CHAPTER XVI.

PROTEIN REQUIREMENTS—THE EXTRAVAGANCE OF MEAT

PROTEIN is distinctive from all other food elements in that it is the chief substance or rather the group of substances from which the actual organs and tissues of the body are formed and repaired. The other great groups of food elements, the starches, sugars and fats, can only supply heat and energy or go to form body fat. For this reason, since the early days of food chemistry, the protein group of food substances has always been conceded to be of especial importance.

ANCIENT FAITH IN PROTEIN.—For many years protein was also thought to be the source of muscular energy, for the reason that the muscles are composed of protein. This belief has been known to be erroneous for half a century, yet it had a hold, even upon the scientists, who had difficulty in getting away from the idea that a hungry, hard-working man must have meat to keep up his strength.

The food chemists of our colleges, before 1903, taught that a diet relatively rich in protein was the diet for strength and endurance. As a result the athletic training tables of those days were heaped high with juicy beefsteaks, ham and eggs, and milk and cheese. About this time Horace Fletcher, a retired college and business man, appeared at Yale University and asked to be subjected to strength tests in the Yale gymnasium. Mr. Fletcher at that time was in his fifties, yet he broke strength records made by the young and vigorous athletes of the university. His endurance was far greater than that ever before recorded for a man of his age. Without previous training he was enabled to undergo the most severe ordeals without any of the resulting muscular soreness that commonly follows such tests.

Mr. Fletcher ascribed his superior condition to his eating habits, the chief distinction of which was that he practiced exceedingly thorough mastication and had developed his sense

of taste until his food selection was very different from that of the conventional American bill-of-fare. An investigation of Mr. Fletcher's diet showed that he not only was eating a great deal less food than was supposed to be essential to health and strength, but that he was also eating a smaller proportion of protein, about forty grams a day, whereas the dietary standard called for 150 grams for an athlete.

Professor Chittenden of Yale became so interested that he conducted a series of researches which gave most remarkable results and seemed to indicate that protein, instead of being of greater value for strength production than other foods, was an actual detriment, and when taken above the necessary minimum is prone to increase fatigue and lessen endurance.

This revolution in the conventional dietetic teachings was seriously and stubbornly questioned by the orthodox scientists. The Danish government took particular pains to investigate the subject and gave Professor Hinhede a laboratory for such research. Hinhede not only confirmed the conclusions of Fletcher and Chittenden, but went even further in the reduction of proteins and showed that a man could live and thrive for months upon a protein intake as low as 20 to 30 grams per day, not quite equal to four eggs.

These findings in favor of low protein have not been wholly accepted, but practically the entire scientific world has conceded that the former dietetic standards were entirely wrong, and that a much lower rate of protein consumption is desirable than was formerly considered necessary. This faith of science in the lower protein standards had a very practical application in connection with the European War, enabling the warring governments to feed their people upon a diet containing a much smaller proportion of meat and dairy products than would have been considered possible a few years ago. Mr. Fletcher spent much of his time in Belgium during the first years of the war, and he insisted that in spite of the great deprivation and the misery of the Belgians the low protein rations materially contributed to improved physical conditions and a lower death rate.

The question of the amount of protein is, in practice, the question of heavy meat eating and is complicated by the fact that meat foods are highly flavored and that people like these stimulating flavors. Because such foods are expensive to produce and taste good, the rich, prosperous people, whether individuals or nations, consume more of these foods than their poorer brethren.

Meat-eating races, that is, the rich, well-fed of the earth, have been the successful, domineering sort. The poor ape their betters and strive to adopt their habits, and the beef-eating Englishman, who went out and conquered half the earth, has never quite got rid of the idea that his beef was partly responsible for his power. Vegetarian arguments about the strength of the rice-eating Oriental have been copiously printed, but never more than half believed, and the prejudice in favor of meat, backed up by its good taste, has kept alive the notion that the protein foods, especially those from the flesh of animals, are of particular value and potency.

CONSERVATION IN WAR TIME.—The vegetarian has eschewed the flesh of animals for physical, mental, or moral reasons, but always for very personal reasons. The social responsibility, the possibility of the vegetarian's peculiarities in diet being of consequence pro or con in the affairs of the nation, has rarely entered into the argument.

