FIRST LESSONS IN FOOD AND DIET

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IN

FOOD AND DIET

BY

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SECOND PRINTING

WHITCOMB & BARROWS
BOSTON
1907

Composition and Electrotyping by
Thomas Todd, 14 Beacon Street, Boston, Mass.

INTRODUCTION

FIRST LESSONS IN FOOD AND DIET

EACH living thing has its food, without which it dies. This food may vary within certain limits; beyond them disease sets in, even if life continues.

Every child who has kept chickens or rabbits knows how carefully and regularly they need to be fed. Every child who has grown house plants or cultivated a garden plot knows how necessary air, water, and soil are for their life and growth.

It is only needful to transfer this knowledge to ourselves to see that we, as living beings, need our food in the same way; and that air and water, as well as meat and milk, sugar and eggs, are our foods, without which we cannot live.

The baby's food is milk, which contains all the substances needed except oxygen of the air. This must be breathed in through the lungs. To milk is added for the child of two years starch in various forms, rice, potatoes, wheat bread, corn mush, etc. For the six years old there are added a few fruits and vegetables, eggs and a very little meat.

are destructive; they usually work on dead matter, reducing it to a condition to serve again as food for the green plants. At least they are found wherever decay is going on. A bit of apple, a leaf, a piece of cheese, left out in damp air "molds," as we say. These various molds are little plants doing their best to make the material ready for grass or apple tree food again.

Animals, man included, are made up of millions of small cells, which do their work in a like manner. They live upon the ready prepared substances which the blood stream carries to them and change this material to forms which the green plants can use again, giving off CO_2, water, ammonia, etc. These cells, like the molds and other destructive plants, can live on either vegetable or animal matter, that is, we can eat either lettuce, peas, corn, apples, or meat, and derive health and strength from them all, but, like the green plants, we must have water in abundance and air, only we take oxygen from the air and give back to it the carbon dioxide which the green plants need.

In the course of this transformation in the living cells, some of the energy which the sunlight gave to the plant that was eaten is released, and our bodies make use of this energy to keep warm, to work, think, and feel.

The source of bodily heat, of human energy and power to work, is in the chemical changes which the food, whether animal or vegetable, undergoes in the cells and tissues of the body.

ILLUSTRATIVE MATERIAL FOR THE FIRST LESSON

1. A growing plant or several of a kind; one allowed to go without water, another covered tightly by a bell jar or inverted bottle, and one cared for and watered most carefully.

2. An aquarium with gold fish, or a cage with a toad to be fed with flies, or some other animal to be cared for.

3. Bread or cheese, leaves or fruit, allowed to mold under another bell jar.

4. Oats or corn planted in the pores of a moist sponge placed in the top of a tumbler or jar two-thirds filled with water.

5. A magnifying glass or a microscope is helpful. If at hand, show the cells from the amœba of the mouth and blood corpuscles, also the miscellaneous organisms from stagnant water.

6. Yeasts and various fermenting solutions.

LESSON II

EVERYTHING is food for something else, each after its kind, and *matter*, carbon, oxygen, hydrogen, and nitrogen, for instance, is kept circulating like gold and silver, which is now made into amulets and images, now lining drinking cups, now buried in the earth, now stamped as coin and passing from hand to hand until melted and worked into rings again. It is gold or silver all the while.

The food of mankind is to be here considered, and we begin with the earliest and simplest, the food of the infant, milk.

This is chiefly composed of five great classes of food stuffs, classes we shall find in all natural food materials.

1. Water; eighty-seven per cent, more than three-fourths of the whole, and we shall find that our food must always contain a large amount of water, or if it does not, that we must drink liquids to make up the amount.

2. The curd of the milk; which contains not only casein but albumen and other proteids.[1] This class of substance is also found in all living things, whether animal or vegetable.

3. Fat; which we know best as cream or butter. This is also common to both vegetable and animal substances, as olive oil and fat of meat.

4. Sugar; dissolved in the water of the milk so that we do not recognize it at once. Except this sugar of milk, most sugars are derived from the juices of plants and their fruits, but so abundant and universal are these that all races of mankind have sugar in their diet.

5. Mineral salts; also dissolved in the water of milk, so that we do not think about them in that form. Salt, as we put it on our food, and the fertilizer we water plants with are instances of mineral food. The mineral salts are as needful for the life of the cell as the other classes. As has been proved by experiment, it is not difficult to learn the composition of milk and the amount of the various substances which the child requires.

The infant in the first weeks sleeps quietly

[1]Proteid and protein are terms used to designate those nitrogenous substances which in some way not yet clearly understood are essential to life or living matter.

most of the time and gains in weight rapidly, has doubled by the end of the third month, and trebled by the end of one year.

As activity increases, more of the food is devoted to energy — power to move arms and legs, and so great is this demand that in the second year the child adds only one-fifth to its weight, during the third year one-tenth, and from the age of four until eight or ten years old the child gains only about four pounds a year in weight, but very greatly in strength and control of muscles and nerves.

At first the infant takes about one-seventh its weight daily in food, twenty-four to thirty-two ounces of milk (at the end of the second week 500 grams, at the end of the eighth 800 grams, at the end of the twentieth 950 grams).

