If men are fearfully and wonderfully made, there is nothing more marvellous in the form of this creation than the character or substance of the food they eat. In this food there is carbon, serving as a fuel for the support of animal life; and carbon, hydrogen, oxygen, and nitrogen make the four essential elements of human life. Phosphorus, sulphur, chlorine, sodium, potassium, calcium, magnesium, iron, and fluorine are but of secondary importance among these primary elements. In all these which the animal and vegetable kingdoms provide, the sustenance of our daily existence is found. They give strength to the limbs, flesh and blood to the frame, and muscle to the whole body.

Carbon, with a little hydrogen and oxygen,—the chief constituents of our food,—compose the alimentary support found in butter, suet, and in all those fatty or oily elements which become part of every healthy life. The flesh, blood, and bones need the phosphates derived from animal and vegetable food. The iron in our blood is obtained chiefly from the meat we eat, and traces of iron are found in milk, eggs, and in almost all kinds of vegetables. The elements I have named are parts of one great whole; and in the food we eat, their mixture is necessary to prevent waste and decay. Using any one of them alone,—which is almost impossible, as the combination is practically a necessity,—the human system would lose about all its forces.

These elements make blood and cause nutrition. There is in them the power of respiration, and there is no real life without them. The saccharine qualities, as water and sugar, the oleaginous, representing butter, the nitrogenous, representing albumen and salts, the aqueous, representing water and other fluids, include and conclude all sources of supply. Water in quantity, if not in variety and quality, holds all these elements. Nine tenths of the milk we use is water. Uncooked beef contains 70 or 80 per cent. of water, and many vegetables have even a larger percentage of fluid; but while this is true, milk is almost the only fluid that supports the human body. This fluid, besides holding water in greater proportions than almost anything else, represents sugar and casein, which, in close alliance with albumen and butter, represent in food what is oleaginous. The proportion of these ingredients in human
milk are ten parts of casein, which makes blood, ten parts of butter or fat, twenty parts of carbo-hydrate or sugar, and a tracing of salt.

For infants and adults alike, physiology has proved in recent experiments that casein and albumen are the essential producers of blood, and we all know what this fluid performs in the work of rebuilding and strengthening the human frame.

The combinations of the several groups of human food are aqueous, saccharine, oleaginous, albuminous, gelatine, and saline. The best recognized teachers of the qualities of food remind us of what is necessary to make up the deficiencies in the wear and tear of life, if we would preserve the necessary fires of animal existence. With constant waste in one direction, the necessary daily food to prevent this decay is required as the needed balance to preserve life.

The "good digestion which waits on appetite" depends largely upon the food we eat. The quantity is oftener far too much than too little, but quality and quantity are essential to the health which almost alone comes from good digestion. Age, sex, habits, uses, and cultivation may regulate the quantity. Any fixed quantity is, therefore, without individual knowledge, almost impossible.

In the army and navy, in the hospitals, and in prisons especially, the quantity is prescribed by pounds and ounces, and the portion is, as it ought to be, based upon the exposure and work done by the consumer. The prison worker usually receives 36 ounces of food, of which whole quantity in England there are 16 ounces of meat during the week. The diet of a single Esquimaux has been given as 35 pounds in 24 hours, and a Siberian Cossack is said to consume from 12 to 20 pounds of animal food daily. Conaro, a famous name in Dietetics, reduced his self-offending corpulence, and lived to the age of 100 in fair health, upon 12 ounces of food, mostly vegetable, and 14 ounces of light wine. State criminals as a rule fare much better than the very poor in private life; and especially is this true in cases where disease is produced by poverty.

THE PROPER COOKING OF FOOD

is one of the fine arts, and men and women engaged in this art are public benefactors so far as they thereby produce physical health. Mental happiness and domestic comfort are largely conditioned upon well cooked food used within the bounds of reason. Without proper limits of quantity the stomach is as much affected by an excess of eating as the brain becomes crazed or addled by intemperance or excess in drinking.

