(*a*) The loss of albuminoid is greatest. It is indicated in the increased excretion of urea, and is measured by the muscular wasting and debility.

(*b*) The destruction of fat is evidenced by the emaciation and the increased excretion of CO_2.

(*c*) There are marked changes in the composition and quantity of the liquid elements of the body.

2. *The digestive and assimilative processes are perverted.*

(*a*) Gastric digestion, which is chiefly concerned in the utilization of albuminous, and to a minor degree of the fatty foods, is usually the function most seriously involved.

(*b*) Intestinal digestion is less perverted, and the carbohydrates and fats are more available for food purposes, provided they are given in liquid form.

There is, therefore, need to adjust the dietary with reference to the affected part, and—according to our estimate of the ability of these respective parts to perform their functions—to give foods which require either chiefly a gastric digestion or chiefly an intestinal digestion.

The excessive destruction of albuminous tissue, with the attendant increase in the urea to be eliminated, should make us watchful that there is no failure to excrete these products of nitrogenous waste.

3. *Adjustment of food to the existing conditions.*

(*a*) The food should be fluid; solid food frequently excites nausea and vomiting.

(*b*) It should be sufficient to equalize a part of the combustion coincident with the fever. This may be accomplished by supplying:

(*α*) Albuminous food in the form of milk, meat broth, or egg albumen.

(*β*) Carbohydrate in the form of strained gruel, toast, barley water, or some similar diluent and nutritive liquid.

(*γ*) Fat must not be given in greater quantities than is present in the cream of whole milk.

There are two conditions constantly present in febrile processes: first, increased combustion, and second, diminished assimilation.

When the excessive quantity of food required to furnish heat for one degree of bodily temperature is taken into consideration, it is manifest that we cannot hope to give sufficient food to compensate for the destruction of tissue resulting from the febrile process. Our aim should therefore be to give nourishment in a form that will tax least the enfeebled digestive organs, and that may be most readily assimilated.

The digestive juices are scantiest when the fever is highest, therefore adjust the administration of the most nutritive food to the time when the temperature is nearest normal, *e.g.*, in the morning and at noon, in a case of phthisis. The selection of food will be influenced by:

1. The age of the patient. For puny, badly nourished children and feeble, aged patients, a persistent effort must be made to maintain the strength of the patient.

2. The severity of the fever. An acute self-limiting fever in a robust individual warrants less anxiety, and less urgently demands the ingestion of a considerable quantity of nourishment. A high temperature for a protracted period demands a commensurate intake of nutriment.

3. The condition of the digestive and excretory organs. The diet should be entirely liquid, or semi-solid, according to the estimated condition of the digestive functions. In the exanthematous diseases, in which the kidneys may become acutely involved, an exclusive milk diet should be instituted.

Milk must be given first place as the food suitable for nourishing the sick. The curd must be modified by means of some of the methods previously indicated. The taste and digestibility may be changed by the addition of aromatics and malt extracts. The nutritive worth may be increased by the addition of egg albumen and carbohydrates, which should be given cool or warm according to the preference of the patient. It may prove more acceptable to the taste, and more easily digested, if taken through a tube. The milk intended for the patient should be kept separate from that used for other purposes, so that the quantity used in a day may be accurately determined. The evacuations should be studied to detect any evidences of failure to digest the fat or casein of the milk.

Meat should be given in a form that will prove acceptable to the patient. Clear bouillon, nutritive beef-tea, beef juice, or scraped beef must be selected according to the patient's taste and digestive power, and the stage of the fever.

Eggs will be found most valuable if only the whites are used. The yolks, however, are of service when convalescence is established and oils can be digested. They should be slightly cooked at a temperature not exceeding 180° F.

Gelatin preparations are regarded as "albumen-sparing foods," and may be secured in the form of gelatin, blanc mange, bromangelon, calves'-foot jelly, chicken jelly, wine jelly, milk jelly, and similar preparations.

In those cases in which a carbohydrate is desired, a strained cream of potatoes, peas, beans, asparagus, and similar vegetables may be employed. Cereals and light puddings, or custards, may be used.

Beverages.—First and of greatest importance is water, given in the largest quantity possible without exciting nausea. If there is irritability of the stomach, a simple carbonated water, or one combined with cracked ice and a few drops of brandy, may be found superior to champagne in allaying the nausea. Lemonade, prepared by using boiling water and straining after it has cooled, will be accepted by certain patients who cannot take it when prepared in the ordinary way. Dilute phosphoric or hydrochloric acid will be well received in some cases. The use of egg, barley, rice, oatmeal, corn, toast, and similar waters, will each in turn be found of utility. Tea and coffee, without sugar or cream, are not used as often as they might be in cases in which the contained alkaloids would not be objectionable. They have the additional advantage of possessing distinct therapeutic properties.

