pats the top of the cranium. The two positions are shown in Nos. 11 and 12. Nos. 16 and 17 show the belt kick and the high body kick. No. 18 shows the backward side face kick and the parry; while No. 20 is a striking picture (as they all are) of front side face kick and parry.

The present representative professors of the savate in Paris are Messrs. O. Quillier; Charlemont, Jr.; and Leclerc, successor of Charles Lecour. The first is an amateur professor who teaches merely for the love of the art. To him I am deeply indebted for facilities given me for studying the savate. I also wish to return thanks to the Paris representative of the Eastman Kodak Company for courtesies extended.

# FOODS IN THE YEAR 2000.

## PROFESSOR BERTHELOT'S THEORY THAT CHEMISTRY WILL DISPLACE AGRICULTURE.

By Henry J. W. Dam.

"WHAT will the man of the future eat?" The answer to this question has been undertaken, not by an imaginative writer, but by one of the greatest of living men of science, Professor Berthelot of Paris; and it may be said at once that, but for his scientific eminence and the undeniable facts upon which he bases his forecast, it would pass the limits of human belief. The epicure of the future is to dine upon artificial meat, artificial flour, and artificial vegetables; drink artificial wines and liquors, and round off his repast with an artificial tobacco beside which the natural tobacco of the present will seem poor indeed.

### WHEAT FIELDS AND CORN FIELDS TO DISAPPEAR.

Wheat fields and corn fields are to disappear from the face of the earth, because flour and meal will no longer be grown, but made. Herds of cattle, flocks of sheep, and droves of swine will cease to be bred, because beef and mutton and pork will be manufactured direct from their elements. Fruit and flowers will doubtless continue to be grown as cheap decorative luxuries, but no longer as necessities of food or ornament. There will be in the great air trains of the future no grain or cattle or coal cars, because the fundamental food elements will exist everywhere and require no transportation. Coal will no longer be dug, except perhaps with the object of transforming it into bread or meat. The engines of the great food factories will be driven, not by artificial combustion, but by the underlying heat of the globe.

In order to clearly conceive these impending changes, it must be remembered that milk, eggs, flour, meat, and, indeed, all edibles, consist almost entirely (the percentage of other elements is very small) of carbon, hydrogen, oxygen, and nitrogen. Oxygen and hydrogen are the two gases which, when combined, form water. Oxygen and nitrogen mixed are the air we breathe. Carbon forms the charcoal of wood, is the main constituent of coal, and as carbonic acid gas in the air is the chief food of the vegetable world. These four elements, universally existing, are destined to furnish all the food now grown by nature, through the rapid and steady advance of synthetic chemistry.

Synthetic chemistry is the special science which takes the elements of a given compound, and induces them to combine and form that compound. It is the reverse of analytic chemistry, which takes a given compound, and dissociates and isolates its elements.