THE AVERAGE PERCENTAGE COMPOSITION OF 200 SAMPLES OF HUMAN MILK

Water.	Fat.	Nitrogenous substances.	Sugar.	Salts.
87.41	3.78	2.29	6.21	0.31
THE AVERAGE OF 800 ANALYSES OF COWS' MILK				
87.17	3.69	3.55	4.88	0.71

It will be seen that cows' milk is not an exact substitute for mothers' milk, and if diluted it is still less so, since the proportions are not the same. The potassium salts which seem so necessary to the building up of the blood corpuscles and body tissue are deficient as well as the fat. A favorite recommendation of physicians is to allow fresh, clean milk to stand, protected from dust, on ice or in a cold place for four or five hours, and then pour off the upper third, ten ounces, from a quart (if more fat is desired, then only six ounces), add twenty ounces of sterilized whey, which contains the sugar and mineral salts of the whole milk with some albumen. To give the potassium salts, barley broth is frequently used after the first weeks. A well-strained, transparent barley broth contains not over one per cent of starch. At the age of a few months veal broth, which contains lime salts, is frequently given, and if the milk is poor must be used if the material for the bones is to be furnished. If milk whey is not used, then milk sugar dissolved in water is added, for the child needs more heat-giving food than the adult, since his bodily surface, from which heat is being lost, is three times as much in proportion to his weight, and he is more active and uses relatively more energy.

All food for infants must be carefully protected from the destructive plants before referred to. These plants are in the air everywhere; are more plentiful in warm, dusty places, and as milk is a most attractive food for them, it must be kept cold and covered.

For extended treatment of infants' feeding, see such books as Holt's, Griffith's and others.

ILLUSTRATIVE MATERIAL FOR THE SECOND LESSON

Milk, whole, diluted, top milk; calculations of food values of a pint of the various sorts. The principles of these calculations should be thoroughly learned at this point to serve as a foundation for future work.

Tests by means of simple apparatus at hand. Specific gravity, fat by some of the lactoscopes or by a Babcock testing machine.

If a laboratory is at hand, test for sugar, phosphates, and albumen.

Examination of bones for mineral salts and organic matter.

LESSON III

BY the end of the child's first year the saliva has increased, and thereby the power of forming sugar from starch has been gained (for a child under six months of age starchy foods are indigestible), and as the teeth appear some solid food is permissible. But the mucous membrane is very sensitive, and the whole bodily structure is very delicate and easily injured.

All indications point to a simple, non-stimulating, fairly monotonous diet. The child at the breast receives the same food day after day, and the pleasures of the table do not appeal to nor agree with the young child. No "sweets," desserts, or delicacies are needed, but the quantities of food must be relatively larger as the child grows older to supply the activity which promotes growth.

The child has no reserves of stored food and little excess of digestive power, so cannot bear deprivation or excess without injury. In fact he is in a state of very delicate balance of forces which may be easily disturbed.

In the second year the food should continue to be chiefly milk with some broth, but always fluid or soft solids. There should not be allowed in the diet any of the following substances or their relatives: cellulose, mineral or strong acids, coffee, tea, spice, made dishes, salads, etc. A little breast of fowl, rice cooked in milk, white bread, are sufficient additions.

The child of three to six years old need not be confined to fluids, but the food should still contain much water, broths rather than meat, ripe, sub-acid fruits, weak cocoa occasionally, oatmeal and wheat preparations strained after cooking to eliminate the cellulose. Eggs, especially the yolks, are valuable. If the yolks are cooked separately they may be boiled hard so that they crumble to powder, which is not only more digestible but more acceptable to most children than the running yolk.

ILLUSTRATIVE MATERIAL FOR THE THIRD LESSON

For practice in making up bills of fare and for learning the composition of some common food substances, the following tables are taken from "The Cost of Food."[1]

[1] "The Cost of Food." Ellen H. Richards.

TABLE V

One Day's Menu for a Child of Six to Nine Years of Age

Required.	Total grams.	Dry substance, grams.	Nitrogenous substances, grams.	Fat, grams.	Carbohydrates, grams.
One and one-half pint milk . .	679.0	88.8	22.3	27.1	33.9
One-half pound bread	226.8	147.0	20.3	2.7	119.8
One-eighth pound dry rice (one-half pound cooked)	56.6	51.5	5.4	0.3	45.4
Four ounces orange	114.0	41.7	0.5	0.1	9.7
Two ounces egg	56.6	13.5	7.3	5.3	. . .
One-half ounce butter	14.0	12.5	0.1	11.9	. . .
	1147.0	355.0	55.9	47.4	208.8

At average prices this would cost twelve to thirteen cents.

Estimated Daily Quantities of Necessary Food

	Body weight, kilos.	Total grams.	Dry substance, grams.	Nitrogenous substances, grams.	Fat, grams.	Carbohydrates, grams.
Girl of four . .	13.3	1203	197	44.8	41.5	102.7
Boy of six . . .	18.0	1560	311	63.7	45.8	197.3
Girl of nine . .	22.7	1660	328	61.3	47.0	207.7

