On boiling with alcohol the tritolylchlormethane gives the ethoxy compound, which can be easily purified by recrystallization from alcohol. Melting-point, 105° C.

	Calculated for $(C_6H_4CH_3)_3C.OC_2H_5$.	Found.
Carbon	87.27	86.63
Hydrogen	7.88	7.66

On boiling with water the carbinol is formed. This work will be continued, and the action of metals upon the halogen compound will be studied.

UNIVERSITY OF MICHIGAN,
CHEMICAL LABORATORY,
January 9, 1901.

REVIEW.

THE FOURTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.[1]

The grand amphitheater of the Sorbonne has seen many notable assemblages of scientific men, but probably the most distinguished body of chemists that its walls ever enclosed was that which met on the 23rd of July, 1900, to assist in the opening of the Fourth International Congress of Applied Chemistry.

This organization of chemists had its real origin during the World's Fair, when the chemists of the United States invited their professional brethren from all parts of the world to meet them in an international congress, which convened in Chicago, in 1893, under the auspices of the American Chemical Society, and the chemical section of the American Association for the Advancement of Science. In the address of welcome to this congress, I said :

"Chemistry is truly cosmopolitan. There is no one country that can claim it entirely, either by birth or adoption, Wurtz to the contrary notwithstanding. It is therefore entirely fit and proper that the chemists of all nations should now and then meet on common terms for the sake of mutually profiting by the advances and discoveries that each has made. I believe that there will be brought before the present congress a proposal for the regular triennial meeting of the chemists of the world, after the plan which has been followed so successfully by our brethren, the geologists and physicians. Were the object of such a congress only to listen to papers and addresses pertaining to the progress and development of our science, it might well be asked

[1] Read before the Northeastern Section of the American Chemical Society, January 17, 1901.

whether such conventions are useful. The chemical journals of to-day fully cover the whole field of chemical activity, and thus even in the most remote mining camp the chemist and assayer may be fully *en rapport* with his fellows, the world over. But the objects of our congress are wider than the mere listening to papers. The chemist is a social being, and there is a life outside of the laboratory as beautiful and useful as the life within. The narrowness of an idea, and the flattening of isolation are to be avoided as the purpose of an investigation is to be pursued. The highest culture is not found in books, but in men. The power and splendor of a great and old university are not alone in its libraries and professors. There is a subtle influence of association that does more, often, than the lecture room to develop mind and mold character. And thus to widen his horizon and broaden his views the chemist must leave his desk and seek the acquaintance of his fellows. Every time you take a brother chemist by the hand you enlarge your life and extend your strength, and the farther apart the field of your activities, the greater the benefit."

The congress of chemists at Chicago contained representatives from almost every civilized country, and the fruit of this conference, the first international conference of chemistry ever held, was manifested in the following year by a call issued for a congress of applied chemistry to meet at Brussels. The Brussels congress decided to hold the next meeting in Paris, and the Second International Congress of Applied Chemistry convened at the Sorbonne, the latter part of July, 1896. It was my good fortune to attend this meeting, as well as the meeting of the third congress which convened in Vienna, in July and August, 1898. Reports of the proceedings of both these congresses were published in the Journal of the American Chemical Society.

The Vienna congress decided to have its fourth meeting in Paris, in 1900, on account of the World's Fair which would be likely to bring together a larger number of representative chemists than could be collected in any other quarter at that time.

The functions attending the opening and closing of scientific congresses in Europe are somewhat more elaborate than we are accustomed to in democratic America. Evening dress and uniforms representing offices in civil life are not found in scientific functions in this country before 6 o'clock. Quite otherwise in Europe where the evening coat and the uniform of any learned body to which the member may belong are *en regle* even for morning functions.

The Fourth International Congress of Applied Chemistry was opened by Mr. Moissan, the president of the Committee of Organization. He said, in part:

"Gentlemen: I declare open the Fourth International Congress of Applied Chemistry. The first words which we pro-

nounce to-day in the grand amphitheater of the University of Paris, should be words of thanks addressed to the bureau of the Vienna congress. We have not forgotten the charming fashion with which we were received in the capital of the Austro-Hungarian Empire. Nor have we forgotten that the members of the last congress decided to meet here again by reason of the universal exposition which closes the 19th century. Gentlemen, you have not forgotten the date fixed. You have come in great numbers. We thank you, and we will do our best to do the honors of the city, and of that exposition which your own efforts have rendered worthy of the progress of science, and of industry. These congresses have opponents. Many see in them only occasions for excursions and banquets, more or less repeated. When I think that we have, during the exposition, 127 congresses regularly organized, in the warmest months of the year, I desire to class myself among the opponents of whom I have just spoken, but when I meet among this crowd of chemists, which fills our new Sorbonne, already too small, the smiling countenance of a friend from America, or of a delegate already known in the preceding congresses, I am happy to exchange my ideas, and class myself with those who rally to the support of the 127 congresses of our universal exposition.