When the world war was on we, as a people, felt obliged to see it through, not only for ourselves, but for civilization, and food questions which were formerly personal matters become social and patriotic matters of the greatest importance.

With a view of conserving our food supply, many writers had urged the prohibition of the killing of young meat animals. Germany, at the beginning of the world-wide war, took the opposite policy, and enforced the slaughter of about one-third of her meat-producing animals. But later the Germans, because of the deprivation of fats, altered their policy, and in the third year of the war preserved their young stock, and at great privation to themselves brought the number of domestic animals far back toward the original figures.

But the American situation was different from the German, and we cut down rather than increased our meat production. The isolated German nation represented an unbalanced state of agriculture, in which fat was produced in quantities insufficient for either the nourishment of the population or for the technical needs for fat in industry, and particularly in the manufacture of munitions. How hard put the Germans were was indicated by the report that the Imperial Government used butter in the manufacture of munitions. This may or may not have been true, but the fat famine in Germany was unquestionably the most acute phase of the nation's food shortage during the war.

The United States is a heavy producer of food fats, not only because of her great meat industries, but because of her very considerable output of cotton-seed oil. While dietitians dispute the interchangeability of vegetable and animal proteins, it is generally conceded that fat from vegetable sources is dietetically as good or better than fat from animals—with the exception of butter.

Whenever there is actual shortage of grain for human sustenance, and a comparative abundance of food fats, it is certainly grossly extravagant to feed so much of the food grains to animals. It requires five or six pounds of grain to produce one pound of beef, and beef averages less than twenty per cent of fat. This means that about twenty-five pounds of grain are required to produce one pound of beef fat. Dietetically, a pound of fat is worth two and one-fourth pounds of grain, hence the loss of food value in producing beef fat is in the ratio of ten to one.

In feeding hogs, because of the greater proportion of fat in the carcass, the ratio of loss of food value is not so great, probably five to one.

Because of the more vital need for milk in the diet than for meat, and because, as a whole, including its fat, it is the most economical form of converting vegetable foods into animal foods, milk production should never be curtailed.

There need be no fear of a meat famine at any time, for

meat from cows and calves produced as a by-product of the dairy industry, together with our milk, poultry, pork and fish, will more than supply the real needs of our people, and leave a surplus that may be exported.

An article in Physical Culture, 1910, stated: "Savages in cold climates were forced to eat meat and found the natural game of the forest only sufficient for a sparse population. Following the hunter came the herdsman, who thrives only as long as land and grass and grain are so abundant as to make a wasteful method possible. In this new country we became heavy meat eaters, and though our population doubled every generation, our land area was so vast that we kept up the practice for a century. But now the need for land for the direct production of human food has become sufficient to make us think about the future.

"When, in more densely populated countries meat appears rarely upon the bill of fare, we are taught that it was due to poverty, political reasons, or some other far removed cause. As a matter of fact, the people of Belgium or China cannot eat meat three times a day because they cannot afford to produce it. It would take three or four acres of ground to support a man if we depended solely upon meat for the source of human energy. On the other hand, an acre of ground will easily support three or four men when growing a variety of plants."

To bring the question of food patriotism back to the individual, we are bound to conclude that *vegetarianism is quite as patriotic a way to avoid national waste as the skimping and scrap-saving so urgently commended by the government and the press.*

The greatest American extravagance is the excessive consumption of animal protein, chiefly meat, and this waste has received endorsement from the high authorities. A dietary which a leading government food chemist recommended was found to derive forty-one per cent of its total food value from the animal protein group, the cost being sixty-six per cent of the total. As ten per cent of animal protein in the diet is suffi-

cient for healthful nutrition, there is a waste authorized here that amounts to about fifty per cent of the total food cost.

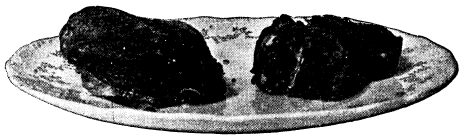
Such a reduction of our excessive meat eating would save from five to ten pounds of grain for each pound of meat not eaten, and hence, not produced.