TABLE VI

APPROXIMATE COMPOSITION OF SOME COMMON FOOD MATERIALS

One pound contains	Refuse, per cent.	Water, per cent.	Proteid, grams.	Fat, grams.	Carbohydrates, grams.	Calories, per pound of 453 grams.
Apples	25.0	61.5	1.8	1.8	56.0	255
Barley (pearled)	. . .	10.8	42.2	4.5	352.0	1660
Beef (round)	8.8	64.2	86.0	32.2	. . .	650
Beef juice (as purchased)	. . .	93.0	22.2	2.7	. . .	115
Beef juice (as it should be)	. . .	88.0	31.0	. . .	. . .	127
Bouillon and consomme	. . .	96.0	11.0	. . .	1.8	55
Bread (white)	. . .	35.4	43.1	5.4	239.5	1205
Butter	. . .	11.0	4.5	385.0	. . .	3504
Cheese (American pale)	. . .	31.6	130.6	162.8	1.4	2060
Chicken	34.8	48.5	67.0	5.0	. . .	325
Cream	. . .	74.0	10.3	84.0	20.0	865
Cream soup	. . .	87.4	23.5	14.5	25.0	285
Eggs (whole)	10.5	66.0	59.4	43.1	. . .	645
Eggs (yolk)	. . .	49.5	71.5	151.0	. . .	1705
Lentil meal	. . .	10.73	115.5	8.7	260.0	1620
Milk (whole)	. . .	87.0	14.9	18.1	22.7	325
Mutton (leg)	18.0	51.4	67.5	67.5	. . .	905
Oatmeal	. . .	7.2	70.0	33.0	308.0	1860
Peas (sugar), shelled	. . .	81.8	15.4	1.8	62.1	335
Potatoes	20.0	62.0	8.0	0.4	69.0	325
Prunes (dried)	15.0	19.0	8.6	. . .	282.0	1189
Raisins	10.0	14.0	11.3	13.6	310.7	1445
Rice	. . .	9.0	43.0	2.3	363.0	1685
Wheatlet	. . .	10.4	55.9	6.3	340.0	1685

From these tables or from Bulletin No. 28, United States Department of Agriculture, Office of Experiment Stations, or Farmers' Bulletin No. 142, revised edition, at least half a dozen bills of fare should be made, showing the various combinations possible with these few substances.

A beginning is here made in the recognition of the value of a given food as a producer of energy. The word potato or apple should bring up to the mind not only the shape, size, and color, but the part in the diet it may play.

LESSON IV

THE SCHOOL LUNCHEON

THE digestion of healthy children of seven to fourteen years old is good; the period is one of great growth, demanding a gain of from five to twelve grams per day. Half the nitrogenous food may be of animal origin. Fat is absolutely necessary at this age, and when the coarser forms are repulsive, great care must be taken to give it in a delicate or concealed form.

The incessant activity of the child in the open air if left to himself permits the ready assimilation of whatever comes to hand, but when confined in the too often stuffy school-room, the food should be selected with knowledge. The school luncheon should be supervised with as great care as the food of the infant. A few simple rules, if followed out intelligently, will enable the mother or provider to furnish a suitable lunch.

The food should be such as can be readily assimilated, that is, it should not be concentrated, as fried meat or doughnuts or rich cake or pastry, and it should not be highly spiced. It may contain some sugar, as in ice cream, because sugar is soluble, and if not eaten in too large quantities (an ounce at a time), is readily digested. There should be some starchy food, because starch is converted slowly and furnishes energy over a longer period of time than sugar. The food should be appetizing and attractively displayed, or, if taken from home, put up neatly.

A study of the accompanying diagram and its use in calculation will be most helpful to the student in future work. This diagram is only an approximate statement of observed facts. The value of such generalizations lies in the number of observations upon which they are based, and in this case they are too few for a final decision. Further, the facts are from German sources almost exclusively, because no others gave the whole series; and it seemed better to adhere to a uniform standard of calculation in view of the great gaps in our knowledge. It is given in this imperfect state in order to induce a fuller study of the question.

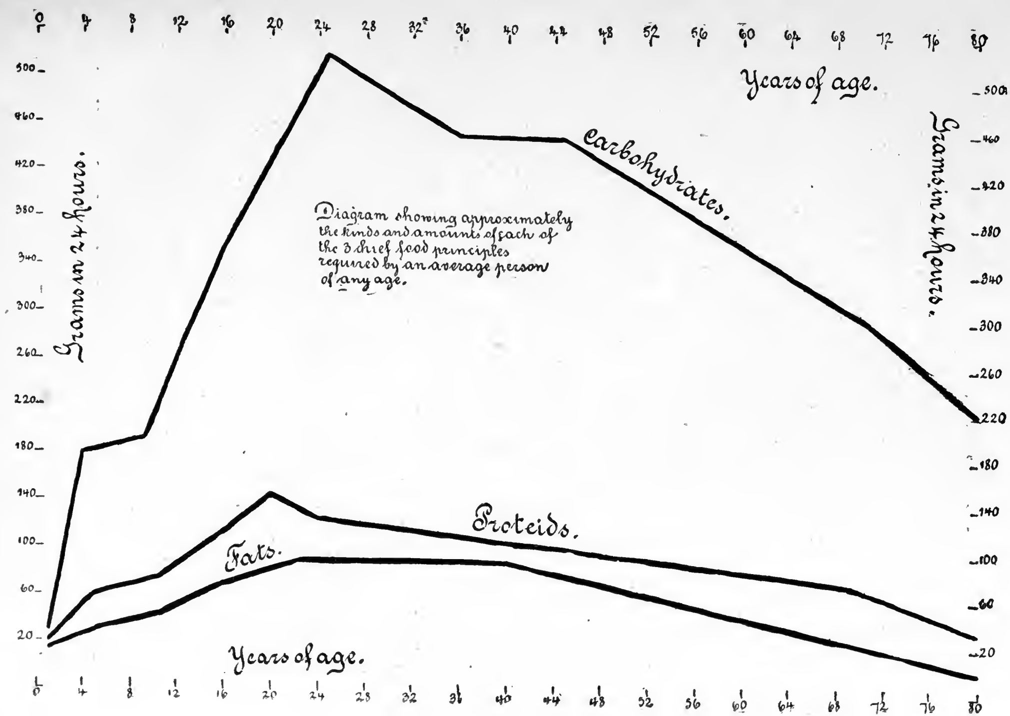
Diagram showing approximately the kinds and amounts of each of the 3 chief food principles required by an average person of any age.
Grams in 24 hours.
Years of age.
Carbohydrates.
Proteids.
Fats.
Grams in 24 hours.
Years of age.