Alcoholic liquors are to be used only when a positive indication for them exists. They are valuable as foods and beverages, and require the minimum degree of effort upon the part of the digestive organs to utilize them. But they are not to be administered in doses larger than may be required to produce an odor in the breath some time after their ingestion. So long as the feebleness, restlessness, or sleeplessness is favorably influenced by their use, we may know they are doing good. The form in which they are exhibited is less important than is the purity of the beverage and the effect produced. In America whiskey is most used. All forms of alcoholic stimulants are less used than formerly.

Typhoid Fever.—Milk is, without question, the food best suited to these cases. This is true for the following reasons: (1) It is a complete and sufficient food; (2) it is most easily digested; (3) it is acceptable to almost all patients; (4) it is available, and its purity is easily determined; (5) it is easily modified as to taste, curd, and proportion of any constituent; (6) the dosage is easily regulated; (7) it furnishes a food which is both diuretic and diluent.

So far as can be determined milk is the food best adapted for the human race at all ages and in all conditions. The somewhat prevalent idea that a considerable number of patients cannot digest milk is not founded upon fact, the difficulty being due rather to individual peculiarity of taste than to inability to digest the milk. The cases of illness in which milk cannot be made the exclusive diet, if the patient is so inclined, must be rare. The milk may be made more acceptable by modifying the taste and curd, by diluting to the extent of one part of milk to four of water, by feeding through a tube or giving a teaspoonful every minute for eight minutes of each hour, by having the patient take it from a porcelain drinking-cup and preceding and following it with a tongue bath. If, after persistent efforts of this sort, the patient is still unable or unwilling to take milk, it may be necessary to give it as whey or junket, or it may be peptonized, or sufficient oyster or clam juice may be added to it to impart a distinctive flavor. The failure of the foregoing methods for the administration of milk may necessitate the employment of nutritive beef-tea, or manufactured beef preparations, the precaution being taken to ascertain that they possess albuminous worth.

Egg water, prepared by adding eight ounces of water to the white of one egg, is serviceable. Sherry or lemon peel or juice may be added to impart flavor.

The quantity of milk to be given to a patient must be determined for each particular case. Ordinarily, three pints in twenty-four hours is regarded as sufficient for the adult who is confined to bed with an acute illness. If the patient is given six ounces of milk every two hours, from 7 A.M. to 7 P.M., and two feedings of six ounces each during the night, he will receive three pints in twenty-four hours; or if eight ounces be given every three hours during the day, and twice during the night, the same amount will be ingested. This plan insures the administration of the quantity determined upon as desirable.

The evacuations should be watched, and the presence of curds or globules of oil would demand respectively either the lessening of the quantity of milk or the rendering of the curds smaller, and diminishing the quantity of cream contained in the milk.

Constipation will be less annoying if large quantities, *i.e.*, five pints or more, of water are given daily.

Hemorrhage, or perforation, will make it advisable to withhold all milk and give meat juice only; a half-ounce may be given every hour or two. When we remember that six ounces of meat juice represent the liquid element of one pound of beef, it will be appreciated that the patient is being sufficiently nourished. The beef juice is speedily absorbed, and leaves so little residue that there is no need to have a bowel movement until a sufficient time has elapsed for the bleeding point to have healed.

If we remember that the stomach is the first to recover its function, and that it has been least involved in the morbid process, we shall appreciate the fact that the dietetic indication is to give foods requiring gastric rather than intestinal digestion. A safe and extensively adopted rule is to give milk diet until the temperature has been normal for one week, then to give the whites of eggs raw or slightly cooked. Foods such as chicken jelly, junket, pap, an entire egg, strained cream of potatoes, oysters and clams, raw oysters, ice cream, cornstarch, arrowroot, egg custard, scraped beef, baked potatoes, and similar *properly prepared* good food, should constitute the diet for at least a month after the temperature has been normal.

Acute Articular Rheumatism.—The food suitable for any acute febrile process will be acceptable in this disease. The foods containing meat in any form are to be curtailed or entirely cut off. Milk foods and cereals in the form of broths are to be given. After the fever has subsided a greater variety of broths and light custards may be given. It is preferable to secure the nitrogenous elements of the food for these cases from a vegetable source, unless it can be given in the form of casein. Broths of oysters and clams, rice or barley soup with chicken, or egg prepared in digestible forms, may be administered, unless they excite some untoward symptoms.

Chronic Articular Rheumatism.—The conditions demanding dietetic consideration are similar to those present in gout, and the diet outlined for that disease will serve in this instance (*vide* section on Gout).

Gout.—Under this head are included Lithæmia, Uricacidæmia, Gall Stones, and Renal Calculi.