"I will add that these congresse sought to have their immediate utility. Many economic questions, of which certain ones are vital for industry, can be studied by you with care and afterwards submitted to the different governments represented. The continuity of your efforts in successive congresses must lead to useful solutions. The attention with which the different governments follow your congresses is a sure guarantee to you of the interest which the public authorities bear you.

"Gentlemen, I cannot terminate these few words without addressing our best thanks to the French Government which has taken our congress under its patronage, and to the president of the republic who has honored us by being officially represented at this opening meeting. I am also to thank the ministers who, not content with sending us official delegates, have for two years done all in their power to aid our work."

M. Moissan then thanked the ministers by name, and also the learned societies, and the foreign governments, and the foreign learned societies which had sent delegates, and closed his address in the following words:

"Gentlemen, our dear president of honor, M. Marcellin Berthelot, on account of a slight indisposition from which he has suffered for several days, we have begged in your name not to expose himself to the fatigue of this first reunion, and if you will kindly permit me I will read the discourse which he has prepared."

The address of M. Berthelot, read by President Moissan, was of the greatest interest. He said in part :

" Gentlemen : I bid you welcome in the name of France and of the Republic. You have come from all parts of the world to show your works at the exposition of 1900, and to participate in that universal competition of all the industries in that pacific contest of all the people for the honor and the profit of the human race."

M. Berthelot next called attention to the fact that chemistry was the most important of the sciences which were to work for the good of the human race in the coming century ; that it did not belong to any continent, neither to Europe nor America ; nor to any country ; neither to Germany, nor to France, nor to England, but it was the common heritage of all mankind. He also developed the fact that chemistry owed little to the remote past, that it is essentially a modern science which had borrowed but little from the alchemy and necromancy of the middle ages. " Let us guard then," he said, " the belief that chemistry is the one work purely modern. In reality, it belongs to the years which have recently passed. Allow me also to retrace some of the grand historic steps of the general methods of chemistry and of their progress."

Perhaps no living chemist is better able to give in a brief review the chief characteristics of chemical science than M. Berthelot. He began his historic account by references to the chemical arts practiced in Ancient Egypt, especially in metallurgy. He called attention to the fact that the science of antiquity became also that of the modern age, transmitted in part directly by the technical traditions of the workshops and in part by the Syrians and Arabs.

It was in the central part of Europe, in the 13th and 14th centuries, that there was noticed the first assumption of the scientific spirit in its industrial initiative. It was at this time that new chemical methods made their appearance. The manufacture of metals was perfected, leading to the construction of powerful machines for war and for industry. The use of saltpeter in the manufacture of Greek fire, and of powder, created a revolution in modern warfare. The knowledge, which then became general, of fermentation and distillation led to the manufacture of alcohol on a scale sufficient to be used in the arts. Many of the essential oils of plants were also discovered about this time, and nitric, sulphuric, and hydrochloric acids became established objects of manufacture.

I could not give here even a synopsis of the rest of the address of M. Berthelot, bringing, by brief references to the principal steps of progress, the science of chemistry down to the present time. One point, especially, in speaking of the employment of fuels, is worthy of particular notice here. He said :

"It is thus seen that the employment of carbon, and of oil, the old generators of chemical energy, by reason of the heat disengaged by their union with the oxygen of the air, shows a tendency to-day to be replaced by the energy obtained by the fall of water, energy purely mechanical; but coal and oil exist in limited quantities which are exhaustible while the falls of water are not so, because they are derived from the energy borrowed from the sun, an energy of which the human race will never see the end."