From what we do know of the American standards, it seems probable that the curve of carbohydrates would be less marked, and that the curve of fats would be nearly coincident with that of the proteids, except in that part showing the amount from the tenth to the twentieth year, if drawn to represent American practice.

The steepness of the curve of carbohydrates shows the need of a full supply of the material which serves as the source of power for the very great activity of youth. The child naturally runs all day long; the activity, the amount of work done, is enormously in excess of that done in after life, aimless though it may seem. It is none the less work because it is work of heart and lungs, and muscular exercise in play. It is useful work, in that it builds up a structure for the grown man to use; it is the building time, and the building cannot be well made, strongly put together, without it. This intense activity is required for the metabolism[1] of the tissue, which is also rapid, as will be seen by the curve of proteid. If the weight of the individual at

[1] Metabolism. The cycle including both anabolism, the synthetic building up of tissue, and katabolism, the breaking down of that which has been formed. In other words, the chemical process of living.

different ages were taken into account, this would be even more marked.

It may be advisable to begin a discussion of the cost of material at this point, but food is of such importance to the child that we should be careful in emphasizing that question too early in our studies.

ILLUSTRATIVE MATERIAL FOR THE FOURTH LESSON

This may be in the form of five or ten lunches which the class will agree upon as desirable. A discussion of these as fulfilling the requirement of the diagram and, if time permits, a calculation of the food value from the tables in the "Dietary Computer,"[1] or Bulletin 28, or Farmer's Bulletin 142.

[1] The "Dietary Computer." Ellen H. Richards and L. H. Williams.

LESSON V

WHAT shall we eat as a family? What shall our daily fare include?

If we look back in history and ask what early man ate, we find evidences in the caves and mounds left behind him that he ate other animals, grains, roots, fruits, just as we do, and of the same kinds as the people living in the same conditions do today. In Asia rice for bread, in Peru corn and yams, in North America fish, berries, and roots, in the islands of the Pacific Ocean cocoanuts and breadfruit.

We of today have a choice of all these things brought to our markets, and we have not the protection of race habits to keep us from eating the wrong thing or to show us the right quantity of the right thing. The early peoples had an abundance of one kind of food of which we certainly deprive ourselves — air — and this lack is the cause of much, if not of most, of our ill health.

The early peoples had to work and often work hard for their food, and hence did not often get too much of it. We have food set before us in such abundance and variety that we overeat without knowing it. This causes so many of the illnesses from which modern man suffers, that, barring accidents, it may be said that if we are ill or ill tempered, it is likely to to be our food which is at fault in some of the many ways we have indicated.

It is well worth our while, then, to study food and food substances in order that we may know what to value and what to avoid. There are many ways of learning these lessons. Here we will take up only a few general principles, leaving the more detailed study to a later stage.

Keeping the order taken in the examination of the five classes of food in milk, namely, 1, water; 2, proteid; 3, fat; 4, sugar, carbohydrate; 5, mineral salts; we first ask what foods contain at least three-fourths of their weight of water? To name only those most commonly found on our tables, we find the following:

apricots	milk
asparagus	onions
blackberries	oysters
cabbage	pears
celery	potatoes, boiled
cherries	strawberries
cream	string beans
cucumbers	tomatoes
green corn	tripe

We next wish to know what common food stuffs contain the proteids or second class in at least as great an amount as milk? To make the statement general, we find the following to be true:

Animal Origin	*Vegetable Origin*
all the meats	all the cereals
all fish	all breads and crackers
all cheese	dried apricots
eggs	dried figs
	all nuts
	chocolate
	beans
	peas
	lentils

Food nutrients in the third class which contain as much or more fat than does milk:

Animal Origin	*Vegetable Origin*
all meats, except very lean	oatmeal
only a few fish, like catfish and salmon	corn meal
	crackers
butter	chestnuts
cream	peanuts
cheese	cocoanuts
eggs	walnuts

Food substances in the fourth class which contain as much or more sugar as is found in milk:

Vegetable

honey	syrups
dried fruits	beets
ripe bananas	

But the adult has added starch to the sugar. This is not really in a separate class, because both come under the general term, carbohydrates. Also starch yields a sugar — must, in fact, be changed to sugar before it is a food for the human body.

It belongs to the concentrated food stuffs, and is found in the seeds of the grains put up to keep. Before we eat it we cook starch in much water, as cereals, or drink much water, as when we eat crackers.

Food stuffs of the fifth class which contain as much or more mineral salts as does milk are:

Animal	*Vegetable*
all lean meats	most cereals
cheese	most vegetables
eggs	most fruits

If we select the names of food stuffs which appear in all five classes, we shall have those materials which are sufficient of themselves for food, because they contain all the essential substances, but they are very few. If we next select those which appear in the last four classes, we shall have those which, *with the addition of water*, will serve as complete foods capable of sustaining efficient life.

For the rest, they must be mixed, some from one class and some from another, not only from this list but from the thousand listed food materials. Our food is usually so mixed.

This larger list contains, however, a large number of needful and desirable substances whose food value, in the sense we have been using it, is nothing or very small. They are called food accessories, and by their flavor they act upon the senses of man, so that he secures for himself the food value locked up in the nutritive materials we have been studying. The German scientist calls these additions to our diet "pleasure giving things." Condiments, flavors, and spices play a large part in the art of cookery.