Cash is readily translated into its equivalent in human life, and we are told that three cents will buy a meal for a starving child. With equal honesty we might placard our butcher shops with the statement that *for every pound of steak which we refrain from eating we release grain enough to furnish a hungry man bread for a week.*

Human prosperity and power is a thing of many causes and we now know that heavy meat eaters eat more because they like it and can get it and are powerful in spite of that fact, not because of it. Some protein food is essential to life, growth and health; the discussion between the old and the new ideas is based not upon its necessity, but upon the amount necessary.

PROTEIN IN EXCESS HARMFUL.—Protein substances are not altogether different from the other foods. In fact, three-fourths of the weight of protein foods are composed of the same basic carbon and hydrogen compounds that form starches and sugars. When protein is eaten in excess of the body's needs, it is separated into simpler components, and the fourth of it which contains the element nitrogen is discarded and excreted in the urine, while the remainder is utilized as starch and sugar are utilized.

This process of discarding part of the protein eaten in excess of our actual needs is now known to be physiologically harmful. Certainly it represents a great economic waste, for not only is the substance wasted, but it is substance that costs five to ten



An example of the wastefulness of the high proteid diet. French lamb chops—cost twenty cents each; cost of actual food nutrients one dollar and fifty-two cents per pound.

times as much as the substances which it only partly replaces. Both economy and health here argue to the same end—that we should eat only as much protein foods as we need, and that to eat more is foolish, if not actually harmful. Eating excess of protein is like burning the furniture to warm the house. Coal is better fuel and is decidedly more economical.

This question of how much protein we should eat is very important to the man who would cut down the cost of living—as important as would be the question of getting coal if one were heating his house by burning tables and chairs. If you want to save money, patronize the butcher less and the cereal counter and the vegetable man more.

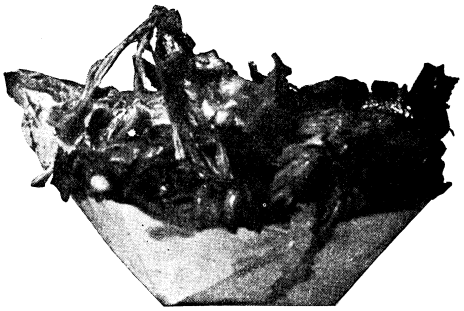
The dietetic teachings now advocated as the "low protein diet" are closely akin to the vegetarian theories. Vegetarians have always shown up remarkably well in athletic competition, especially where the event depended upon endurance. In long-distance races, in America, England and Germany, the percentage of vegetarians who finish in the lead has always been greater than the percentage of winning meat-eaters. About ten years ago, Professor Irving Fisher of Yale put this matter to a definite trial by taking the number of simple endurance tests of vegetarians as against meat-eaters; the resultant showing for the vegetarians was highly favorable to their claims.

A strange inconsistency on the part of vegetarians is the idea that they should have "meat substitutes." If meats are a thing of evil and not part of the natural diet of man, why have meat substitutes? It is hardly fair to accuse the leaders of the vegetarian movement of thus deliberately condemning their own doctrines. It is a more likely explanation that this idea of the need of meat substitutes was adopted by the general public who believed there was something good in both theories and that by eating meat substitutes they would gain the benefit supposed to come from meat and sidestep its evil effects. This idea was undoubtedly strengthened by the belief that large quantities of protein were essential to a healthful diet. We now know that this belief never had a scientific foundation, and that modern evidence indicates that it is exactly opposite to the truth.

The vegetarian in opposing the excessive use of meat agreed with scientific truth in a rather unscientific way. But in practice it is not wise to omit the animal proteins altogether. In modest quantities, preferably from milk and eggs, they are desirable if not actually necessary, and for giving taste and flavor they are essential for us who have been so long accustomed to eating them.

