- we wish to be little-- wish to be petite. I am not very large but I never wish to be anything different from what I am,-- I am a sort of drawf because I didn't have a change to grow. When I was about ten years old I got the idea of studying and undertook to strve my self from sleep, as that was the only chance I had for study; I was anxious to learn and I

couldn't rest and so I would get up and study about three o'clock in the morning, and I followed up that practice when I ought to have been asleep and growing. But that was the only chance that I had, and I feel satisfied with the manner in which I embraced it for it is better to have studied and be small than not to have studied and be larger, so I am content, as I am. But if a person spoils a splendid body by wilfully deforming it, what a terrible thing it is! When I see a man with a fine large, strong and splendid body, I think , "What a chance that man has to make a good use of his magnificent energy. When I see a person spoiling himself by smoking, I feel miserable and wish I could make an appeal to him to cease. When I see a woman with a waist constricted,- a woman who looks as though she might be bright and intelligent, and lovely, and yet with a little waist, and stomach and liver and other internal organs all compressed, and all laboring under the greatest disadvantage, it seems such a terrible crime that I feel as though I wanted to shout out to her about it.

Now that is what the whole world is doing, and it is our duty to protest against this abuse of the temple of God. Here are some Arabid girls in dancing costumes from the Midway Plaisance at the World's Fair in Chicago I have seen hundreds of such girls in Cairo and other Egyptian towns. You will see the peasant women there all have this sort of figure; they don't wear corsets or constricting garments of any sort. On the next page there is the picture of a young woman from central Africa, This is the figure of a young woman from the Nile,-- see what a strong waist she has. You can see that she has good broad shoulders, a well developed chest, and a strong waist. Here are a couple of little girls from Africa that I saw at the World's Fair. This plate is intended to show the loose garments of the African girls and which give opportunity for development of the form. The next is a Congo belle,-- the garments do not interfere with the development. Please notice the strong curve in the back. This is the style of dress-- or rather the un-

dress worn on the upper Congo, and the climate is so mild that it is not necessary to wear clothing, except for the purposes of modesty. These girls are modest, notwithstanding their scanty attire; they are just as proud and as anxious that their garmetns should be worn properly as are girls who wear more clothing. The next page presents the picture of the daughters of an African king-- the king of Matebele land; they are erect, strong figures.

This is the picture of a Samoan peasant girl, and you see it is a fine strong figure. The point of interest here is, that these are all people in a perfectly natural state; they are simply wild human animals who have grown up in the woods with all the freedom of squirrels and rabbits, so they have just as graceful figures as these wild animals have.

Here is the picture of an Egyptian girl in dancing dress,-- I took this photograph. This shows you the strength of the muscles of the trunk and the strong action of the muscles of the waist, and the large waists.

This represents Queen Louise coming down a stairway; notice her queenly bearing and her dignified appearance, with apparently no waist constriction; there is a good strong curve in the spine, and the body is held in a natural attitude. Queen Louise is a civilized woman, and this Congo belle is not, but you see they have bodies nearly the same shape and held in about the same pose,-- the poses are a little different, but the shape of the spine cannot be very different,-- they must be essentially the same.

Now it is very difficult to make ladies that a woman should not have a large waist. I showed these outlines, some years ago, at a medical meeting in Washington. There was a Professor from the Maryland Medical College, in Baltimore-- a Professor of Gynecology and Obstretrics. After I had finished reading my paper and exhibiting these outlines, this professor stated that he was very much surprised to learn that a woman should have a large waist; that he had been informed by his mother and sisters that it

was a mark of beauty in woman to have a small waist, and he was very much disgusted with the idea that a woman's waist should be large, and he sat down on me as heavily as possible. The next speaker was a lady doctor and she encouraged me and declared that a woman was just as much entitled to a large waist as was a man. After the meeting she insisted that I should show these pictures at the girls' High School where there were some 2,000 (?) girls, and I did so and gave them a talk.

(Referring to charts). Here are some charts that I told you of yesterday,-- here are some copies from ancient artists: this is the Appollo Belvidere-- see what a large waist-- this is a copy from Titian. Every time you see an undraped figure made by an artist, you will observe that it has a large waist and a convex anterior line. Imagine this figure made into the shape of this woman-- a sinking in of the waist, and a bulging at the lower abdomen, which takes all the beauty out of it. (Chart) This is also a bodern paintihg -- every time tyou find an undraped figure, ancient or modern, you will always see that a woman has a large waist.

(Charts) These are natural figurez; this is a German woman. Here are some figures that I showed you yesterday. This chart shows internal conditions-- here was a woman,-- the stomach ought to have been up here, and here is where it was (prolapsed). (Chart) This is a woman with a posterior curvature; here is where the stomach should have been, but it is prolapsed- the liver also is prolapsed. (Chart) Here is another woman-- there is where the stomach should have been, and here is where it was. Here is a case of a woman thst I thought had a fibroid tumor. One day I examined her and found the lump in one place, and the next day in another, and so on in different places and all around. On investigation one day I found — she hd a large waist; she had had malarial fever and a friend told her if she would wear a corset nights it would help her overgrown condition. So she

laced up as tight as she could at night, and the next night she took her fastenings up another notch, and the next night another notch, auntil, all at once she said she heard something pop, and the spleen slipped out of place, and has been out of place ever since. Here is where the stomach and liver was in that case. (Chart) The stomach and liver were away down, and the uterus was also out of place.