It is quite right that we should find pleasure in our food as in anything else, if only we do not make it all pleasure and no profit: if we do not produce more evils than we realize good.

Condiments too often result in over-stimulation of the secretions, and thus cause the eating of more food than the body needs.

ILLUSTRATIVE MATERIAL FOR THE FIFTH LESSON

Cereals, rice, etc.; dried fruits; extracted oils.

Exercises making out lists of ten foods of equal heat giving value, expressed in calories,[1] but of different composition.

[1] A calorie is a unit measure of heat used to denote the energy-giving power of food.

Samples of spices, condiments, etc.

Make lists of condiments, with a study of their action, for which see "The Spirit of Cookery," Thudichum, p. 86.

The student should learn the approximate value of the one hundred common food materials on the market; that is, should be able to say whether there is ten or fifty per cent of starch, fat, etc., in a given article as bought.

LESSON VI

DAILY FOOD

HAVING learned something of the natural food materials, we must now study *diet*, or that which goes to the table, for it is rarely in its natural form or as a simple food stuff. Fresh fruit, as apples, bananas, oranges or nuts, radishes, celery, plain boiled potatoes are set before us with little or no change in form or composition, and are eaten with the addition of salt or sugar only.

Uncooked lettuce and cucumbers are dressed with salad oil. The fig, raisin, and date have been dried, and so lost the water they once contained, while rice and oatmeal, once dry, have had three times their weight of water added before they are put on the table. Many made dishes contain a dozen ingredients.

The one thing to bear in mind is that during the day or week we need the right amount of *all* the classes of food that the baby gets in its milk, and starch in addition. But grown people cannot have their food weighed and measured out to them as the baby has, both because it is so complicated and because, while all babies are so much alike, sleeping most of the time, grown people are very different from each other in their work and in their play and in their health (alas, that it should be so), for most of them have hurt their bodies in some way, so that they cannot do what the truly well person should be able to do. Hence, diet must vary for the different members of the same family unless they are normally well people, but no one should allow himself to become whimsical and full of imaginary notions. It is found that most, although not all, the objections people make to certain foods are without any foundation. The evils are mostly imaginary.

Because one person ate a green banana and it distressed him, he eschews all bananas ever after. One may have eaten of veal pie when very tired or cold, and because a severe attack of indigestion followed, the blame is laid upon the innocent dish.

Of these five classes of foods, then, a person needs daily *about* one hundred grams of dry proteid or nitrogenous food, about the same of fat, and about four times as much starch and sugar and other carbohydrates, or, in ounces, about four each of proteid and of fat, and fifteen ounces of carbohydrates, provided he has plenty of that other essential food, oxygen, in fresh air, and that he takes exercise enough to keep the blood stream flowing freely, so as to carry the prepared food, sufficiently diluted, to the little living cells referred to in the first lesson, and to bring away the broken up stuff they do not want, and which will hurt the body if it is not quickly brought away.

The quantity of food eaten does not always correspond to the amount the body uses, hence the great differences found in the estimates different authorities have made. It is noticeable that the largest eaters are neither very hard workers nor very stout persons. Some active, powerful individuals are small eaters; they often say they live on air, which is in a measure true. The food taken is burned up to the last morsel and gives its energy to the body. Not only plenty of air (brought into the lungs by exercise) but plenty of water is needed for good utilization of the food eaten. The reason for this is that all chemical changes go on more rapidly and completely in dilute solutions. Water is essential to those processes by which the body is nourished. To use up the amount of dry food indicated on page 28 about six pounds, or three quarts, of water are needed. As has been shown, all this water may be in the food as eaten, or varying portions may be taken as drink. If there is too little, some of the food will pass out unused and some will undergo the wrong decompositions and cause irritation and finally disease. That is why so many of the "cures" are water cures and fruit cures. If a person is sent to live on grapes for a month it means a large amount of water is taken. The visits to mineral springs include much fresh air and exercise with the drinking of large amounts of water. The time of taking this water, with reference to the meal, belongs to the physician to determine. It is governed by the quantity and strength of the gastric juice the individual secretes. We are concerned with keeping well, and the lesson we should learn is to eat fruits which contain water naturally, vegetables, and foods which have taken up much water, as rice and cereals. If we do have dry and concentrated food, like crackers and cheese or pastry, much fluid must be drunk with it.

Much pains should be taken to work out a satisfactory system of diet, for man is his own power producer. He must manufacture his *own energy*. It cannot be pumped into him. His body cannot be charged at certain stations as can an electric automobile. His energy is developed inside of him by all the tiny cells to which the blood stream carries food. If he is not energetic, then his machinery is not doing its duty.

Each person's diet must, therefore, furnish the material for this energy in such form that the body can set it free.

ILLUSTRATIVE MATERIAL FOR THE SIXTH LESSON

Meaning of energy and work, calorie, osmose through membrane, illustrated by one per cent sugar solution, etc. See elementary works on physics, physiological chemistry, etc. Release of energy through chemical action, batteries.

Solution of metals by dilute acids. When strong have no effect. Show a day's ration: 100 grams dried meat or egg (allow for the water they still contain); 100 grams of fat (not butter unless it has been melted and freed from water and curd); 400+ grams of starch and sugar. Translate these into a day's ration as it goes to the table.

LESSON VII

THERE are three reasons why the matter of diet is not so simple as the last lesson made it appear.