Without entering into a consideration of the identity of the pathology of these diseases, it may be confidently asserted that the dietetic treatment for all is so similar that they may be considered at the same time. It is well to remember in this connection that in these cases "there is a want of balance between the intake of food and the power of the body to oxidize and utilize it." Here, as in so many conditions, the disease is not limited to one organ, but is the result of an inability of all organs concerned in food elaboration. The end product of albuminoid digestion in these cases is uric acid, which is decidedly less soluble than the urea which should be the form in which the excretion occurs. The dietetic indication in these cases is to administer the food most favorable to the maintenance of the alkalinity of the blood, thus preserving its solvent power. Ready and complete digestibility and assimilability of the food administered must always be given consideration. Moderation is a watchword for all these cases. The food must be adjusted to the age and occupation of the individual. A vegetable diet is one most favorable to these conditions, and yet it would be a serious mistake suddenly to change the dietary of an individual from one made up chiefly of meat to one entirely composed of vegetables. The red meats are especially concerned in the causation of the conditions under consideration, and should therefore be replaced to a greater or less extent, according to the amount of work being expended, with the white meat of fowls and fishes. What will prove more efficacious in a considerable number of cases is to have the patient adopt a diet from which meat is entirely eliminated.

There is great need of a more extensive and accurate study of the causal relationship existing between food and the conditions conveniently grouped under the designation "lithæmia." Two propositions that seem almost axiomatic may, however, be stated: first, most individuals eat too much food, and second, most Americans eat too much meat. It is surprising what a small amount of food will prove sufficient for the demand of the system after maturity has been attained. A close adherence to the rule that permits enough food to satisfy positive hunger and no more is the price of comfort for many lithæmia patients. Fothergill expresses this idea when he says, "there is no nice way of having gout, and what is worse, there is no pleasant way of avoiding it."

The dietetic treatment will have to be adapted to the stage of the disease. During the acute manifestation of the disease none but the lightest nourishment should be given. Diluent, diuretic, and diaphoretic drinks, milk diluted with carbonated water, thin oatmeal gruel, or similar preparations, should be given. Hot drinks are indicated.

The interval between the acute manifestations offers the most favorable opportunity for influencing the disease. The greater facility with which we secure complete metabolism of a meal composed of one or two simple foods, selected with a view of securing a complete food, would make it advisable to adopt this method in arranging the dietary for these cases. The plan pursued in the meal composed of several courses is intended to stimulate the appetite, with the result that the digestive and assimilative powers of the individual are frequently overwhelmed with uric acid, which the organs concerned are unable to excrete, and an acute paroxysm of gout results. The nitrogenous element of the food for these cases may be derived from whole milk rather than from skimmed milk, which contains a larger percentage of albuminoid. If whole milk cannot be digested, it is better that it should be diluted with alkaline water than to have it skimmed. The fat contained in the cream is of service in lessening the amount of carbohydrate that would otherwise be required. Milk is of further advantage from the fact that it will not yield uric acid in the same measure as do most other nitrogenous foods.

In those instances in which a meat-free diet is not to be insisted upon, oysters and clams may be used in a great variety of ways, and their preparation enables us to introduce large quantities of milk and water into the system. Fish of almost any variety, excepting the indigestible forms, represented by those containing a large percentage of oil,—*e.g.*, mackerel, herring, eels,—are permissible.

The white meat of fowls may be prepared in a great variety of ways, ranging from broths to the minced meat made into panada, or, if the digestive power will permit, it may be given roasted, broiled, or stewed.

Eggs slightly cooked may be used, and if they are found unsuited as food for these cases, it will probably be the yolk that has disagreed, because of the large amount of fat contained in it. The albumen of the white is very easily digested.

Cheese, representing the albuminous and in some instances the fat constituent of milk, has many of the advantages possessed by milk as a food, and may be used to furnish the albuminous element of the meal. There is less likely to be indigestion from its use if meat is excluded from the meal, of which cheese is to furnish the nitrogenous element. The constipation so frequently associated with the diet into which cheese enters is less troublesome if cream cheeses are taken. The ability to digest different varieties of cheeses varies with the individual patients. Sometimes it is necessary to begin the use of cheese in the dietary by administering casein in the form of junket, then cottage cheese, Neufchâtel, or some similar cheese rich in cream. It not infrequently requires time and persistent effort before it can become a considerable element in the dietary of certain individuals. If we desired to give a cheese poor in fat and rich in casein, we should select the Parmesan cheese. This variety may be added to broths, after it has been grated, to increase their nutritive worth, or it may be made into sandwiches, and if whole wheat or gluten bread be used, there will be secured in such a combination a food containing a large nitrogenous element. Cheese is said to be three times as nutritious as meat. One has only to remember how largely this form of food takes the place of meat in almost every country except America, and to contrast the infrequent use of it in this rôle, to realize to what great extent meat enters into the dietary of the Americans.

Fats, in moderation, serve a useful purpose in the dietary of these cases. Any evidence of inability to digest them may be regarded as a contraindication to their use.

Sugars, just as fats, are permissible to a limited extent. They must not be taken in quantities sufficient to excite indigestion or to favor the development of corpulency. So far as sugars and fats can be utilized as heat and force producers, they do good; more than sufficient for this purpose should not be ingested.