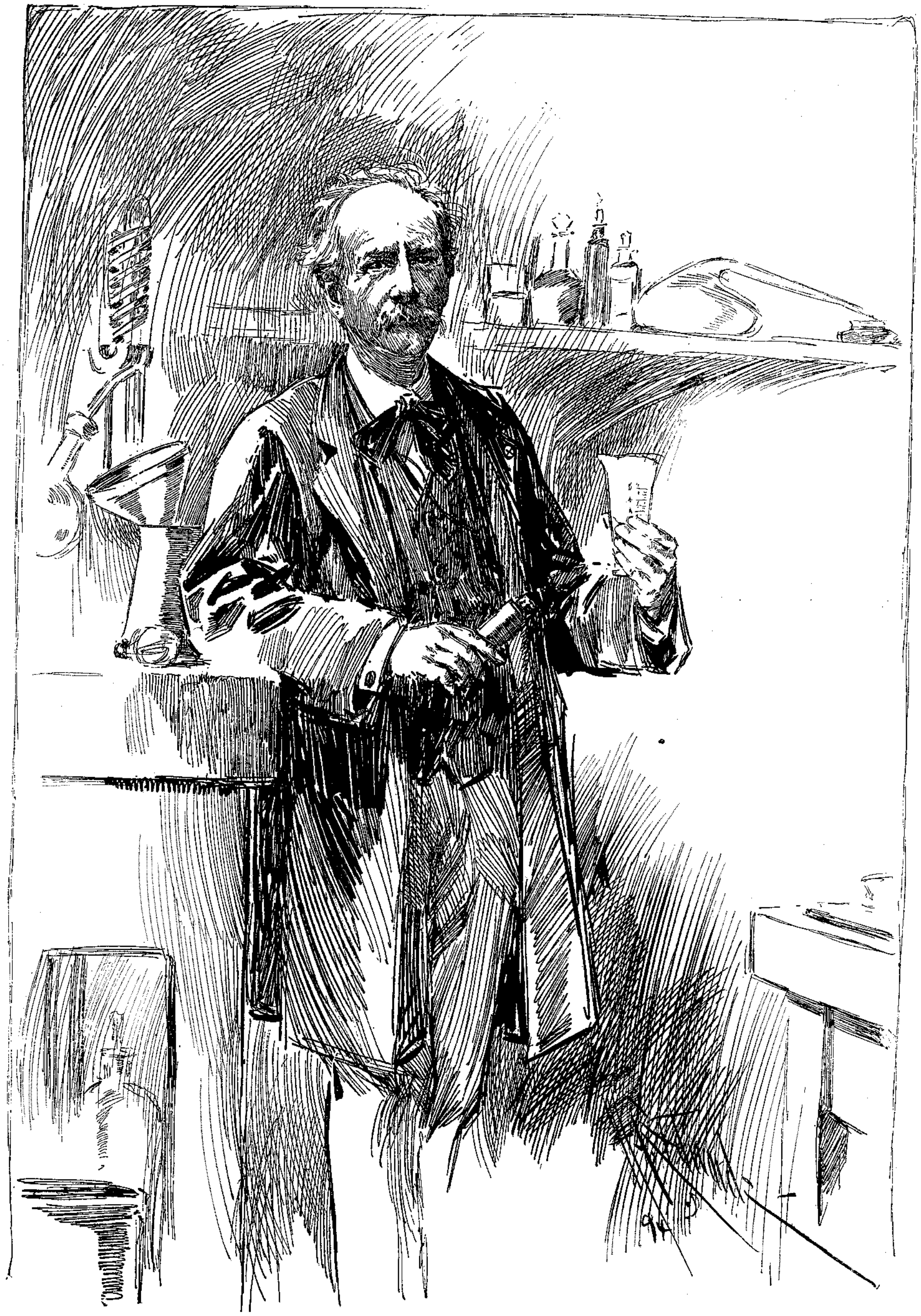
Analytic chemistry would separate water into oxygen and hydrogen, and synthetic chemistry would take oxygen and hydrogen, mix them, put a match to the mixture, and thus form water. For many years past synthetic chemistry has had an eager eye upon food-making. It has already progressed so far that several great agricultural industries have been destroyed by its advancement, compounds which were once obtained by plant growth in the fields being now entirely furnished by chemical laboratories and direct manufacture. In fact, the clear evidence of the present leads quite logically to the conclusion that at some more or less distant period in the future, synthetic chemistry will destroy all the great agricultural industries, and put to new uses the grain fields and cattle ranges of to-day.

PROFESSOR BERTHELOT.

No man is more entitled to act as a prophet in this field than Professor Berthelot. If not the father, he is certainly the foster-father, of synthetic chemistry as a special science, and for nearly fifty years he has been one of the leaders of the scientific army in the invasion of strange regions. In every way open to a grateful nation, France has loaded him with honors. He is a member and perpetual secretary of the Academy of Sciences, a member of the Institute, and a grand officer of the Legion of Honor. He is president of the Superior Council of Public Instruction, president of the Committee on Explosives, and in 1870 was president of the Committee on the Defence of Paris. As a cabinet minister he has had occasion and excellent opportunity to study the people, and as a life-long chemist he has enjoyed the best opportunities for considering the industrial changes which affect their condition. Many of the manufacturing improvements which have enriched France have been due, directly or indirectly, to his own chemical researches. Consequently, any predictions he ventures in his chosen field have the highest value, and I was particularly glad of an interview which he was good enough to accord me lately.