Nearly all vegetable foods in their natural forms contain small proportions of proteins. Were it not for this fact, life upon this globe would be impossible, as all animals would then have to eat each other—a very difficult state of affairs. But the vegetarian animal has a larger digestive apparatus than man. Vegetarians get around this fact either by advocating large quantities of nuts in the diet, or by meeting the meat-eater half way and including milk and eggs and tabooing flesh foods. Others allow fish, on the theory, perhaps, that it doesn't hurt a fish so much to die because it isn't red-blooded.

Dish containing all edible meat secured from three pound chicken. Weight eighteen ounces—cost of chicken per pound, 50 cents. Cost of edible meat per pound, $1.33.



Unedible portion of cooked chicken, weight sixteen ounces.

Entire edible flesh of chicken (dried). Weight, seven and one-half ounces—cost per pound $3.20.

But these are sentimental and rather unscientific aspects of the question. Only a small per cent of Americans are vegetarians by conviction, and the complete adoption of vegetarianism usually involves worries and fears about getting enough protein, and especially about getting the right kind of protein. Animal proteins are the right kind, if not eaten in excess, because the needs of animals are very like our own. Milk and eggs, being created in the scheme of things for the express purpose of nourishing young life, are the best of all, and an effort to exclude them from the diet, especially the diet of children, is a dangerous experiment. Moreover, milk is reasonable in cost and to exclude it from the diet is both bad cooking and false economy.

Further light will be thrown on this question by the consideration of the difference in food quality of the different proteins.

QUALITY VARIATION IN PROTEIN.—One of the serious errors of the former chemists was the considering of all protein as of practically equal nutritive value. While it has long been known that proteins were highly complex chemical substances of many different sorts, the chemists were until recently unable to analyze them. In fact, the percentage of protein given in the old food tables was not determined as protein at all, but the chemist merely determined the amount of the element nitrogen and estimated the protein by multiplying the amount of nitrogen by a figure derived from the average percentage of nitrogen in the various proteins.

More recent chemical investigations have not only resulted in distinguishing a great number of proteins, but in also determining the more elementary compounds that go to make up the individual protein. To show how immensely complex is the chemistry of these food substances we may consider first the total protein in a given natural food. This is again divided into various individual proteins; for instance, milk contains casein and albumen, wheat contains, among others, gliadin and glutenin, while eggs contain albumen and ovo-vitelin. Each of these particular proteins is again composed of numerous

Harvesting the golden product of the corn fields.

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substances known as amino-acids. Some eighteen or twenty of these amino-acids have been chemically isolated and the approximate proportion of each in the different proteins determined. However, this analysis is approximate only, and it is highly probable that not all of the amino-acids have been isolated and named. Enough is known, however, to show the enormous complexity of protein chemistry and to show also why various proteins, or proteins from various foods, are not all of equal value in the diet.

To make this clear it should be explained that proteins are not absorbed from the digestive tract as such, but are broken down into the various amino-acids which then pass into the blood in these simpler forms. From the blood stream carrying amino-acids in varying proportions the cells of the body select those needed to build the various proteins. As the body proteins are also very numerous and complex, we see the reason that the amino-acids from different food proteins will not be supplied in the exact proportions the body requires. Moreover, the requirements for protein building material will vary according to the demands of the body as determined by the various stages of growth and functional activities of the individual.

From this brief sketch of protein chemistry it will be seen that we may expect that some protein foods will be so composed as to supply the bodily needs with but little waste, while with others a large surplus would be required in order that the human cells might find the exact ingredients needed for growth and activity. Moreover, since all proteins do not contain all the amino-acids, it is likely that some would prove wholly deficient and incapable of completely nourishing the body or sustaining normal growth.

All the above theoretical assumptions have been demonstrated by feeding experiments upon animals. The most important protein in corn kernel is zein, which substance is lacking in three amino-acids that are commonly found in the proteins of living animal tissues. On the other hand, the proteins of beans and peas seem from chemical analysis to more

nearly approach those of animal tissues. But the chemical knowledge is not sufficiently accurate to enable the chemist to anticipate what will support protein metabolism in the animal body, as revealed by the fact that corn protein proves a better source of growth than that of beans and peas. An account of an actual feeding test will show how such facts are determined: Rats were given a diet complete in every respect as to fats, carbohydrates, salts and vitamines. To such a diet the protein from a single food, and that only, was supplied, and from experimental trials the amount of protein necessary to just maintain the weight of the animal is determined.