The vegetable element of the meal should be made up of one, or at most two, vegetables. If the nitrogen required is supplied in the form of meat, milk, or cheese, then the vegetable had better be one composed chiefly of starch, *e.g.*, potatoes or rice. When peas or beans are used the contained nitrogen will furnish a portion of that required for the meal.

The green vegetables, so long as they do not excite indigestion by reason of their bulk and woody fibre, are allowable.

Cereals, when properly prepared and thoroughly insalivated, may form a part of the morning and evening meal.

Macaroni and vermicelli, arrowroot, corn starch and bread, offer convenient and digestible forms of starchy food.

Fruits suitable to these cases must be neither too sweet nor too tart.

All forms of food for these patients must be studied with reference to the effect produced on each case. The more nearly we accurately estimate the need and ability of a given case to metabolize various kinds and quantities of foods, the more likely we are to get satisfactory results.

Beverages.—Water stands first, and might with advantage be made the exclusive drink. Water, plain or medicated, hot or cold, should be used in large quantities to secure its mechanical and solvent effect upon the excretions. The most favorable time for its ingestion is a half-hour or an hour before, or several hours after a meal.

Tea, coffee, cocoa, cider, port, champagne, and malt beverages are not usually permissible. For those who require it, a light wine, poor in sugar and alcohol, if diluted with carbonated water, may be administered. Moselle, Bordeaux, claret, or Hungarian wines are permissible.

If a spirituous liquor is required, whiskey, brandy, or gin, well diluted, may be given.

The foods prohibited are those containing oxalic acid in considerable amount, *e.g.*, rhubarb, spinach, tomatoes, asparagus, sorrel, and radishes; neither must patients take spiced or dried meats, pork, bacon, veal, game, eels, mackerel, salmon, or lobster, or rich gravies, pastries, and candies.

Diabetes.—The dietetic treatment of this condition demands a painstaking and systematic estimate of the amount of sugar being eliminated by the patient. There is no other disease in which the relation of diet to the activity of the morbid process is so intimate. Anything less than the most detailed attention to the ingestion of food, and the excretion of sugar in the urine, is an act of censurable neglect. It can be readily appreciated that the selection of alimentary substances is of no more importance than their proper preparation. A condition demanding, for a protracted period, a diet composed of articles from which an entire class of foods—*i.e.*, carbohydrates—must be eliminated requires the greatest skill and ingenuity on the part of the one to whom the preparation of the food is entrusted. It is not enough to hand to a patient suffering with this disease a list of the foods allowed and those to be omitted. Here, more than in any other condition requiring dietetic direction, is there need to demonstrate to the patient the possibilities of the curtailed regimen permitted him. There must be a thorough understanding between the doctor and the cook as to what is to be attempted, and that the starches and sugars are not to gain entrance into the dietary in any form. For instance, it would not be permitted to use wheat flour as a thickening in soups when we had forbidden wheat bread in order to eliminate starch.

Before beginning the dietetic treatment of this disease certain facts should be determined as a result of observations extending over several days. The quantity of urine voided and the percentage of sugar contained in it; the diet yielding these figures; the weight of the patient and his strength, as evidenced by tests with the dynamometer or graduated work; all require careful consideration. After this has been done the capacity of the organism to metabolize carbohydrates should be determined. The plan suggested by von Noorden, according to which the patient is gradually placed upon a standard diet, may be recommended (Yeo, "Food in Health and Disease," p. 376).

Von Noorden's Standard Diet.—After the carbohydrate element of the diet has been gradually reduced the following diet is administered:

Breakfast: Tea, 5 gm. infused in water 200 c.c.; ham, 150 gm.; one egg.

Lunch: Cold roast beef, 200 gm.; cucumber, 60 gm. with vinegar (5 gm.), olive oil (10 gm.), salt and pepper (to season); Apollinaris water, 400 c.c. with brandy (20 cm.); coffee, without milk or sugar.

Dinner: Clear boullion, 300 c.c.; beef, 250 gm.; butter, 10 gm.; green salad, 80 gm.; vinegar, 10 gm., and olive oil, 20 gm.; sardines, 3; Apollinaris, 400 c.c., with brandy, 20 c.c.

Supper: Two eggs; Seltzer water, 400 c.c.

This diet contains about 204 gm. of albumin, 135 gm. of fat, and no carbohydrate. It is to be continued until there is an absence of sugar from the urine in the one instance, or until it demonstrates the amount of sugar being formed despite the absence of carbohydrate in the food ingested. This method yields a basis for the classification of these cases, and is of further advantage in enabling us to determine the ability of the economy to metabolize varying amounts of carbohydrates in those cases in which there was an absence of sugar from the urine after the patient had been upon the "standard diet" for a sufficient length of time. A patient whose urine shows no sugar for several days as a result of the carbohydrate-free diet, is allowed some form of starch, in gradually increasing quantities, until sugar reappears in the urine.

The following formula will then express his power to metabolize starch: tolerance to starch = standard diet + *x* grains of starch.