Professor Berthelot occupies in Paris a residential suite of apartments in the Institute of France. This is a great stretch of old brown stone buildings on the Quai Conti, with bare and barren courtyards paved with many square feet of gray stone blocks. The sense of coldness in the environment that you have after you have traversed two of these courtyards to the last doorway on the right, is dissipated by the cheery smile of a stout Breton sewing woman, who ushers you without delay through a long, dark corridor to a small, dark study at the end. Here, surrounded by books, which cover the walls on all four sides, sits at his desk the Professor. His slender figure, clad in professional black, is somewhat bent by the deep study which has made his fame, but otherwise his sixty-seven years sit lightly upon him. His greeting is grave, but entirely courteous and sympathetic, an intelligent curiosity concerning the field of research to which he has devoted his life being all that is required to arouse his interest and unlock his store of strange and interesting facts. The interview is had pursuant to an appointment, and he plunges at once into the subject, referring to his address of April 5th before the Society of Chemical and Mechanical Industries.

"That address," he says, "was in the nature of an after-dinner speech rather than a scientific pronouncement. We do not use the dryer language of science upon festive occasions. I was speaking, however, to an association of chemists, and I believe that all I predicted upon that occasion will, in the process of time, say the year 2000, be actually or approximately the existing state of affairs. I said that new sources of mechanical energy would largely replace the present use of coal, and that a great proportion of our staple foods, which we now obtain by natural growth, would be manufactured direct, through the advance of synthetic chemistry, from their constituent elements, carbon, hydrogen, oxygen, and nitrogen. I not only believe this, but I am unable to doubt it.



PROFESSOR BERTHELOT.

The tendency of our present progress is along an easily discerned line, and can lead to only one end."

"Do you mean to predict that all our milk, eggs, meat, and flour will in the future be made in factories?"

### A TABLET OF FACTORY-MADE BEEFSTEAK.

"Why not, if it proves cheaper and better to make the same materials than to grow them? The first steps, and you know that it is always the first step that costs, have already been taken. It is many years, you must remember, since I first succeeded in making fat direct from its elements. I do not say that we shall give you artificial beefsteaks at once, nor do I say that we shall ever give you the beefsteak as we now obtain and cook it. We shall give you the same identical food, however, chemically, digestively, and nutritively speaking. Its form will differ, because it will probably be a tablet. But it will be a tablet of any color and shape that is desired, and will, I think, entirely satisfy the epicurean senses of the future; for you must remember that the beefsteak of to-day is not the most perfect of pictures either in color or composition."

This declaration from so high an authority was somewhat staggering. It was an unexpected blow at a tender (usually tender) and long-loved household idol. The common or garden beefsteak suddenly took upon itself a poetry and a pathos in the mind which could only have been born of its prospective superannuation. The idea of glass cows and brass beefsteak-machines, however scientific, carried a certain shock which was scarcely modified by the hope that the beefsteak of the future might, could, and would escape ever being tough.

"To comprehend what I mean by the tendency of the time," continued Professor Berthelot, "you must consider the long evolution which has characterized the development of foods and the major part which chemistry has played therein. The point is, that from the earliest time we have steadily increased our reliance upon chemistry in food production, and just as steadily diminished our reliance upon nature. Primitive man ate his food and vegetables raw. When he began to cook, when he first used fire, chemistry made its first intrusion upon the sphere of nature. To-day the fire in the open air has been replaced by the kitchen. Every cooking utensil now used represents some one of the chemical arts. Stoves, saucepans, and pottery are the results of chemical industries. So also modern cookery uses an indefinite number of compounds—food compounds—which, like sugar for instance, have been subjected to a more or less complex chemical treatment in their journey from the field in which they grew to the kitchen in which they are used. The ultimate result is clear. Chemistry has furnished the utensils, it has prepared the foods, and now it only remains for chemistry to make the foods themselves, which, indeed, it has already begun to do."

Before proceeding to describe what synthetic chemistry has already done in this direction, the Professor said, by way of preface:

"There is a distinction which I would like to make at this point between the laboratory stage and the commercial stage of any given discovery in food-making. From the scientific standpoint the laboratory result is the important one. As you and all the world know, the commercial result follows inevitably in time. Once science has declared that a desired end is attainable, the genius of invention fastens upon the problem, and the commercial production of the result slowly attains perfection by gradually improved processes at less and less cost. Take aluminium, for instance. Once a very expensive metal, its steadily decreased cost in production is bringing it within the reach of all. The use of sugar is universal. Sugars have recently been made in the laboratory. Commerce has now taken up the question, and I see that an invention has recently been patented by which sugar is to be made upon a commercial scale from two gases, at something like one cent per pound. As to whether or not the gentlemen who own the process

can do what the inventor claims, it is neither my province nor my desire to express an opinion. It may be that the commercial synthetic manufacture of sugar is a more difficult task than they imagine. I have not the slightest doubt, however, that sugar will eventually be manufactured on the largest scale synthetically, and that the culture of the sugar-cane and the beet-root will be abandoned because they have ceased to pay. Look at alizarin. There is one result of the same kind that synthetic chemistry has already brought about."