The following percentages of protein from various foods were found to be just sufficient to maintain body weight.

Milk	3	per cent of the entire food
Oats	4.5	per cent of the entire food
Millet	4.5	per cent of the entire food
Corn	6	per cent of the entire food
Wheat	6	per cent of the entire food
Rice	6	per cent of the entire food
Flax	8	per cent of the entire food
Beans	12	per cent of the entire food
Peas	12	per cent of the entire food

A similar experiment was conducted with young pigs. But in this case protein from the various sources was supplied in reasonable abundance and the amount retained in the body, or utilized for growth, was determined. The pigs utilized:

20 per cent of the corn protein.
23 per cent of the wheat protein.
26 per cent of the oat protein.
63 per cent of the milk protein.

The striking thing about both of these experiments is the very great superiority in nutrition of the protein from milk. This result, however, is perfectly logical because the milk proteins were built up for that specific purpose of furnishing material for growth, while the proteins in plant substances as well as the protein in meat are created to serve other functions than that of the nourishment. The superiority of milk as a food is not confined to its protein content alone, but its mineral and vitamine contents are equally efficient as will be shown in the following chapters.

Scientists have not, at this writing, made full investigations of the relative value of protein from all food sources, nor can the investigation upon other species of animals apply absolutely to the human nutrition. We can, however, derive certain principles from the investigations thus far made that will be of use in determining the approximate value of protein from various foods. Milk as already clearly demonstrated heads the list for the efficiency of its protein. A close second is eggs. Next in value we may expect to find the proteins of flesh food. This statement may seem contradictory to the general teachings in this work of the evils of excessive meat eating. However, the two statements will be seen to be in absolute harmony when we recall that the conventional meat diet supplies many times the amount of protein actually required for efficiency nutrition. Since the average proportion of protein in a diet of cereals, nuts and vegetables, together with milk and eggs, furnish an ample amount of protein, the use of meat as a source of protein is uncalled for, and such dangers as may be involved in the introduction of disease germs or poisonous waste products of the animal through meat is a danger that may very wisely be avoided. There is ample evidence that there is no quality in meat protein that cannot be better secured through milk and eggs, and since the quantity of protein required is much smaller than that usually eaten, meat is unnecessary as a source of protein, either from a quantitative or qualitative standpoint.

Therefore, when milk and eggs are available the use of meat must be defended upon other grounds than that of normal nutrition. For the growing child the substitution of meat for milk and eggs is never to be advised or tolerated where the purer forms of animal protein can be secured. For the adult meat may be utilized as a source of protein if taken in small quantities and no harm will ordinarily result.

Relative Value of Vegetable Protein.—The relative value of vegetable proteins is a point upon which we still need more light. The present information would indicate that oats rank higher than wheat, and wheat higher than corn. But

a more important discovery is that the leguminous foods (peas and beans) have in the past been generally over-estimated as a source of protein. This use of legumes was formerly endorsed on the grounds that they were meat substitutes, a view in harmony with the old belief that a large percentage of protein was essential to the diet. Our modern knowledge of the smaller amount of protein required, together with the later discovery of the lesser value of these proteins, would indicate that this use of vegetable meat substitutes is uncalled for. This does not mean that the leguminous foods are harmful, but merely that they add no great value to the diet. The fact that they are richer in flavor and that our habit of using them as "meat substitutes" may justify but it does not necessitate their continuance in the diet in their accustomed place.

Certain vegetable protein foods were much advocated during the war, such as the soy bean and the peanut, and the meals made from the residue from the oil extraction of these products. These foods are wholesome and the evidence available indicates that the protein quality is somewhat higher than that of ordinary beans and peas. The same general statement may be made regarding the protein of nuts. I advocate the use of all these materials as wholesome and valuable foods as I have found them of practical use in winning people away from their extravagant and excessive use of meat. The teachings of the recent discoveries in this field is merely that meat substitutes are not as essential to healthful nutrition as was formerly supposed.