The gravity of the disease is proportionate to the amount of sugar persisting, notwithstanding the administration of the "standard diet." In the cases in which sugar appears in the urine despite this diet, we are given a measure of the transformation of the albuminoid tissues and fats into sugar.

The indications in regulating the diet of diabetic patients.—In the withdrawal of the carbohydrates, the economy being denied the usual supply of carbon for the production of heat and force, it becomes necessary to supply a sufficient increase of fat for this purpose, and greatly to augment the intake of nitrogenous food for the same purpose. The dietary permissible to these patients includes all meats, excepting liver, which latter, because of its contained glycogen, is not suitable; and fats, which are called the sheet anchor by von Noorden, and which, in addition to their nutritive worth, are esteemed because they tend to produce a feeling of satiety, and thus relieve the distressing hunger so frequently a prominent symptom in these cases. They in a great measure supply the deficiency of carbon resulting from the withdrawal of the carbohydrate. The administration of fat requires the greatest care lest a disgust for it be excited. It can be introduced in the form of a thin layer rolled in a slice of roasted beef, or between bits of broiled beef; as a mayonnaise dressing on various salads; as butter spread very thickly upon almond biscuit or gluten bread; in the form of gravy of fowls; in the form of meats containing a large proportion of fat, *e.g.*, mackerel, eels, blue fish, salmon, sardines, squab, and the dark meat of fowls; and ripe olives. Some writers also allow paté-de-foie-gras. The problem of successfully feeding a diabetic is largely one of skilfully administering in acceptable manner the various meats and fats. To these articles may be added a moderate allowance of green vegetables containing a minimum amount of starch, and possessing vegetable salts, the latter being of value for antiscorbutic purposes.

Meats may be given in any readily digestible form, such as beef in the form of broth; scraped meat cakes suitably seasoned, to which may be added chopped almonds, pine nuts, or celery; cold boiled ham; crisp broiled bacon with eggs: chipped beef creamed, or as a sandwich with gluten crackers; tongue, kidneys, tripe, sweetbreads, calves' brains, smoked meats, and game of all kinds.

Fish of all kinds may be employed, as, for example, oysters, omitting the liver; clams, lobster, crabs; caviare, plain, or combined with a few drops of grated onion in the form of a sandwich of gluten bread or diabetic biscuit.

Milk is of service in certain cases, the sugar of milk being less likely than most other forms of sugar to favor the development of glycosuria. *Cream* is of especial utility, containing as it does an albuminoid and a fat. It may be given plain, combined with various flavors, whipped, frozen, or in conjunction with white of egg. *Skimmed milk* has been urged by various writers, large quantities, as much as from nine to twelve pints daily, being urged by Donkin, who reports favorable results from its use. He points out that in this form milk offers a concentrated assimilable albuminoid. Part of the milk recommended is to be taken in the form of coagulated casein. Koumys, zoolak, and buttermilk may be found acceptable and unobjectionable in certain instances.

Cheeses prepared from cream are less likely to increase the amount of sugar present than are those prepared from the whole milk. All forms of cheese may be utilized in certain instances.

Eggs offer an ideal food because of the albuminoid and large percentage of fat contained in the yolk. Given cooked or raw, with a little salt to facilitate their digestion, they lend themselves to innumerable methods of preparation, and may be consumed in large quantities.

Gelatin, if regarded as an "albumin-sparing food," should be of utility. It may be given in a great variety of ways, such as in the form of milk jelly, blanc mange, chicken jelly, calves'-foot jelly, and similar preparations.

The vegetables allowable comprise most of the greens: lettuce, cress, spinach, cabbage, asparagus, onions, cauliflower, cucumbers, dandelion; also cranberries, gherkins, artichokes, horseradish, kale, green French beans, pickles, carrots. Potatoes are allowed by some as a substitute for bread, because the percentage of starch contained is smaller than in ordinary bread. If potato be given in the form of a salad, with mayonnaise dressing and onion, or if it be baked and butter and egg added, it should possess special nutritive worth.

Fruits containing little sugar, preferably those containing it in the form of levulose, are permissible, *e.g.*, apples, strawberries, gooseberries, currants, raspberries, sour oranges, and lemons.

Nuts of all kinds, excepting chestnuts, may form a large element in the dietary. They furnish a form of food that may be used extensively by varying the method of administration. If the patient picks the nuts from the shell he is apt to enjoy them more and is less likely to partake of them too freely. In other instances they may be administered after they have been ground in some one of the machines now upon the market for this purpose. This method of preparation overcomes the tendency to rancidity so pronounced in the nutmeals upon the market. Roasted and salted nuts are often particularly appetizing and sometimes aid digestion.

Forbidden Foods.—The forbidden foods comprise all saccharine or starchy vegetables and fruits, as well as the livers of animals and oysters *Bread* is not permitted except in the milder cases, where it should be "torrefied" or twice baked.