"What is alizarin?"

### A GREAT AGRICULTURAL INDUSTRY ALREADY DESTROYED BY THE CHEMIST.

"Alizarin is a compound whose synthetic manufacture by chemists has destroyed a great agricultural industry. It is the essential commercial principle of the madder root, which was once used in dyeing wherever dyeing was carried on. The madder root was grown to an enormous extent in Persia, India, and the Levant, and spread from there to Spain, Holland, and the Rhine provinces. Continental Europe used it in enormous quantities, and twenty years ago its annual import into England was valued at six million two hundred and fifty thousand dollars. The discovery was made, however, that alizarin could be manufactured synthetically, and the artificial production of it has so far supplanted the natural that the madder fields, so far as Europe is concerned, have practically ceased to exist. So with indigo. The chemists have now succeeded in making pure indigo direct from its elements, and it will soon be a commercial product. Then the indigo fields, like the madder fields, will be abandoned, industrial laboratories having usurped their place."

So far as dye stuffs were concerned, the intervention of chemistry seemed not so unnatural. When it came to tobacco and tea and coffee, however, synthetic chemistry appeared to be getting nearer home, invading the family circle, so to say.

"Tea and coffee could now be made artificially," continued the Professor, "if the necessity should arise, or if the commercial opportunity, through the necessary supplementary mechanical inventions, had been reached. The essential principle of both tea and coffee is the same compound. The difference of name between theine and caffeine has arisen from the sources from which they were obtained. They are chemically identical in constitution, and their essence has often been made synthetically. The scale of manufacture, or synthetic ladder, is as follows:

Carbon and oxygen make carbonic oxide.
Carbonic oxide and chlorine make carbonyl chloride.
Carbonyl chloride and ammonia make urea, whence uric acid.
Uric acid transforms into xanthine.
Xanthine yields theobromine.
Theobromine yields theine or caffeine.

Theobromine, you remember, is the essential principle of cocoa. Thus, you see, synthetic chemistry is getting ready to furnish, from its laboratories, the three great non-alcoholic beverages in general use. The tea plants, coffee shrubs, and cocoa trees must some day follow the lead of madder and indigo."

"And what about tobacco?"

### EXCELLENT TOBACCO OUT OF COAL TAR.

"The essential principle of tobacco, as you know, is nicotine. We have obtained pure nicotine, whose chemical constitution is perfectly understood, by treating salomine, a natural glucoside, with hydrogen. Synthetic chemistry has not made nicotine directly as yet, but it has very nearly reached it, and the laboratory manufacture of nicotine may fairly be expected at any time. Conine, the poisonous principle of hemlock, has been made synthetically, and it is so close in its constitution to nicotine, and so clearly of the same class, that only its transformation into nicotine remains to be mastered, a problem which is not very difficult when compared with others which have

been solved. The parent compound from which the nicotine of commerce will be made, exists largely in coal tar."

"You believe, then, that all our tobaccos will some day be made artificially?"

"To as great an extent as appears desirable. The choicer growths, with their individual characteristics from individual circumstances of growth, will be longest cultivated. The tobacco leaf is simply so much dried vegetable matter, in which nicotine is naturally stored. Chemistry will first make the nicotine, and impregnate any desirable leaf with it to any degree of strength. Later on, if necessary, it will also make the leaf. In some directions it is not difficult to improve upon nature, and the best chemical medium for carrying nicotine might easily prove superior to the natural."

Having weakly permitted his beefsteak to be carried by storm, the writer was all the more inclined to defend his tobacco. "But, surely," said he, "there is something more in fine tobacco than merely nicotine and vegetable fibre."