A further teaching from the recent scientific discoveries regarding the composition of proteins is that a mixture of proteins from various sources will often make good the deficiencies of the proteins from a single food. Hence, as a general principle, we may conclude that the protein requirements on a mixed diet would be less than that of a more limited diet. For illustration, gelatin was formerly said to be of little nutritive value, as it has long been known that it was not a complete protein. While gelatin alone will not support life, it is found that the addition of gelatin to a diet containing

only the protein from a single grain will greatly increase the growth supporting power of the grain protein. The proteins of a combination of grains are also found to be better than those from any single grain of the group.

Not much is yet known of the quality of protein from vegetables, though those from the potato have been determined to be somewhat inferior to the protein from grains. Note carefully, however, that no practical application should be made of this statement or of similar discoveries that may yet be made indicating that the protein from this or that fruit or vegetable is not of high quality. The value of protein from fruits and vegetables is relatively unimportant, for these foods are not to be judged by their protein contribution to nutrition.

On the whole the question of protein has received more prominence in dietetic teachings than it really deserves, for while essential to life and growth it is sufficiently supplied in all mixed diets. The practical problem, both from a standpoint of health and economy, is to keep the protein content of the diet from being excessive. The dangers of deficiency in diet is not in protein at all, except in most unusual cases, but is the lack of the mineral salts and vitamines, which will be discussed in the two following chapters.

SUBSTITUTES FOR MEAT.—If the use of meats in the quantities ordinarily eaten in American homes is a dietetic evil rather than a benefit, what we want is not meat substitutes to give us an excess of protein, but merely other normal foods to replace the meat eaten.

Because of the reasons fully explained, I no longer advocate the use of high protein meat substitutes. The beans, peas and macaroni that we have been in the habit of calling meat substitutes are no longer so cheap as they once were. Moreover, their dietetic value has been over-estimated. Their proteins are not as palatable nor as well suited to our bodily needs as the proteins of animal origin. The use of proteins from milk and eggs will prove as economical and more healthful than an excessive use of such vegetable protein meat substitutes.

But there is another sort of meat substitute which I deem

to be thoroughly sound in theory and often necessary in practice. Our habits of eating require that the meal have a sort of centerpiece or hub which is preceded by the soup and followed by the dessert. In ordinary American cookery the *"pièce de résistance"* or hub of the meal has been a meat dish. With it we have eaten bread and butter, potatoes or other vegetables. There is no real reason why a meal need be eaten in this fashion, but man is not a creature of reason but a creature of habit. To make food economy practical to the largest number of people the efficient thing to do is to require the least necessary change from past habits. Therefore I advise the use of dishes that may be served as the hub of the meal, as meat is usually served. These dishes may truly be called meat substitutes, as they enable one to follow the customary meal habits and leave the table feeling well fed. The exact chemical composition of such dishes is of less importance than is the flavor and manner of serving. If one cannot give up the liking for the taste of meat, use for such meat substitutes may be dishes made of part meat, or of well-flavored fried or baked products which may be served or eaten in the same manner as meat dishes. The general adoption of such dishes in the place of straight meat will result in a saving of from twenty to forty per cent of the food bill.

Butter substitutes may be considered from two standpoints: First, as a food that is equivalent to butter in both the nature and the quantity of the nutrition furnished; and second, a food to be eaten as butter is eaten and which will therefore cut down the amount of butter used.

In the first instance cotton-seed oil, or other cheap cooking fats, used in cakes and other dishes that ordinarily call for butter may be considered a dietetic equivalent for the fat of butter furnishing the same amount of nutriment and being distinguished only by the lack of the peculiar "rich" butter flavor and the presence of the butter vitamine.

To use butter for general frying is an obvious extravagance, yet in many homes it has become the custom to fry certain foods in butter, because lard, which is the only other fat used,

gives an objectionable flavor. If cotton-seed oil be substituted for both lard and butter, it would cut expenses in both instances, and the unwelcome flavor which lard gives to certain foods will be no longer an excuse for frying in butter. The only cases in which butter should be used in economical cooking are those in which the other ingredients are very weak in flavor and butter is relied upon to give flavor to the dish.