THE ASSIMILATION OF THE FOOD

put into our stomachs is essential to bodily nourishment, and becomes necessary to the avoidance of half the ills which flesh and blood are heir to. How best to secure this nourishment seems from common observation to form one half the work of medical practice.
There can be neither peace nor pleasure where there is bad digestion, and the source of bad digestion is to be chiefly sought in unwholesome food, bad cooking, and the adulteration of what we eat and drink. There are kinds of food which resist the action both of the stomach and bowels, and even nutritious food may be so prepared as to become indigestible, and positively injurious. The kernels or seeds of currants, gooseberries, melons, and grapes, and the skin of apples and pears, are of the class of indigestible substances; and so also are the skins of wheat, oats, barley, pease, and beans. The teeth may break them, or proper cooking remove them, but without this these substances, which the chemists call lignin, are injurious.

Among the birds, these seeds are often swallowed and dropped without digestion; and some of the grandest trees and most beautiful flowers that the eye of man has ever seen are the fruits of the seeds sown where the birds of the air “have winged their way over the earth.”

Whatever we may say of the grandeur or aesthetic taste of our drawing-rooms and parlors, and the utilities and uses of our libraries and dining-rooms, the important and essential part of a true domestic home—little as the family may see it, or know of what is done there—is the kitchen. Here, in every well conducted home, is a

**PRACTICAL SCHOOL OF ORGANIC CHEMISTRY,**

and this kind of chemistry, in the form of skilful or careful cooking, is not only one of the fine arts, but just that one which may give strength to the limbs, proportion and beauty to the form, and vigor to the whole constitution. Here are the means to the end which provide, in the food we eat, the digestion and appetite of all between the ages of the tenderest infancy and the fulness of the most mature life. Here are found what are called both the proximate and the ultimate principles of life and health. Here are the evidences of those four great elements of nourishment already named,—carbon, hydrogen, oxygen, and nitrogen,—and each provided by Providence for the food of man.

The mixture of one or more of these elements is essential to existence, and the use of one of them alone would in time produce waste and decay. These compounds include starch, sugar, gum, and albumen, and make blood, bones, and muscle, and give form, subsistence, and growth to the human body.

The most palatable and beneficial of our varied kinds of food is milk. While its nutritious power is stated at less than one tenth of 1000 parts, it is the best if not the only natural food that seems to support the animal body. There is in it sugar, albumen, casein, and butter, which we usually regard as one of the most welcome parts of our morning and evening meals. Where beef, mutton, veal, chicken, and pork average from one fourth to one third in the 1000 parts of nutriment, and wheat, barley, and oats from three fourths to nearly all, pure milk offers the most natural and healthy food.
OF OUR FOOD, AND ITS ADULTERATIONS.

Of general adulterations I shall speak very briefly. They are found in a greater or less degree in much that we eat, drink, and wear; and this fact demands, at least, if not for the household at home, for those who provide for the poor and the rich, knowledge both of whom they buy and what they purchase. As a safe rule, in our food and drinks we may banish, except when prescribed by a physician, all our stimulants and all our condiments, with the exception of salt, which is a necessary alimentary principle, and occasionally vinegar when used to soften the texture of our food. None of these stimulants are necessary to health; none of them add to nutrition; and all of them tend rather to weaken than to strengthen the organs of digestion.

FOOD ADULTERATIONS.

The extent of food adulterations is one of the worst signs of the times. No country is free from this public evil, nor hardly any occupation. English food and drug adulterations, as stated on British authority, and chiefly upon the investigations of Dr. Hassall, are so common as to be notorious in their numbers, preparations, and uses. It is next to impossible to reach and punish these abuses; but where it is possible, the attempt at least to reach and punish the crime should not be omitted, nor prove a failure.

New York state and city, and boards of health elsewhere, have investigated and proved the following adulterations:

In coffee, so called, where not an ounce of coffee was found in the pound, and where, in other cases, French chalk, gum arabic, charcoal from wood, yellow ochre, and a mixture of clay and hydrate oxide of iron, chrome orange, celestial blue, and turmeric, the powdered root of curcuma longa, were found as coloring agents. All these came from one factory alone. In another were found Venetian red, quina, indigo extract, chrome yellow, and orange and Prussian blue, and both of the latter were very common.

The health boards, thanks to the chemists in some of the cities, have succeeded in condemning and removing the Prussian blue and chrome yellow from certain factories; but this whole coloring system is meant as a deception, and is an actual fraud.

Tea. The importation of vicious teas in large quantities has been in part suppressed. But the impure teas thrown upon the market have often been three fourths of the quantity imported.