1. Food is liable to be injured, rather than made more digestible, by cooking.

2. Substances are often eaten together which do not make a good mixture for the blood stream to carry to the little cells. The latter may be severely injured, poisoned, as we say, and the person will be very ill — have an attack of cholera morbus or severe pain — colic, perhaps, or a feverish headache only; or it may be that the result is only a heavy, sleepy feeling, which wastes a whole day of valuable time. Every day of our short life should count for something, and to lose it because one ate the wrong food is foolish waste.

3. The disturbing effect of mental states.

Bearing in mind that the object of life is the production of energy, of power to work, to think, to enjoy, progress in civilization would naturally be an increase of this power in each individual, and one would expect that the preparation of food would be so developed as to permit this gain in power. We are taught that this is what the art of cookery has done for us. In some cases it is true, especially where scientific research has found out the chemical and physical changes at the basis of the cookery.

For instance, the soaking of starch in fat, the cooking of white of egg, the frying of meat, render the food material more difficult of solution, and therefore a larger part may escape digestion altogether. But this depends upon the strength of digestion of the individual; to some persons it apparently makes no difference.

Again, cooking is supposed to produce appetizing flavors, as the roasting of coffee, the toasting of bread, the broiling of steak; but sometimes, as in the steam cooking of cereals and some vegetables, flavor is lost, and artificial flavor, less wholesome, needs to be added to satisfy the palate.

The keeping qualities of some foods are lessened by the addition of the water needed in cooking; for instance, cereals, dried beans, etc.

In other cases cooking preserves the foods, killing the molds, yeasts, and bacteria often found with the edible materials. In some cases this cooking lessens the digestibility, as is undoubtedly the case with milk as infants' food.

Frying an oyster in batter is a case where the outer coating is made less digestible by cooking.

Well-baked bread gives a more digestible starch product, a less digestible gluten.

Of wrong mixtures it is not easy to predict. The effect is largely bound up with the third cause, *i.e.*, mental attitude. Usually we object to milk with salads, especially lobster salad, because the milk is liable to be curdled into hard lumps, but it is probable also that in this case, as in others, a wrong chemical decomposition, not clearly understood, sometimes takes place, giving toxines or poisonous substances.

In some cases of illness these toxines may be in the food, but in most they are produced after it is eaten.

The reason for this bad result is the third cause of trouble, the inhibiting effect of mental emotion, or of bodily condition on the secretion of the digestive juices. Fear, anger, grief, even depression or lack of cheerfulness, prevent, to a greater or less extent, the flow of these fluids.

Extreme cold demands all the energy of the body to keep up internal heat, and none is left for digestion. Exhaustion of nerve force leaves none for the work of more production of energy.

Poisons absorbed into the blood hinder the necessary chemical changes.

Inflammation of the mucous membrane prevents the passage of the fluids.

The chief object of the thorough mastication of the food and its treatment with saliva in the mouth is to protect the stomach from overwork. The thoroughness with which the stomach prepares the food for the final act of digestion, intestinal absorption, depends upon the amount given it to do. It would seem as if man might learn this lesson readily, but the fact is that the average human being bolts his food and washes it down regardless of all physiological law.

A reason for a certain variety in diet is that each class of food seems to stimulate the secretion of that fluid which is needed to convert it into suitable body food. For instance, meat seems to excite a flow of juice, large in quantity but poor in ferments, while bread causes a scanty but concentrated flow, which is rich in ferment.

The formation of fixed digestive *habits* is seen to be possible, and is to be avoided. Hutchison says this fact may explain why sudden changes in diet are to be avoided.

ILLUSTRATIVE MATERIAL FOR THE SEVENTH LESSON

Examples of food spoiled in cooking are fried egg albumen, browned fat of meat, soggy bread, highly seasoned croquettes.

Make out experiments for a study of the composition of and effects of heat upon food mixtures.

Show examples of wrong mixtures.

Make out lists of helps to nutrition and hindrances to nutrition.

From the available text-books write out a concise but clear statement of the course of food in the body and, so far as is known, of its decomposition in the body.

LESSON VIII

THERE is some reason to believe that better health might be the rule if the food were less mixed at a meal, if the single stuffs were better cooked, and not cut up and worked over so much. Not so much fire would be required, not so much labor, not so much garbage would be left to poison air and ground, if each day only perfect dishes were served at our family tables, and few of them. There could be found enough combinations to go through the month, and thus give requisite variety.

The world is full of theories, and, as we have seen, people have very individual characteristics, but there are two reasons why we find so many kinds of theories about food, and so little definite fact.

1. The human organism is so highly developed that it can adapt itself to a great variety of conditions. A man cast away on a tropical island or lost in the desert will not flourish at first on the unusual food, but soon becomes

accustomed to it. The same person may go from the tropics, where he lives largely on fruit, to the arctic regions, where he may be obliged to live chiefly on fat, and yet keep well. If the change is made gradually, no ill effect necessarily follows. If made suddenly, trouble results, and that is because of the second reason referred to in the last lesson.

2. Habit, custom, reconciles the living being to strange conditions, but the habit once formed, it tends to preserve those conditions, because an effort is required to change and the healthy body abhors waste of effort.

It is most desirable to form good habits and to accustom the body to variety so that energy may not be lost. In the formation of habits the mind has the leading part. It seems to be true that those who believe in the use of uncooked food, as tending to more refined and spiritual living, soon become accustomed to the use of fruits and nuts and raw grains, and get from them the needed nourishment. Witness the fruitarians and vegetarians.

These studies of fruit and nut diet[1] are most

[1] Bulletins 107 and 132, United States Department of Agriculture, Office of Experiment Stations. A. B—Z of Our Own Nutrition. Fletcher.

interesting as confirming the view that the large amount of food commonly eaten is not utilized in the body, but is waste.