"Precisely. Leaving aside what the manufacturers may add, there are delicate flavoring oils, which chemistry will also create. Vanilla, a flavoring compound of very general use, has always been obtained, until recently, from the tonka bean. Now artificial vanillin, in the same compound made chemically, threatens to drive the natural vanilla out of the European market, and will doubtless succeed in doing so as its manufacture is perfected. In fact, some of the chocolate and confectionery manufacturers are already taking it up. All the essential oils will eventually be made direct. Vanillin is very near in its chemical constitution to the aromatic, the distinctive, principle of cloves and allspice. Artificial cloves and allspice will therefore probably come next. Flower perfumes, too, have been fully analyzed, and in time will be largely synthesized. One of them, meadow-sweet, is being largely compounded and sold. There are consequently no virtues in the natural tobacco which are likely to be missed in the artificial. In fact, the contrary state of affairs is more probable."

With our tobacco prospectively obtained from coal tar, and our flower perfumes made without flowers, the sphere of synthesis was decidedly broadening. Professor Berthelot, however, made it broader, touching upon an important law of which he himself was the discoverer.

### USEFUL COMPOUNDS UNKNOWN TO NATURE IN PROSPECT.

"Perhaps the greatest importance, and certainly the profoundest charm, in the study of synthetic chemistry," said he, "is the certain evidence which it offers of the discovery and manufacture of many compounds now entirely unknown, whose effect upon human health, human life, and human happiness no one can possibly conjecture. A hundred years ago, for instance, who could have foretold photography or the telephone? To understand the prospect before us, you must recall the familiar laws of atomic proportion which characterize the combination of different elements in mineral chemistry. Among the metals of a given class, the combinations with oxygen, for example, follow the same atomic law, and, by means of this law, compounds which had not been met with by chemists were from time to time looked for and created. In other words, the acting law of atomic proportions having been discovered, the chemist knew what to expect in a given class of metals, and wrote the formula, in many cases, before he obtained the compound.

"Now, in mineral chemistry the operations of this law are limited. In organic chemistry they are limitless. When I found that the same general laws acted uniformly throughout the measureless field of organic chemistry, I saw that the number of compounds to be dealt with in this way was numberless, infinite in extent. How many compounds each having, like nicotine or theine, its own distinctive peculiarities, remain to be discovered, it is simply beyond our power to imagine. Analytical chemistry has dealt and

could deal only with what it found in nature. Synthetic chemistry, armed with the elements and with the knowledge of the laws by which classes of complex compounds combine with other classes of complex compounds, will go on and on, developing new fixed compounds not yet met with in nature, whose influence upon human life, as I have said, no mind can possibly foretell. The science of chemistry grew out of the search for two things, the elixir of life and the philosopher's stone. These two will never be discovered; but, that other compounds almost as wonderful in their way may be, it would be dogmatic and rash to deny. It is a great, untraversed country, a field of exploration for chemical students for centuries to come."

In illustration of this point, as well of his own methods of study, he continued:

"I passed hydrogen over carbon at a white heat, and by aid of the electric spark obtained a combination, the result being a familiar gas, acetylene.

"I found that acetylene would take up another atom of hydrogen in the nascent state, and this gave me marsh gas and ethylene.

"I found that ethylene in the presence of water could be made to combine with the oxygen and hydrogen of the latter, thereby forming ordinary alcohol, and that marsh gas in the same way formed methylic alcohol.

"Combining the acetylene with free oxygen in the nascent state, I obtained oxalic acid.

"Combining the acetylene with free nitrogen by aid of the electric spark, I obtained cyanhydric acid.

"Combining the acetylene with oxygen in the presence of water and an alkali, I obtained acetic acid.

"I also found that under certain conditions the acetylene could be transformed directly into benzine. Here, then, we have seven familiar compounds of wide utility, acetylene, marsh gas, alcohol, oxalic acid, acetic acid, cyanhydric acid, and benzine, to say nothing of many others which I might mention, obtained from these elements direct. Now, imagine for a moment the enormous number of organic compounds into the constitution of which, according to regularly acting laws, these seven compounds enter. There are six different families of alcohols alone, and each one of these families embraces a greater or less number of special alcohols. Here is a great list of alcohols, each one representing in combination an indefinite class of alkaloids. Some of these alkaloids are known, many more can be conjectured, and what may not develop from them when they are studied and tested in their relation to life and the arts? Over the whole field of organic chemistry the mystery of possibilities extends. Its combinations and intercombinations are so limitless that we can only work on regularly to ends that it is impossible to foresee. A discovery may arise at any time which will have an incalculable effect upon the happiness and welfare of man."