Because of our universal habit of eating butter spread on our bread, any other spread for bread will reduce the quantity of butter used. In the case where much fat meat is used there is no need for butter to add fat to the diet, but economy may be gained and food be made more palatable if sugar products are used as spreads for bread in place of a large portion of butter frequently used by Americans. An example of such a dish is orange marmalade so commonly used by the English.

The following is a standard recipe for marmalade. Varying proportions of oranges, lemons and grapefruit will give a variety of similar marmalades.

ORANGE MARMALADE.

Wheat pounds 4.61. Cost of recipe 46 cents. Cost per wheat pound 10 cents.

2 oranges.
1 lemon.
5 pints water.
4 pounds sugar.

Slice the oranges and lemon (including the peels) very thin. Let stand over night with the water. Put on stove next morning, boil one hour, let stand twenty-four hours. Then add the sugar, boil slowly two hours longer, and put in jelly tumblers. This amount should be boiled down until it will fill eight glasses. The marmalade keeps well and it is a good plan when oranges are cheap to make up a supply for the winter.

Marmalade is nothing but sugar flavored with oranges, and represents scarcely any cost at all except the sugar. There is a sort of subconscious idea running in the back of our heads that sugar is an expensive food. Even though sugar has doubled in price since the war, it is still much cheaper than most foods, and in nine cases out of ten its increased use would cheapen the diet.

The good old custom of making apple butter on farms where apples are cheap furnishes an inexpensive spread for bread that will reduce the dairy butter consumption. Sorghum and other varieties of molasses also cut down on the butter bill.

Another type of spread for bread is soft cheeses. Some of these cost more than butter, but cottage cheese, made from skim milk and enriched with cream and oil, makes a spread both nutritious and inexpensive. Cheese can also be made of buttermilk.

Heat buttermilk gradually to about 130 to 140 Fahrenheit. Allow it to cool, pour off most of the whey from the curd settled to the bottom, and strain out the rest. This cheese has hardly any fat, yet has a consistency suggestive of fat.

Cottage cheese made from either skim or buttermilk may be seasoned with salt only, or mixed with oil or butter or cream and various seasonings. Chopped olives or pimentos combined with cottage cheese enrich the flavor greatly. Cottage cheese can be used not only as a sandwich, but equally as well for the meaty part of a salad.

SWEET SPREADS UNSATISFYING.—Where the diet does not contain much other fat, sweet spreads will not satisfy, for as the German experience in the war proved, men crave a certain amount of fat and refuse to feel well fed without it. The following fat-containing butter substitutes may be used as spreads for bread. Some of them you may reject because they are not as tasty as butter, but they are all wholesome and economical and if economy is imperative there is no reason why you need to continue to suffer poverty elsewhere merely to indulge in an inordinate butter appetite.

The first of these is drippings so commonly used by the poorer classes in England. The drippings from fried or baked meats are very flavory and may be used as a butter substitute, both in cooking and as a spread for bread. The latter use will hardly be approved when there is company in the average American home, but the world food scarcity has forced some of us to serve foods we once considered as beneath our notice.

Cotton-seed oil is too flat in flavor and too thin in body to be a suitable spread for bread. It is not so bad, however,

for a hungry man as one might think. With a bit of salt, or still better, with a liberal amount of sugar, it is very palatable when eaten with good fresh bread.

There are many grades of oleomargarine, the better ones of which are superior in flavor to the poorer grades of butter. Because of our pride, and the fact that we can afford to be extravagant, oleomargarine was formerly held in bad repute because it was often marketed as butter instead of being sold under its own name. The war brought oleomargarine into better repute and whereas it formerly sold for not over one-half the price of butter, it now sells for three-fourths as much.

There is now on the market a "nut margarine" made from churning cocoanut oil with cream. This sells for about the same price as cotton-seed oleo, and is excellent while fresh, but does not keep well.

Vegetarian cookery brought forth many butter substitutes in the form of nut butters. The oil of nuts is fluid at room temperature, but the solid ingredients of the nut give certain firmness or body to the butter. Nut butters are excellent, but with the exception of peanut butter are more expensive than the dairy article.