He closed his address in the following words:

"Better than mysterious magic, better than the antique faith, modern science lifts the mountains and realizes dreams and miracles. It creates without cessation riches which cannot be taken from anyone by force or by stratagem. It tends thus to the equalization of fortunes by the universal increase of capital, and the equalization of intelligence by incessant publication, liberal and disinterested, of the discoveries of learned men, and especially by the general elevation of public instruction and of workers. The hatred among men, peoples, and individuals is born of ignorance and egoism, but science exerts itself without relaxation to diminish that because it belongs neither to a private personality nor to a particular nation. It teaches us that all are citizens of the same country, that all the civilized people of the world are united. Science has no nationality. It is as well German, English, Italian, Russian, Japanese, as French. It is progressive among small nations as well as among large. Each one brings its contribution to the common work. This is the reason, I repeat, that all civilized peoples are united. Every loss suffered or inflicted upon one of them is a loss for all humanity, a loss at the same time material, on account of the destruction of existing values, and a loss moral by the weakening of the necessary bond which attaches men to one another. When these truths shall be tried by all, and shall have penetrated the minds in the most elevated social layers of the aristocracy as well as the most fundamental layers of democracy, we will have understood that the true law of human interests is not a law of conflict and of egoism, but a law of love. This is how the science which brings us together to-day in this environment proclaims as the final end of its instruction, universal solidarity and fraternity."

After the address of M. Berthelot, M. Dupont, the secretary-general, read his report as secretary of the Committee of Organization. The congress then proceeded to the formal election of officers, choosing M. Berthelot as president of honor, M. Moissan, as president, and a list of vice-presidents representing different countries having delegates in the congress. For the United States, the vice-presidents chosen were Messrs. Doremus, Rising, Chandler, Clarke, and Wiley. Among the vice-presidents of Germany were Messrs. Fischer, Maercker, and Herzfeld; from Italy,

Cannizzaro and Piutti; from Switzerland, Lunge; from Russia, Mendeléef; from Austria, Strohmer and Liebermann; from Belgium, Sachs; from Egypt, Ventre-Pasha; from England, Thorpe; and from Greece, Christomanos.

At 2 o'clock in the afternoon the various sections met for organization. The organization was completed as follows:

Section 1.—Analytical Chemistry; president: M. Muntz; and presidents of honor: MM. Lunge and Clarke.

Section 2.—Industrial Chemistry of Inorganic Products; president: M. Etard.

Section 3.—Metallurgy, Mines and Explosives; president: M. Adolf Carnot.

Section 4.—Industrial Chemistry of Organic Products; president: Lindet.

Section 6.—The Chemical Industry of Fermentations; president: M. Durin.

Section 7.—Agricultural Chemistry; president: M. Dehérain.

Section 8.—Hygiene and Medical Chemistry, and Chemistry of Food Adulteration; president: M. Riche.

Section 9.—Photography; president: M. Janssen.

Section 10.—Electrochemistry; president: M. Moissan.

At 4.30 o'clock, M. Leygues, minister of public instruction and beaux-arts, received the members of the congress at the Sorbonne, where a lunch was prepared in their honor. M. Leygues made a happy address which was warmly applauded.

The rest of the day was devoted to a visit to the new laboratories of the Sorbonne which have lately been completely reconstructed. The laboratories especially visited were those of Troost, Haller, and Lippmann. In the laboratory of Lippmann were found many of the interesting color photographs, which he has made by means of an invention he has perfected of depositing in the original negative successive films of silver having a definite relation to the wave-length of various rays. When these negatives are viewed by reflected light, the various colors are reproduced corresponding to the wave-lengths employed in the deposition of the superimposed silver films. The method of producing these photographs has already been described in sufficient detail, but I may say here that the principle consists in placing back of the plate, which should be transparent, on which the negative is to be made, a film of mercury which, by the reflection of the transmitted rays, produces the interference necessary to secure the deposition of the superimposed silver films.

The modern appliances for increased laboratory facilities were carefully studied by the members of the congress, who were received in all parts of the building, by the professors and their assistants, the greatest courtesy and willingness to answer all inquiries being shown.

I cannot do more than mention some of the most important papers presented to the sections on the successive days of the meeting.

In Section 1, M. Hanriot raised the question of the assumption as a basis for the atomic weights the value of 16 for oxygen. The discussion of this point was engaged in by many of the members of the section, including Professor Clarke of this country. At the end of the discussion, M. Hanriot proposed the following resolution: "The congress of applied chemistry, believing that the adoption of the atomic weight of oxygen as a basis will lead to a greater stability, and to a simplification in a calculation of the atomic weights, wishes to associate itself with the workers of an international commission." This resolution was unanimously adopted. Professor Clarke proposed the formation of an international committee, having for its object to indicate to chemists the methods which ought to be adopted, and the coefficients which they ought to adopt in the different calculations which they make. This proposal was also adopted unanimously.