Gluten bread is certain to contain not less than fifteen per cent. of starch, and usually the amount is much greater. It is heavy, and patients not infrequently refuse to eat it. It is well to learn the possibilities of the various manufacturers' products of biscuit of gluten, almond meal, and similar food substances which are likely to contain less starch than is contained in gluten bread; they are quite palatable and keep indefinitely.

The *sweetening* required is to be secured by the use of saccharin. This substance is likely to excite indigestion, and must be used in the smallest possible quantities. There are tablets on the market containing one grain of saccharin, which offer the substance in a convenient form. Glycerin is recommended for sweetening purposes by some writers.

Beverages.—If alcoholic beverages are required because they have become essential to the patient, they should be confined to a dry or tart wine, such as Moselle, claret, hock, or Burgundy; brandy, whiskey, or gin may have to be given, and all beverages should be well diluted with an alkaline or carbonated water. Study the effects of particular wines upon a given case and regulate their administration accordingly.

Tea, Coffee, and Cocoa. Tea may be given, preferably with lemon; coffee, without milk or cream. Cocoa nibs and chocolate prepared without sugar may be used. The "*water cures*," notably those of Carlsbad, combine with the therapeutic effect of the water administered, a favorable environment, a suitable adjustment of food and exercise, medicated baths, massage, and an absence of the exciting causes that have been potent as factors in the production of the disease.

For one to whom so much is denied it is worth while to consider the possibilities of a daily ménu consisting only of the foods permissible. Such a dietary would comprise for one day:

Breakfast: Poached eggs and bacon; gluten bread; cream and hot water.

Luncheon: Cream of spinach; hot sardines on gluten biscuit, garnished with lemon and parsley; celery salad with mayonnaise; tea with lemon.

Dinner: Little Neck clams; consommé; roast beef; asparagus with melted butter; stewed onions; lettuce with French dressing; junket; coffee.

Nervous Affections.—Neuralgia has been defined as "the cry of a hungry nerve." The pain may be associated with the trifacial, gastric, hepatic, intestinal, or other nerves, and the neuralgia may be designated accordingly. If traumatic irritation has been excluded as an exciting cause of the condition, it is of importance to determine the degree of nutritional failure that is likely to be present in a particular instance. The intimate causal relationship between nerve pains and lithæmia or uricacidæmia, would lead one to endeavor to determine how far an excess of foods containing uric acid is concerned in the production of the neuralgia. Indeed, it would seem justifiable to regard neuralgia as a symptom; it may be of anæmic, lithæmic, gouty, rheumatic, or dyspeptic conditions, and these each, in turn, may be regarded as the products of faulty nutrition. Therefore the principles underlying the dietetic treatment of one condition will apply to all.

First, the habits of the individual must be studied. The food he has been accustomed to take, the care exercised in its preparation, the regularity in eating, and the suitability of the quantity and kind of food to the life work of the individual must be ascertained. A good practice in these, and in similar cases, is to have the patient continue, under observation, for a time without any dietetic restraint. Let a record of each meal be made and submitted for inspection, and in this way it is often possible to discover a potent factor in the causation of a morbid condition. It is well, however, to guard lest a patient in moderate circumstances should bring a list of fare so sumptuous as at once to disprove its accuracy.

The study of the urine, with special reference to the amount of uric acid being excreted, will yield most valuable data regarding the advisability of withholding certain albuminous foods. One cannot study Haig's work on this subject without being impressed with the intimate relationship existing between an excess of uric acid and certain neuralgic manifestations. Indeed, it is hardly possible to determine how far gout, rheumatism, and calculous diseases in general are dependent upon this same condition of uricacidæmia.

That diet is a potent factor in the successful treatment of all these processes is universally accepted. Therefore it is in order to consider what foods will give us sufficient of the various elements necessary for nutrition, and at the same time leave no excess of uric acid in the circulating blood.

The gradual withdrawal of all forms of meat from the dietary, with a proportionate increase of milk, cheese, and gluten foods to supply the nitrogenous food required, and a corresponding increase in the starches, nuts, and fruits, is recommended. No better example of this plan can be given than is found in the tables suggested by Haig (Tables 1, 2, and 3 on page 460).

It is not to be inferred that the dietary is to be limited to the articles suggested in these tables. Indeed, it is surprising to note what a variety of meals can be prepared without meat and the forbidden foods. On the other hand, certain patients find it entirely impracticable to live upon this or a strictly vegetable dietary. In these instances the liberal administration of beef in the form of nutritive beef-tea and scraped or chopped meat cakes, in conjunction with a decided increase in the fats, will give the best results. The fats suitable are obtained in cream, butter, bacon, and in the yolks of eggs, in the form least likely to tax digestion and excite repugnance.

When all the exciting causes of the disease under consideration are eliminated, the diet which maintains a condition of nutritional equilibrium will be the one best suited to the case.