In milk, water is the most innocent of all adulterations, but it is not always pure water. Often barley is fed to the cows, and in some dairies there are pits containing loads of this grain. The milk of cows thus fed in summer is not a healthy food for children, and it is often fed when the barley is fermented and rotten.

Spices are notoriously largely adulterated; and what is called cream or tarter, the odors in the manufacture of which the N. Y. state and local boards of health have had to suppress by stopping the factories altogether,
at times have had the added offence of cream of tarter sold with 95 parts of gypsum or *terra alba* to 5 parts of tartaric acid.

In milk the adulterations have been even worse than this record. The health office chemist of the District of Columbia has found in Washington a liquid sold there for consumption, under the name of milk, where the substance sold contained not one drop of milk, and was reported as an offensive concoction of the brains of animals.

**THE ADULTERATION OF DRUGS,**

upon the proper use of which depend health and life, demands the attention of health authorities, and of all in any way interested, commercially or otherwise, in their prescription or use.

**IN SPIRITS,**

especially in wines, the adulterations are much worse than in coffee or general articles of food. The municipal laboratories of Paris report that almost every kind of eatable food is adulterated; and in a late report the statement is made, that the wine dealers are trying to have the analysis of wine abolished, and some of the Paris deputies, fearing the loss of votes, hesitate even to promise the suppression of the evil. In 1881, upon 3,361 samples of wine examined, 56 per cent. were found bad, and 6 per cent. dangerous. The 6 per cent. marked "dangerous" is about the average of what is beyond the merely bad qualities. What is called antiquated or colored wine, or wine in apparently old bottles, is covered with cobwebs. This is one of the curiosities of the trade.

It is not enough, unless wrong and fraud are to be defended, to say that the adulterations of what we eat and drink are harmless. What is complained of, as proven to the N. Y. State Board of Health is, for example, that hominy burned and ground, or roasted, is sold for coffee, and the same is true of chicory, rye, beans, and other substances. What is called coffee is often wholly without coffee, or without enough of the genuine article in the quantities examined to admit of scientific tests.

**BUTTER,**

we need not say, should come from the dairy and not from the fat of animals. The fact of adulteration in this article, if ever so harmless, should be known to buyer and consumer.

New York, by statute, has recently forbidden the manufacture of sham butter, forty millions of pounds having been sold in the state in a single year. The constitutionality of this law may be put upon trial, and, if it fail to stand this crucial test, the old evil will continue, and oleomargarine will be sold for butter. But the great wrong consists in calling what is evil good, or what is adulterated pure.

Looking abroad, in Bavaria for example, I see, as recently as in
August, 1883, that at Menningen alone an inspection resulted in the con-
demnation of 33 breweries, and in fines ranging from $50 to $250 each,
according to the measure of impurity found. Three other brewers were
sentenced to eight months' imprisonment. We need some of these
wholesome examples in the United States.

Consumers ought not to be satisfied when spices are sold as pure, of
which 112 out of 180 samples have proved impure, though not poisonous.
The lowest impurities in these samples were 40 per cent. in nutmegs, 50
per cent. in mace and red pepper, between 70 and 80 per cent. in white
pepper, cloves, and allspice, 81.8 per cent in cinnamon, and from 50 to
66.6 per cent. in red pepper, mustard, and ginger. Glucose may be
harmless enough, but when 35 and 50 per cent. are mixed with honey
and maple and cane sugars, and in several samples of brown sugars from
22 to 33 per cent., the deception is palpable and flagrant. While glu-
cose may make a pure and wholesome food, it must not be sold for an
article which is more pure and much more costly.

DRUGS.

Medicinal chemicals are not all adulterated to the extent suggested.
Of 317 samples examined by Prof. Chandler and his assistants in New
York, only 11 were found to be adulterated or of inferior quality; of 232
samples of vegetable drugs, 85 either did not come up to the required
standard, or were plainly adulterated. And of 110 specimens of pow-
dered drugs, such as ipecac, jalap, orris root, rhubarb, and mustard-seed,
46 either in purity or strength failed to meet the required standard.
Powdered drugs as a rule have proved the least reliable and satisfactory.
This is especially true of short weights in sodas and seidlitz mixtures;
and here the fraud is believed to be intentional, and the prescription is
necessarily a failure.

DIFFERENT METHODS OF DECEPTION.