"What do you think of Tyndall's dogma, that from the non-living the living can never be obtained?"

"We do not know enough about the question to dogmatize," said Professor Berthelot, simply. "We shall see what we shall see."

Outside of the products named, the proved results of synthetic chemistry appeared to be already numerous. The oil of bitter almonds is now being made direct commercially, and so also is the oil of mustard. Mustard made from the oil of mustard is preferred for use as an irritant by many physicians, in consequence of its purity, which is perfect; whereas the natural mustard contains other compounds not entirely desirable in this connection. Salicylic acid, tartaric acid, the acid of unripe grapes, and citric acid, the sour principle of lemons and other fruits, are made direct. Artificial turpentine is being actively sought after, and from it chemists expect to obtain artificial caoutchouc. Long before the promised failure of the rubber trees to supply the demands of commerce, synthetic rubber will, in all probability, have filled the void. From a review of what synthetic chemistry has already done, the Professor passed to the subject of what it may reasonably be expected to do. He said:

ASS'S MILK, GOAT'S MILK, AND COW'S MILK ALL FROM ONE LABORATORY.

"The production of food stuffs upon a commercial scale by synthetic chemistry will naturally depend upon two things: the cheapness of production, and the quality of the result. Take artificial butter as an instance. Twenty years ago in this country the idea was conceived of making butter from beef fat. This was an intermediate synthesis, which consisted in extracting the oleo-palmitine from the fat by melting, cooling, and pressure. The extract was then treated with milk, churned, and colored as the dairymen colored natural butter. The growth of the oleomargarine industry has been extensive, and its manufacture now takes place on a large scale. The best artificial butter approaches so closely to real butter that the difference is not very great. In the same way, whenever synthetic chemistry is ready and the commercial conditions have been met, artificial chemical food will infringe upon the sphere of the natural in other directions. Nature, however, produces very cheaply; and no man will desire to lose money for the pleasure of making chemical food. There is no reason, nevertheless, since we are making artificial butter, why we should not before long make artificial milk. Milk consists of say 3.50 per cent. of milk fats—olein, stearine, butyrine, palmitine, and others—3.98 per cent. of caseine, four per cent. of milk-sugar, and 86.87 per cent. of water, with traces of other substances which have been determined. It will not be a very difficult problem for synthetic chemistry to mingle these constituents in these proportions, and make a milk that will as nearly approach natural milk, in meeting the demands and desires of the public, as artificial butter approaches natural butter. So, too, the variation of proportions would be easy; and ass's milk, goat's milk, or any other milk desired, could be furnished from the same laboratory as easily as cow's milk. The only necessity is, that we shall be able to make all the solid constituents mentioned, and this is simply a matter of time. In short, milk factories may be looked for just as soon as the constituents can be directly and cheaply obtained."

"But will such milk be as healthful as that produced naturally?"

"There is no reason why it should not be. With the vital action and vital machinery by which the cow produces the milk, chemistry has nothing to do. It is a question of physiology. When the milk has left the cow, however, it is merely a chemical compound, and with it physiology has nothing to do. As I said, the fats I have already made direct. The milk-sugar, too, has been made. When we come to the caseine, however, and, with it, to starch, meat, and albumen, we come into a set of very complex chemical problems. Still, they are merely chemical problems, and as such are subject to study and solution in the future, just as we have seen equally difficult problems met and solved in the past. The mass of animal tissues are constituted of certain nitrogenous compounds which play an equally important rôle in the development of vegetable tissues. These compounds are very complex, nearly always fixed and uncrystallizable, and easily affected by re-agents. Some are soluble and some insoluble, but most of the former become insoluble by coagulation in water, through heat or through the action of acids. Such are albumen, fibrine, caseine, syntonine, osseine, chondrine, glutine, chitine, etc. To make meat we must make these compounds, or so many of them as are necessary. That chemistry will some day be able to make them I cannot doubt. That at some time in the future artificial meat will infringe upon the domain of natural meat, as artificial butter has upon that of natural butter, is only to be reasonably expected. So with the vegetables. A potato consists of, say, 81.844 per cent. of starch, 13.030 per cent. of water, 2.313 per cent. of nitrogenous matter, 1.13 per cent. of woody fibre, and minute proportions of fat and mineral constituents. When we are able to make starch direct, what will hinder us from making a potato? And what is to pre-

vent us, once we have gained the mastery, from making better milk, better meat, and better potatoes, at any season of the year, than those which nature gives us, more or less afflicted, as these are, with impurities and additions, and produced only at the periods in which her laboratories are kept open for the public good?