It seems to be proved that health and strength and brain power may be maintained on a little more than half the food value commonly allowed if the diet is of pears, apples, bananas, raisins, with Brazil nuts, peanuts, and walnuts. The addition of some fresh vegetables with olive oil and of cereals and milk makes it very possible to subsist anywhere without the trouble of the preparation of the traditional three meals. Habit, rather than physiological necessity, seems to govern our eating.

We are told that those who *believe* that it is wrong to take life for the purpose of food soon come to loathe the sight and taste of meat, and sit down to corn and beans and bread with a zest quite unaccountable to the mixed food eater.

The human body obeys the brain wonderfully. But it must be remembered that *habits* require time to become second nature, and that most of the failures we see in the testing of new diets are due to sudden changes.

It is easy to see why mankind as a rule lives on a mixed diet. According to states and conditions, the body will more readily find its preference among a dozen materials than in two. If no especial care is given to the diet, then a variety of all kinds brings the best result with the least waste of energy.

But there are a limited number of good food materials, and a limited number of healthful ways of serving them, and it is not difficult to exhaust them and bring on a feeling of dissatisfaction if too many kinds are put on the table in one day or at one meal.

ILLUSTRATIVE MATERIAL FOR THE EIGHTH LESSON

Examples of what might serve a family of six for a week if the appetite had not been ruined by bad habits and wrong ideas.

Examples of fruitarian diet.

Examples of vegetarian diet without animal products.

Examples of vegetarian diet with milk, butter, cheese.

Example of satisfactory diet.

LESSON IX

PRINCIPLES ON WHICH BILLS OF FARE ARE MADE

THE appetite is to be stimulated, without being satisfied, by the first course, bouillon rather than corn soup. The warm fluid causes a flow of the gastric juice because blood pressure is increased. Relishes like olives or salted almonds serve to remove the flavor of the last dish, cleanse the tongue and palate, as it were, for the next dish, which comes as a fresh pleasure.

The sweet (a very little of it) serves to remove the last traces of the oily matter of the salad or the fat of the meat, and to give a feeling of sufficiency and satisfaction with the meal.

These sensations cannot be repeated too many times within an hour or two without losing their acuteness; hence only the most perfectly experienced chef may dare to serve more than four or six courses at one meal.

Three or four dishes following each other, with the right relish before the first and second or second and third, is the wisest plan.

THE PHILOSOPHY OF DINNERS

The various elaborate orders and services from the time of the Renaissance down, may be condensed to eight courses and three "services." Each service may be reduced to one dish, with its adjuncts.

Thudichum gives the following example:—

First service:

Soup, hot and cold *hors d'œuvres.*

Fish.

Side dishes (*entrées*).

Joints or removes (*relevés*).

Second service:

Roasts, game, or fowl (sometimes including a salad).

Savoury and sweet dishes (*entremets*).

Third service:

Cheese.

Dessert.

From this general order the multitudinous bills of fare have been evolved, but the careful housewife may console herself with Thomas Walker's dictum: "It is the mode I wish to recommend, and not any particular dishes. Common soup made at home, fish of little cost, any joints, the cheapest vegetables, some happy and inexpensive introduction like the crab, and a pudding—*provided everything is good in quality* and the dishes *are well dressed and served hot and in succession, with their adjuncts*—will insure a quantity of enjoyment which no one need be afraid to offer."[1]

Before the nineteenth century kings and statesmen were the great patrons of good cookery. The art probably culminated in the seventeenth century in France, and if we wish to learn the secret of well-made and well-served dishes, we must study the records of that earlier time.[2]

Thudichum, p. 649, says, "Every bill of fare must be the result of all kinds of practical considerations, and should never be a theoretical prescription culled from lists."

"The objects for which menus are published in modern prints are mainly of an advertising

[1] "The Art of Dining," Hayward.

[2] Works by Soyer, DeSalis, Brillat-Savarin, and others.

nature, and as printed they convey absolutely no information at all."

ILLUSTRATIVE MATERIAL FOR THE NINTH LESSON

Many menus, as found in the locality.

Exercises in preparing others after definite principles.

LESSON X

IT is sometimes necessary to provide food at a limited cost. In such case it is absolutely necessary to know two things:

First, the approximate composition of the food material; and, second, to know food synonyms, or those things which may be substituted for each other. Otherwise the family will be sure to suffer; and we learned at the beginning that the *right* food was essential to health, to power of work, to capacity for pleasure.

If it is as wise for all to know something of the value of daily food as of the value of the currency in their pockets, it is absolutely necessary for those who have few dollars to spend to know how to get their money's worth without sacrificing life and health.

A large part of the art of cooking consists in making inexpensive food material palatable and attractive.

The first step is to disabuse ourselves of the idea that "cheap" food is poor food. A substance is inexpensive for several reasons, chief of which is its abundance; then its power of keeping and of being transported without loss; the nearness of the market to the place of consumption; often its bulk in proportion to its food value. Milk is dear food in the city because 87 per cent of water must be brought scores of miles in wagon and car to get 13 per cent of food material to the consumer.

Wheat flour is cheap because 87 per cent of it is food material, and it will keep safely while stored or transported.

Products of sun and wind and rain and soil, with very little of man's labor, are inexpensive where they grow; and those that will bear keeping and transportation are inexpensive anywhere on steamboat or railroad lines.

Products which involve many transformations of raw material, as flesh of cattle which eat the first products of the soil, and which requires much handling, and, besides, is perishable; delicate fruits and vegetables grown with a shelter and much human labor are expensive, not because they are better food material, but because they cost more to produce.