The arts and tricks practised by the manufacturer of medicines are
almost, if not altogether, equal to the skill of the best chemical and sci-
entific experts. Where inspectors have once discovered intentional
decception, as by the use of microscopic examinations, the substance once
detected has been removed and other substitutes provided to take the
place of what should be wholly genuine. Flour and starch, once detected
in powdered medicines, have after this fashion been removed. Expe-
rience, skill,—in one word, knowledge,—are required to find out just
what is put into powdered medicines which ought not to be there. Real
tests should be applied to roots and seeds, like ipecac, jalap, mustard-
seed, etc.
OIL FOR CONSUMPTION.

Most kinds of oil are more or less adulterated, and the chief fraud is in calling oil made from cotton-seed, pea-nuts, beech-nuts, poppy, and the ground nut oil of Africa, etc., olive oil. The American cotton-seed, bought at home for three cents a pound, is sent to France and there made into oil, and sent back to the United States and sold for $3 a gallon. The adulteration is common all over Europe and the United States. Cotton-seed oil refined in England is sent in large quantities to Italy for the adulteration of olive oil. Beech-nut oil is largely used in Germany, and, with copper used to give it the required tinge, is sold there and elsewhere as Malaga oil. These adulterated oils are sold in great bulk.

CHEESE ADULTERATIONS.

Cheese in Thuringia and Saxony is adulterated with potatoes or bean meal. The rind has at times in it Venetian red, and at other times blue vitriol and arsenic, to give the cheese the appearance of age. Sometimes nicotine and sulphate of zinc are used to give the cheese a biting flavor, and at times the Limburger cheese is shamefully tampered with. Lard cheese is made at 23 state factories in New York from granted patents, and none, as reported by Prof. Caldwell, is made elsewhere; 6000 lbs. of skimmed milk, 80 lbs. of lard, and 600 lbs. of butter make from five to six hundred pounds of cheese, and 14 per cent., or about 70 lbs. of the whole, is lard. Such cheese is less digestible than when made of milk, and this is also true of oleomargarine butter in comparison with pure dairy butter.

SUGARS

are much less adulterated than formerly. The organic and inorganic dust, dirt, salt, starches, vegetable albumen, terra alba, gypsum, plaster of Paris, once in use, with other and worse ingredients, have, as a rule, passed away, and the adulteration is now limited more to glucose mixed with or added to the refined cane sugar, and the bleaching of brown sugar by the use of tin salts. The dust and dirt, which often enter into the sugars, are the result of either great carelessness or of vicious intentions. Where ultra-marine is used to neutralize the yellow color of the sugars, imparting a bluish white, as was found in 24 of 33 samples, the purpose is not adulteration, and the coloring matter is not injurious. There are before me authorities showing the extensive and carefully planned adulterations in butter, alum, borax, barium, curd, fats, flour, gypsum, lard, lead carbonate, lead chromate, yellow potato flour, salt, sodium, silicate or soluble glass, soapstone, starch, etc., etc. French, German, and English authorities name all these uses and abuses. Lard or cheap fats are as common adulterations in England as in the United States. Where (see letters of W. A. Crofert) loads of sacks filled with
pease and beans are ground and sold for coffee, and the sweepings of factories are used to adulterate ginger, two thirds are impure to one third of the pure article retained. Old boots and shoes literally pass through the heat of the hottest ovens to be mixed with pepper, and old tannin, removed as a nuisance, is ground into cinnamon. This class of domestic manufactures simply forbids all additional comment upon what at times is thus made and sold.

Finally, there is no more reason in truth, and there is much less reason in fact, why food adulterations should be more tolerated or excused than adulterations in gold or silver, or the use of counterfeit money in coin of any kind. What is sold as food to eat, or as coffee, tea, cocoa, beer, or wine, or more stimulating spirits, for drink, should be pure. The gold, when adulterated for purposes of science or manufactures, should state the grains of pure gold in the coin or in the article made, whether in jewels or any other thing manufactured. The same at least should be true of the silver dollar coined at the mint, and of every article of silver. Even more should this be true of what we eat and drink.

I am not surprised, however, to hear the federal government cited as a successful example of adulterated money, by those who practise the manufacture and sale of tainted and adulterated food and drugs. We cannot always control the government, but we can at least insist that the manufacture and sale of adulterated food and medicines shall be exposed to the public eye and punished by public law.