M. Krause read a paper upon the symbols and abbreviations usually employed in chemistry, in which he took the ground that the symbols Am and Cy ought not to be employed to represent the radicals ammonium and cyanogen, nor should methyl be represented by Me, ethyl by Et, nor phenyl by Ph. He also claimed that the words ester and ether, should not be synonymously employed. It was voted to leave that question for further study.

M. Vivier proposed the following resolution: "There shall be established by an international special commission a table of chemical and physical constants of which the use shall be obligatory upon all official chemists in countries represented in this congress, and upon unofficial chemists in cases where they shall be called as experts before any jurisdiction whatever." This resolution was also adopted.

In view of the fact that at the present time a great deal of pressure has been brought to bear upon our congress to establish a bureau of standards, similar to the Reichsanstalt at Charlottenburg, the report presented by M. Demichel upon the graduation of instruments of precision is of great interest.[1] This paper and the discussion which followed, were of the usual character of communications relating to the calibration of chemical apparatus, and are too long for further notice.

Herr Ritter von Grueber presented to the section the work of the commission appointed at the Third International Congress to secure methods of uniformity, for international use, in the analysis of fertilizers. This report was printed in English, French, and German, and recognized, for the first time in the Congress, the progress

[1] This Bureau of Standards was established by Congress just before adjournment, March 3, 1901.

which had been made in the United States in the analysis of agricultural products. The standard American authorities are cited in this report, in conjunction with the standard authorities in Germany and France. Since the adoption of the report pertained particularly to the section on agricultural chemistry, no formal action was taken on this resolution by Section 1. It was subsequently presented to the section on agricultural chemistry, and after an interesting debate, the proposals of the committee were unanimously adopted.

A firm basis has thus been laid for international agreement in regard to analytical methods and processes relating to the determination of the essential ingredients of fertilizer materials. This agreement is not only interesting from a scientific point of view, but also has far-reaching commercial ramifications, and will result in bringing into close touch the chemists in Europe and in the United States who have to do with imported or exported fertilizing materials.

M. Christomanos entertained the section with an account of the studies which he had made of the transformation of red phosphorus into arsenic, under the influence of ammonium nitrate. This is a theme, which has lately excited a great deal of attention. Whether or not it be true that arsenic is one of the elements which forms a compound heretofore known as phosphorus, it is too early to state. The intimate relations, however, which arsenic bears to phosphorus in all of its chemical reactions show that whether or not the two substances are forms of some original material or have entirely different natures, they surely resemble each other very much in regard to their chemical deportment.

An interesting subject to our wine-makers, was that presented by M. Chuard, of Switzerland, concerning the state of sulphurous acid in wines, and the functions which this acid performs in wine-making and ripening. It has long been known that the deportment of carbonic acid, formed by natural fermentation in the bottles, as in the making of champagne, is quite different from that of carbonic acid charged artificially into a still wine. The study of the deportment of sulphurous acid in wines may throw some light on the interesting relation which gases bear to the liquids when in solution under pressure or otherwise.

An interesting communication was made by M. Christomanos in giving the data of the analysis of a piece of iron more than 3,000 years old, which had been recovered from below the foundation of the marble column of the Acropolis at Athens. M. Christomanos also showed an interesting experiment which blackened pieces of marble without danger of fracture, by means of the flame of metallic magnesium which deoxidized a circumscribed

portion of the marble into lime and set the carbon free. He called the process "marmocautère."

Many interesting papers were also presented in Section 2.

To those interested in the analysis of food products, the paper by M. Lucian on some causes of error in the employment of the bomb calorimeter will prove valuable. If the oxygen used is obtained by electrolysis, it is apt to be contaminated with traces of hydrogen, and it is not sufficient to determine the percentage of hydrogen by combustion in a capillary tube of platinum. In the combustion of carbonaceous masses, it is not safe to assume that all the hydrogen which may be contained in the oxygen is burned. The quantity of hydrogen burned is a function of the total calories set at liberty by the combustion of the carbon and, consequently, is an unknown function. It is not possible, therefore, to calculate the error in such a case and oxygen, which is entirely free from hydrogen, should be employed.

M. Guillet read an interesting statistical paper on the inorganic chemical products of France, in which the quantities of all important chemicals manufactured in France were given.

M. Dorenus, although not present himself, sent an interesting paper on fluohydric acid and the fluorides, in which he discussed the production of these important substances.

M. Perron gave an interesting paper on the sulphuric acid industry in which all the modern improvements were described. This paper was ably discussed by M. Lunge, who is recognized as the highest authority in the world on sulphuric acid production.