Peanut butter is one of the most economical foods on the market. It keeps well and should be purchased in bulk or in large sized packages, as the rate charged for it in the small glass containers is exorbitant. The objection to peanut butter is in its mechanical condition. The solid substances of peanut butter form a tenacious mass which does not spread well, and if eaten in chunks gums up the mouth like corner grocery ginger snaps. The consistency of peanut butter may be materially improved by working it up with oil and water, or milk, or even plain water. The butter in this form will spread better and go farther and is more comfortable to eat. The manufacturers would undoubtedly take advantage of this were it not for the fact that the butter will spoil when water is added. Mixed up in quantities sufficient for a few days only, peanut butter in this form is very excellent and most economical.

The last group of butter substitutes which we highly recom-

mend are those in which gelatin is used to give body to the oil. Cook the gelatin with only one-half as much water (or milk) as is called for in making desserts. Gelatin may be cooked with milk in a double boiler. To the cooked gelatin while warm add the oils or butters to be used and whip with a fork as the gelatin begins to set. You can experiment freely with such combinations in various proportions.

Do not overlook the necessary salt, for if you forget this you will reject the butter substitute for tastelessness when it is merely due to lack of salt.

The adding of water to a butter substitute does not affect the economy except as it makes the oil contained go farther by giving us a larger bulk of material to spread on our bread. As a practical problem we should therefore judge the list that follows, both by the cost per pound and the cost per wheat pound.

	Price per lb.	Price per wheat lb.
Beef drippings	$0.15	$0.07
Molasses	.06	.08
Cotton-seed oil	.24	.09
One-half each cotton-seed oil and sugar	.16	.09
Orange marmalade	.08	.10
Peanut butter, three parts, oil one part, water two parts	.13	.10
Carrot marmalade	$0.08	$0.11
Peanut butter	.18	.11
Gelatin butter, oil one part, gelatin cooking milk one part	.16	.12
Oleomargarine	.28	.13
Nut margarine	.29	.14

I have given this attention to the subject of butter substitutes because the excessive price of butter makes many people feel they cannot afford it. I do not ignore that butter has a certain quality found in no substitute and that is the fat soluble vitamine. But this same vitamine is present in the milk and in green vegetables, so if these be abundantly used in the diet butter is not essential. The entire scheme of separating butter from the milk is an inexcusable practice, since it results in the wasting of the skim-milk which contains food elements equally as important. By using your share of the cow's product in its entirety and an ample supply of green vegetables, you can escape the system of robbery by which we pay for milk, but get only the butter, while the farm pigs get the milk.

TEN RULES FOR FOOD ECONOMY

1. First learn which are the most economical foods.

2. Second, keep a monthly grocery account and see to it that the larger portion of your food is of the economical sort.

3. Third, watch your daily menus and see to it that you plan dishes the chief ingredients of which are these economical foods.

4. Be resourceful and try all manner of new economical dishes to find those that appeal to your palate; then adopt these as regular items of your bill-of-fare.

5. Do not attempt to deny yourself entirely of the foods you like, as it will react and you will go back to extravagant habits.

6. Find out by study and observation the least quantity of food that will keep up your normal weight and, first from deliberate effort and later from acquired habits, learn to eat just the proper quantity of food and that amount only—as a matter of thrift, patriotic decency and personal health and efficiency.

7. Be economical in kitchen labor; two meals a day is enough for all but heavy laborers. A three-course dinner is enough for a millionaire.

8. Serve all foods that will not keep till the next meal as one portion per serving, with no second helping. Let the individual who has appetite for more than is first served him fill up on bread and butter or other foods that can be provided in excess of the amount eaten without involving waste. Those who cannot fill up on bread and butter have no healthy, normal hunger, but merely a pampered appetite.

9. Learn the new etiquette of the table which teaches that in the intelligent, cultured household just enough food should be prepared for the family and just enough served for the individual needs. Have a clean table and a clean plate at the end of the meal.

10. Do not waste your time on schemes to utilize left-overs—use your brains in planning meals and have no leftovers.