Neurasthenia requires an excess of easily assimilable, highly nutritious food, administered at frequent intervals, in the largest possible quantities. This particularly applies to those cases undergoing what is usually designated "the rest cure." Here the food is urged upon the patient regardless of his desires, and even despite a positive disinclination for food. Milk, cream, and other forms of fat and oils, gruels and easily digested starches, are administered at frequent stated intervals, and the patient is aided in utilizing a part of this nutriment by the administration of massage and electricity, while he stores the remainder in the form of fat and muscular tissue. Indeed, the entire plan of the treatment aims to secure a marked increase in body weight. This is in accord with the view expressed by S. Weir Mitchell, who states that "loss of fat is constantly associated with impoverished blood, and that to gain in fat is nearly always to gain in blood." Many cases of neurasthenia which do not undergo the rest cure are greatly benefited by an ocean voyage, where there is usually a condition of limited expenditure of mental and muscular effort, coupled with an inclination to ingest and ability to digest excessive quantities of food. A neurasthenic who travels for his health should not be allowed to consume, in long journeys, irregular meals, and hasty sightseeing, all the energy developed from his ability to take increased quantities of food.

Insomnia is frequently referable to one or two classes of causes:

(*a*) Improper eating or drinking before retiring.
(*b*) Deficient nutrition.

The patients of the first class require only to have the food, drug, or drink that has been causing the insomnia to be cut off, and to have the evening meal composed of easily digested food. This, with the temporary use of a hypnotic, should accomplish a cure.

In the second class of cases an effort should be made to place the patient upon a higher nutritive level by the administration of light nourishing food between meals, and a cup of hot milk, a milk punch, or malt beverage with a biscuit before retiring. A complete food, such as "Bartholow's food," taken before retiring, will frequently insure a night's repose. It is desirable to have some milk or crackers at the bedside, in case they should be required during the night. The objection to liquors and malt beverages, as an aid in inducing sleep, does not apply to this class of cases as it does to the cases of insomnia occurring in youth.

Epilepsy is so rare in the herbivora, and so frequent in the carnivora that the immunity of the vegetarian animals would seem to give us a positive dietetic indication for the treatment of this disease. The red meats and coarser forms, such as bologna, seem to be especially prone to excite convulsive attacks. Gorging with food, especially improperly masticated meats and other forms of nourishment—notably peanuts—are noted as being likely to excite epileptic paroxysms.

The intimate relationship between the ingestion of an excess of unsuitable and improperly masticated food and an epileptic seizure must be familiar to all those who have given considerable attention to this class of cases. The dietetic treatment of epilepsy promises most when the patient is under the complete control of an attendant. For this reason the epileptic colonies should secure the best results, other things being equal.

The diet that promises most for these cases is one in which meat is reduced to the lowest quantity consistent with the demand for work and growth. In early youth and old age, fish and white meat, with the occasional administration of red meat for the noon meal, are best. Aside from this, the diet should consist of cereals and vegetables, and the meals should be eaten at fixed hours. The frequency of the attacks during the night would suggest the desirability of having the evening meal composed of easily digested food.

Exanthematous Diseases.—The diseases characterized by a skin eruption in the course of an acute febrile process will demand especial dietetic direction only in those instances in which nephritis has occurred as a complication. Here milk is to be made the exclusive nourishment, until the absence of albumin from the urine indicates the improved condition of the kidneys and permits a more extended dietary.

Skin Diseases.—These, when not of parasitic origin, are frequently influenced by diet. The causal relationship between the occurrence of urticaria and the eating of

certain fish, molluscs, fruits, or cereals is fully established. Certain cases of eczema, acne, psoriasis, furunculosis, dermatitis, and pruritus can be favorably influenced by attention to the character and quantity of the food. That there is found associated with indigestion and lithæmic states a condition favoring the development of skin eruptions, there can hardly be any reasonable doubt. The diet outlined for lithæmia will be found suitable for these cases (*vide* section on Gout).

B. Franklin Stahl.

DI-ETHYL-KETONE.—$(C_2H_5)_2CO$, metacetone or propione-ethyl propionyl. This is a colorless, mobile liquid obtained by the dry distillation of sugar with an excess of lime. It smells like acetone, boils at 101° C., and is soluble in twenty-four parts of water, and freely in alcohol and ether. Well diluted, it has been administered by Giovanni in doses of from 0.5 to 1.5 gm. (gr. viij.–xxiv.) to control maniacal or hysterical excitement, and by Albanese and Barabini to induce sleep in animals.

W. A. Bastedo.

DIFFERENTIATION.—(Med. L. *differentiare*, from *differentia*, difference.) Murray defines *differentiation* as "any change by which like things become unlike, or something homogeneous becomes heterogeneous." In the more special, biological, use of the term it is employed to indicate "the process, or the result of the process, by which in the course of growth or development a part, organ, etc., is modified into a special form, or for a special function; specialization: also the gradual production of differences between the descendants of the same ancestral types." In its biological meaning, then, the term may be applied either (1) to certain phenomena in the development of the individual, or (2) to the origin of species; and in each case it may be used to indicate either (*a*) the process, or (*b*) the result of the process.