#### STEAM TO BE PIPED FROM THE CENTRE OF THE EARTH.

"Time is not an element in these speculations, because all the future is before us, and the line of march is marked out. Great changes, however, which will cheapen the cost of producing these results, will come from cheaper and simpler sources of mechanical energy than those now used. Herein lies the fundamental problem of all the industries, to discover sources of energy which are inexhaustible and which will renew themselves without effort on our part. Nature has given us these, ready for our use, but as yet we have accepted only a very small portion of her gift. Evolution has long acted in this direction also, and must continue to act. We have seen the force of human hands largely replaced by that of steam, that is to say, by chemical energy borrowed from the combustion of coal. Coal, however, is laboriously extracted from the bowels of the earth. The time is coming when, by methods already foreseen and unnecessary to describe, we shall store and make use of the heat of the sun. But greater, far greater in importance than this, will be the ultimate and widespread use of the central heat of our globe. The incessant advances of science give us a sure basis upon which to expect a limitless amount of energy drawn from this source. It will suffice, to utilize the central heat, to sink pits from three thousand to four thousand metres (three thousand three hundred to four thousand four hundred yards) in depth, and this is a problem in engineering quite within the powers of the engineers of the present day, to say nothing of the engineers of the future. At this depth we should find great heat, constant and unvarying, the heat which is the source of all energy and all life."

The writer could personally vouch for this. He recalled having his back scalded by dripping water in one of the three thousand two hundred foot levels of the Comstock Lode.

"At these depths," said Professor Berthelot, "we may easily tap superheated steam under pressure which can be used to drive machinery direct from the top of the shaft. That, however, is merely a detail. We shall have in these pits the cheapest of furnaces, because we can have them at any degree of heat, never failing and never needing fuel or renewal. They will be at some distance from our engines, to be sure, but that will be no difficulty. Into them we can introduce water, if necessary, convert it into superheated steam at the bottom, and use it on the surface. More than this, the advance of thermo-electric science is certain, once the inventions are needed, to supply us with another and perhaps more convenient means of turning this heat into force and using it for mechanical purposes at a cost, after the plant is constructed, which will be no more than the wear and tear. We shall thus have a source of energy which costs nothing, whose extent is indefinite, which is incessantly renewed, and whose diminution through centuries will be quite imperceptible. And this will be force which will be available everywhere, all over the globe, and equally the blessing, with the property which results from it, of all nations and all peoples which seek its use. Given such sources of energy, the artificial production of food will be a much simpler problem, and will more rapidly fall into the hands of chemistry. The hard preliminary work is done. The synthesis of the fats and oils I myself accomplished years ago. That of the sugars and carbo-hydrates is the study of the present time, and that of the nitrogenous compounds is not far off. Carbon from carbonic acid, oxygen and hydrogen from water, and nitrogen from the air will be a source of food for all the world. What the animals and vegetables have produced through the energy of nature, we shall produce

as well, if not better, by our study of nature's laws. Strange though it may seem, the day will come when man will sit down to dine from his toothsome tablet of nitrogenous matter, his portions of savory fat, his balls of starchy compounds, his casterful of aromatic spices, and his bottles of wine or spirits which have all been economically manufactured in his own factories, independent of irregular seasons, unaffected by frost, and free from the microbes with which over-generous nature sometimes modifies the value of her gifts."

"And all this will be due to chemistry?"

### A SYNTHETIC ARCADIA.

"To chemistry and her sister science, physics. If one chooses to base dreams, prophetic fancies, upon the facts of the present, one may dream of alterations in the present conditions of human life so great as to be beyond our contemporary conception. One can foresee the disappearance of the beasts from our fields, because horses will no longer be used for traction or cattle for food. The countless acres now given over to growing grain and producing vines will be agricultural antiquities, which will have passed out of the memory of men. The equal distribution of natural food materials will have done away with protectionism, with custom-houses, with national frontiers kept wet with human blood. Men will have grown too wise for war, and war's necessity will have ceased to be. The air will be filled with aërial motors flying by forces borrowed from chemistry. Distances will diminish, and the distinction between fertile and non-fertile regions, from the causes named, will largely have passed away. It may even transpire that deserts now uninhabited may be made to blossom, and be sought after as great seats of population in preference to the alluvial plains and rich valleys, soils fat with putrefaction, which constitute the great agricultural and popular centres of to-day."