As an example of what may be done if there is an incentive to stimulate interest and cause satisfaction, the following is taken from Bulletin 129, United States Department of Agriculture, Office of Experiment Stations:

"In February, 1902, the students of the Bible Normal College, situated then in Springfield, Mass. (now in Hartford, Conn., and affiliated with the Hartford Theological Seminary and designated School of Religious Pedagogy), voted to save a sum of money, which they desired to raise for a special object, by reducing the cost of their table board. They had been paying $3 per week for table board at the time, or very nearly 43 cents per person per day, which, of course, included the cost of fuel, preparation, and service, estimated to be 10.6 cents per person per day. Learning that it has been found possible to provide a balanced and nourishing diet for 10 cents per man per day for the raw food, they entered eagerly into an experiment with a diet to cost that amount for food materials only, the cost of preparation, etc., to remain the same as before, making the total cost of the daily food as served 20.6 cents per person, or 22.4 cents less than their ordinary diet. There were thirty students interested in this project, and it was planned to continue the investigation three days, as this would suffice to save the $20 desired.

"It was believed that the results of a dietary study of the family during this period would be of some value, as showing some of the possibilities of a practical application of the results of nutrition investigations. The meals provided were enjoyed, and at the end of three days, although the desired sum had been saved and there was no longer this incentive, all the persons concerned were sufficiently interested in the trial to ask to have it continued three days longer when they learned that the results for such a period would be of considerably more value from a scientific standpoint than those of a study carried on for three days only. The details of the investigation are given herewith.

"The method of conducting the investigation was essentially the same as that usually followed. After a study of the available food supply and the cost of food in the local market, menus were prepared which it was believed would be fairly satisfactory, and which would fulfill the requirements as regards cost and nutritive value. The amounts of the various materials which it was calculated would be required during the period were then set aside to be used as needed, the plan being to provide generously of the chief and less expensive dishes, with enough of the more expensive foods to give the needed variety. Whatever material was left at the close of the study was subtracted from the amount provided, and the difference was assumed to represent the amount used. Generally speaking, the estimated amounts proved amply sufficient, but it was found necessary during the study to purchase some articles in addition to those planned for, and all such foods were also included in estimating the total amounts eaten.

"None of the foods were analyzed. The composition of all but two of the different articles was assumed from average values for similar food materials (United States Department of Agriculture, Office of Experiment Stations, Bulletin 28, revised). The composition of the chocolate candy (fudge) was calculated from that of the materials used in making it, and the composition of apple jelly was taken from a compilation not yet published. The assumed values for the composition of the materials eaten in this study are included in Table 29 of the Appendix.

"The menus for the different days covered by the study were as follows:

SATURDAY, FEBRUARY 8

Breakfast: Oatmeal and top of milk, fish cakes, toast (with a little butter), prunes, milk and cereal coffee.

Dinner: Beef soup, croutons, beans (baked with pork), brown bread, apricot shortcake.

Supper: Sandwiches (cheese and jelly), white and graham bread, (no butter), sliced bananas, milk.

SUNDAY, FEBRUARY 9

Breakfast: Cornmeal mush and top of milk, baked beans, buns, milk, and cereal coffee.

Dinner: Split pea soup and crackers (crisped), potted beef, brown sauce, baked potatoes, bread, rice, with milk and sugar.

Supper: Brown bread sandwiches (with a little butter), white bread sandwiches with date and peanut filling, without butter, cocoa, popcorn salted.

MONDAY, FEBRUARY 10

Breakfast: Oatmeal, with top of milk, cream toast, cereal coffee.

Dinner: Baked bean soup, crisp crackers, Hamburg steak balls, brown sauce, hominy, turnip, peanuts, and dates.

Supper: Potato and beet salad, gingerbread, cheese, bread, milk.

TUESDAY, FEBRUARY 11

Breakfast: Wheat breakfast food and dates, creamed codfish, muffins (with little butter), milk, and cereal coffee.
Dinner: Beef stew, with biscuits, bread pudding, bread.
Supper: Scalloped meat and potato, bread (with butter), prunes, chocolate candy "fudge."

WEDNESDAY, FEBRUARY 12

Breakfast: Oatmeal, with top of milk, hash, corn cake, milk, and cereal coffee.
Dinner: Vegetable soup, croutons, baked stuffed beef's heart, brown sauce, rice, cornstarch blanc mange, caramel sauce.
Supper: Potato and celery salad, white and graham bread, fried cornmeal mush, syrup.

THURSDAY, FEBRUARY 13

Breakfast: Cornmeal mush, with top of milk, hashed meat on toast, milk, and cereal coffee.
Dinner: Salt salmon, drawn butter sauce, baked potatoes, parsnips, bread, evaporated apple shortcake.
Supper: Cold sliced beef's heart, creamed potatoes, cocoa, bread (white and graham), ginger snaps.

"The family in this experiment consisted of thirty students, twenty-six women and four men, ranging in age from twenty-five to forty-five years."

The Science and Art of Cookery combined should enable us so to prepare the inexpensive as to produce the most satisfactory flavor, texture, temperature, and consistency, and to use the expensive to enhance the pleasure of the table just sufficiently, and not to the injury of the aim of all living, the production of the happy, healthy, efficient human being.

ILLUSTRATIVE MATERIAL FOR THE TENTH LESSON

Exercises in selection of the satisfactory combinations in a variety of ways suited to the tastes of the class and the markets in the locality.

A few examples of bills of fare covering three weeks' time, because the members of the family will not keep tally of the menu, and know just what to expect day by day.