Taking these meanings in the reverse order, the result, or state, of differentiation of species (2, *b*) would be exhibited by a comparison of the various organs, tissues, habits, modes of life, and other characters of the numerous species and other groups of both animals and plants. It would involve not only a study of their comparative anatomy, but also of their physiology and ecology as well; and thus would be far beyond the scope of the present article.

For the differentiation of species regarded as a process (2, *a*) the term *organic evolution* is commonly employed, and the subject will be discussed in the present work under that title (see article *Evolution*).

In the individual, as among species, the state of structural differentiation (1, *b*) is inseparably associated with functional differentiation, or division of labor. In order to describe the state of differentiation in any form of animal or plant, it would be necessary to make an extended study of the structure of its various organs and tissues and of the various functions that these parts perform in the economy of the whole. For man the results of such studies are set forth in the books upon descriptive anatomy, histology, and human physiology.

The *process* of differentiation by means of which differences arise in the structure and functions of parts of the organism (1, *a*) may be considered under two headings. First, we have the facts in regard to the processes that have been observed in the study of the development of organisms; and, second, we have the theories that have been advanced to explain these facts.

In no existing form of life is there an entire absence of the state of differentiation in any stage of development of the individual. In the protoplasm of the amœba one may distinguish endosarc and ectosarc, nucleus, and contractile vacuole. The protoplasm of bacteria was supposed for a long time to be homogeneous; but Bütschli has demonstrated that by proper methods of staining two distinct substances may be observed. In the germ cells of all the higher animals and plants it is always possible to distinguish nucleus and cytoplasm. In the ova of many animals the cytoplasm is differentiated into two parts: one which contains nutrient material in the form of yolk granules, and the other which is free from yolk, and in which the process of development begins;—not to mention various differentiations in minute structure which cannot be entered into here. The ovum, however, is vastly less differentiated than the adult form, even in the simplest of multicellular organisms.

The process by which the differentiated condition of the adult arises is essentially a cellular phenomenon. In general, development may be divided into three stages: first, cell division; second, growth by the absorption of water and other material; and, third, differentiation. These stages are shown in their simplest forms in the growing ends of the roots or stems of plants. At the tip there is a group of small cells with thin walls and relatively dense protoplasm, in which the nuclei may be seen to be in various stages of cell division. Separated from these by cells in various intermediate stages, there is a zone of cells still having thin walls, but which are much elongated and have numerous large vacuoles in the cytoplasm. In this zone cell division is comparatively rare. It is the zone of growth, and on its proximal side grades off into the next zone, where cell division entirely ceases, the cell walls become thickened, and the cells become differentiated into epithelium, bast, wood fibre, ducts, etc.

In animals the process is not so simple, nor is it always so in plants; for in reality there are two forms of differentiation occurring more or less at the same time. One we may call *anatomical differentiation*, and the other, *histological differentiation*.

During the periods of cell division and growth the cells do not all divide with equal frequency, nor do they all enlarge to the same extent. When the cells tend to arrange themselves in layers, as they do in animals, this inequality of growth causes foldings, the folds may fuse together, and old connections may dissolve. In this way unequal division and growth of the cells, resulting in folding, fusions, and separations, cause a differentiation of the mass of the ovum, whereby the areas are determined which shall include the rudiments of the various organs. In the embryo chick, for example, one may see the boundaries of the central nervous system, the notochord, the heart, etc., while the cells composing these rudiments are still in the most embryonic condition and cell division is going on rapidly. Thus, anatomical differentiation begins in very early stages of development, and precedes the process of histological differentiation, which results in the modification of the cells so that they may form the tissues appropriate to the organs or parts of organs in which they lie. (Further details in regard to the facts of differentiation may be found in the articles *Area Embryonalis*, *Fœtus*, *Gastrula*, *Germ Layers*, *Segmentation of the Body*, etc.)

When we come to consider the conditions under which individual differentiation takes place, we see at once that these may be divided into two categories. For example, we may take an egg of a sea urchin and an egg of a starfish, small transparent eggs not very different in size or general appearance and yet sufficiently unlike to be easily recognized. These, placed together in a bowl of clean sea water of the necessary temperature, and containing sufficient oxygen, will proceed to develop into larvæ; and, although the conditions of the environment are exactly alike for both eggs, one will become the larva of a sea urchin and the other the larva of a star-fish, according to the source of the egg. Or, again, consider a new-born litter of puppies. They are out of the same bitch, have been sired by the same dog, have undergone development at the same time in the same uterus. Yet these puppies will be sufficiently different so that each one may be recognized easily. On the other hand, any puppy in this litter will resemble the others and both parents more closely than will any puppy out of a similar litter dropped by any other bitch and sired by another dog. It is evident that there is something inherent in the germ cell that causes differentiation to proceed in a certain way more or less independently of surrounding conditions. Moreover, the resulting peculiarities of the offspring are cor-