"And man?"

"Man should grow in sweetness and nobility, because he will have done with war, with existence based upon the slaughter of beasts. Perhaps—this is only a dream, remember—synthetic chemistry, or something that we might call spiritual chemistry, will develop means to as profoundly alter man's moral nature as material chemistry will change the conditions of his environment. There is no fear that art, beauty, and the charm of human existence are destined to disappear. If the surface of the earth ceases to be divided, and I may say disfigured, by the geometrical devices of agriculture, it will regain its natural verdure of woods and flowers. Man, becoming familiar with the principles and responsibilities of self-government, will be more easily governed. The favored portions of the earth will become vast gardens, in which the human race will dwell amid a peace, a luxury, and an abundance recalling the Golden Age of legendary lore.

"These are dreams, of course," added the Professor in conclusion, "but science may surely be permitted to dream sometimes. If it were not for our dreams, where would be our impulse to progress?"

# WITH MADNESS IN HIS METHOD.

By Florence L. Guertin.

COURTRIGHT went quickly up the steps, looking at his watch, and touched the bell. Her brougham was standing in front of the door, and he knew that she would be ready.

She came down-stairs in a plain, dark travelling gown, with the violets he had sent her pinned to her top-coat, and with a maid, bearing her satchel and umbrella, behind her.

"To the Forty-second Street Station," he said to the man on the box, and the sleek-looking cobs sprang forward.

It was about a year since Courtright had first met Miss Schuyler. The acquaintance had begun on board a train bound for California, and they had become very good friends. The following winter found him a steady caller at the Schuyler domicile, yet in no way receiving preference above the other men who called quite as frequently, and who were also more or less enamoured of Miss Schuyler's healthy type of loveliness. At least, if he was preferred, it was not made known, and he was treated with the same cordial frankness that characterized her manner toward all. Some one had once sagaciously remarked that Constance Schuyler could not be a flirt, for she was too much interested in every man she met; and perhaps the secret of her popularity lay in the fact that she was interested in people, which always flatters, and generally awakens interest in return. Courtright said she possessed adaptability in a very marked degree, and that it was that quality which enabled her to make friends with the oldest and crustiest of bachelors, or with the youngest and most swaggering of college youths; and that with all her vivacity and high spirits there was an undercurrent of sympathetic womanliness that appealed to you; and he summed it up by saying that she was the most delightfully human and thoroughly lovable girl he had ever met.

In the absence from town of her father he had said that he wanted the privilege of escorting her to the station, and as they bowled along in the snug little brougham he told her that there was something else he wanted, and then repeated the sweet, ancient story in a manly, nineteenth-century fashion.

It was no novel recital to Constance Schuyler, yet she wondered why it had never before been so hard to say "No." But she said it very firmly and decidedly, for if she loved him now she had not found it out, and it was much better to tell him how sure she was, rather than to let him go on, deluding himself with the vain idea that some time she might grow fond of him. After her frank words, Courtright, looking out of the window, replied, meditatively:

"No, I should not want to hang around a woman for years, hoping that some day she might care for me, and bothering her about it. I should want her to come to me gladly, and because she wanted to, and I would not marry Venus herself unless she loved me." Then he looked at her critically, and continued, with delightful audacity: "I think I could marry you, though, if I did persevere, but I should always feel that perhaps you were not giving me your best love. It seems to me that that sort of thing ought to be spontaneous. I shouldn't care to be married to be gotten rid of."

"But you believe that love is a gradual growth, don't you?" Constance asked, wishing in spite of herself to explore further into this partly known, but still fascinating territory.

"Not necessarily," he answered.

Note.—"With Madness in His Method" was awarded the fourth prize in the recent McClure prize-story contest. The author, Miss Florence L. Guertin, lives in Brooklyn, New York. The story entitled "The Mistress of the Foundry," published in the August number of McClure's, it should have been stated there, was awarded the fifth prize in the same contest. The author of it, Earl Joslyn, lives in Pasadena, California.—Ed. McClure's Magazine.