(Chart) This young woman had never worn a corset in her life,-- with the exception of the "health corset", and she had the same trouble-- here is where the stomach was, and here is where it should have been; there is just enough constriction to produce feeble development of the abdominal muscles, and displacement of theimportant viscera. (Chart) This shows a wrong position, crowding the viscera down, and changing the natural outline of this portion of the body.

Here are some outlines of boys and girls-- they are all girls, I think. Here is a boy of eight year s,-- this a side profile, and this is a front profile. Here is a girl of eight years,- notive their outlines-- the loutlines of the boy and girl are just the same you see. Here is a girl of fourteen, and here is one of sixteen. You can see these outlines show a convex line in front-- this is the important point-- the anterior line is a convex line. There is no reason for the depression at the waist,- there is normally no waist line there; you hear dressmakers talk about the "waist-line", but there is no waist line in the natural figure-- there is none until the dressmakers makes it; if there is a depression around here (waist) it is becadse the dressmakers has made it. (Chart) This woman has a"waist-line.

(Charts) Now we come back to the natural figures - there is no waist line here, and there is no reason why the older woman should have a waist-line any more than the young woman. This girl is sixteen years of

age; she is an Icelandic girl and has had a chance for natural development and she has no evidences of deformity. (Chart) This man looks as though he had a waist line; this was one of the first cases of this kind that I had, some thirteen years ago that taught me a lesson. He was a hypo, a nervous invalid and aperfect wreck,- he went around in this way (illustrating). For some time he did not get any better. He went away and for years he travelled to various places for treatment but without improvement, so he came back and though he got a little better. In the meantime I had been studying the matter of physique and outlines, and it occurred to me, the very first thing to make him straighten up, so I showed him how to straighten up, and I put him through some exercises and got his to straighten up and he saw the point; I explained the thing to him, and made an outline, and this was the outline before he straightened up. After I made him straighten up I showed him his outline, and he took hold of thematter enthusiastically and at the end of six weeks he was a different man-- he was reconstructed. . He went home after six or eight weeks, and I met him afterwards in Boston, and he was in perfect health, and he measured less through here than before. (Indicating) The thinkness through here was too great and he had lifted his viscera up, and he has remained in excellent health ever since.

(Charts). Look at these deformities,-- see this prolapsed stomach and colon-- it is a common thing to see a colon away down below its proper position. In one case, in performing an ovariotomy where there had been an enteroptosis, the colon was doubled over on itself, and the center of the transverse colon lay upon the rectum clear down inthe pelvis,-- doubled up like this (indicating); it was the result of incorrect standing--

Q. Why is it that pugilists always have a small taist.

A. Their waists are not so very small,-- they only appear so because they have such tremendously developed chest, shoulders and arms-- that makes the waist look small.

Q. Was not Sandow's waist less than thirty inches?

A. It is probably about twenty-nine. The muscles are drawn in very tense, makingthe abdomen look very small.

Now I want to show you a tumor which I removed day before yesterday, I want a pan to put it in. First here is a curvature of the spine that I want to show you; this is a specimen that I brought home from Chicago, it cost $75. The vertabrae are not diseased; you see they are all intact. This is the result entirely of irregular muscular action, and there is deficient muscular development, and the weight of the body has brought it down into this shape; the bones also are a little softer than they should be, butthe lack of strength is another reason why the spine has gotten into this shape,-- you see there is a rotation-- which way is the rotation? ("To the left"). To the left is front, and toward the right behind; here are the spinous processes pointing toward the rightand laterally, instead of pointing straight back-- it is rotating at a right angle; that is the natural consequence of a curve toward the left-- this lateral curvature is toward the left, and it naturally produced a rotation in that direction. Please observe the bulge of the ribs on this side and a flattening on the other side-- that is a common thing. When we examine a patient in regard to a curvature, we always want to notice where his shoulders are. Suppose the right shoulder was lower and the left shoulder higher-- what would that indicate? ("A lateral curvature to the left.") Why toward the left? ("It would rotate that way.") The curvature toward the left would have a tendency to lift the shoulder. I will put my pencil across the top (using articulated skeleton of chest) Now when I bend it over, what is the effect? ("The end on the convex side rises.") So the shoulder girdle will always sink toward the concave side, and rise on the convex side,-- and that must be the case.

Now we will examine this tumor (students examine tumor). This

grew out from the uterus-- it grew out from the left corner; this was the anterior surface; I knew that this tumor was attached and that there were adhesions-- I knew it was attached both before and behind the abdomen; I knew by the enlarged veins of the abdomen-- what I want you to see is these enormously enlarged veins which are spread out over it; these veins were as large as my little finger, and they had become very hard. What do you think this is? This is the omentum; this is on the second mesentery and it is attached all around here, and I had to ligate it off. Here is one ligature, and here is another. I began on one side and ligated the whole thing clear across, and then, in order to prevent a great hemorrhage I ligated every vein after detaching the two ends, and put a rubber tube around the pedicle and the natural contraction compressed it and shut off the hemorrhage. Now let us see what is inside here. (Percussing). It is just dense connective tissue,- it seems like a scar; you can take hold of it, for there is nothing infectious about it. The patient's temperature is 99°, and that is very low. I want some of you to be present at every operation so that you may have every possible clinical advantage.