M. Boudouard gave an exhibition of the different pyrometric methods which are used for high temperatures. Eight different kinds were described in detail.

M. Bloche gave an historical and technical paper on the production of barium and hydrogen peroxide containing extremely useful information to those engaged in those industries or using their products. The amount of barium peroxide produced in France, is about 1000 tons annually, and the hydrogen peroxide manufactured amounts to from 2000 to 3000 tons. The chief uses of hydrogen peroxide are for antiseptic purposes and for bleaching.

In Section 3, M. Pellet gave the results of his study of the estimation of sulphur in minerals, coals, bitumens, and rubber. The principle adopted is the following: The sulphur and the organic matter are oxidized by fusion with a sufficient quantity of potassium nitrate, variable with the quality of the substance analyzed. Some pure sodium carbonate is added, in quantity usually double that of the nitrate, to moderate the action of the latter. All of the sulphur passes into the state of neutral sulphate or of soluble alkaline sulphate. The melted mass is

treated, over a flame free of sulphur, as for instance an alcohol lamp, by water, filtered, the filtered liquor acidified, some barium chloride added, heated, and again filtered. Thus, the solution of the iron, as in the case of pyrites, is avoided. The precipitation of the barium sulphate is rapid and complete. The determination can be terminated in less than an hour.

M. Le Chatelier presented an elaborate report on the state of our knowledge of the different allotropic conditions of iron and steel.

M. Barthelemy presented a résumé of legislation relating to the storing and transportation of explosives in different countries. He cited the necessity of getting a special class of explosives which are perfectly safe and which can be admitted for transport by express in cases of urgency.

M. Le Chatelier also presented a new microscope for the study of materials and for photographing the same. The description is too long for insertion here.

In Section 4, M. Thomas presented a paper on viscose, a form of cellulose, which can be used for various purposes, as, for instance, sizing paper, decorative painting, adulteration of rubber, fabrication of thin pellicles, threads, celluloid, ethers, acetates, etc.

M. Guillemare stated that all green plants digested with a weak solution of caustic soda yielded their chlorophyll in the form of sodium chlorophyllate, and for this reason he believed that chlorophyll should be known by the name of chlorophyllic acid.

M. Pierron gave an account of the catalytic heating action of platinum from the time of Humphry Davy to the present.

M. Arachequesne called attention to the fiscal regulations existing in France, and other countries, concerning the use of alcohol in the arts, and the hardships which manufacturers had to undergo, by reason of these regulations, and the requirements for denaturalization. He presented some resolutions, which were adopted, calling upon the different governments to modify their regulations in such a way as to permit the use of pure alcohol in certain cases, and where denaturalization was required to make it as inexpensive as possible.

M. Reid presented numerous specimens of a product known as velvril, intended to replace rubber and gutta percha in a certain number of their applications.

M. Ferdinand Jean presented a study of the rôle of micro-organisms in the liquors of the tannery, and in skins, and gave his experience with a number of antiseptics.

M. Kostancki gave a résumé of his work upon vegetable coloring-matters.

M. Jules Wolff gave results of the analyses of the roots of chicory. The quantity of inulin amounts to 15 per cent. in the fresh

root, but the inulin disappears almost completely during torrefaction.

In Section 5, which was the most numerously attended of any of the sections of the congress, the papers were chiefly of a technical character. Two papers were read by delegates from this country in this section, one by M. Wiley, showing the influence of temperature on the specific rotation of sugar, and the other by M. Wiechmann, taking the ground that temperature exerts no influence on specific rotation. This question of the influence of temperature on the specific rotation was also discussed before the section by M. Pellat, who gave an elaborate mathematical discussion of the data which he had obtained in his investigations.

This theme is particularly interesting to the members of the Northeastern Section, because the great influence of temperature on specific rotation was first pointed out by Andrews who, at that time, was connected with the Institute of Technology. The matter is of such importance, both scientifically and commercially, that it occupied the chief part of the time of the International Committee on Unification of Methods of Sugar Analysis. In the meeting of this committee, the data relating to the influence of temperature on polarizations were presented at length by M. Wiley of the United States, and M. Brodhun, of Germany. The only advocate of the stability of specific rotation, independent of temperature, was M. Wiechmann of the United States. The opinions of the majority were embodied in a resolution which finally passed the International Committee without a dissenting vote. This resolution was to the effect that the saccharimeter should be adjusted as nearly as possible to a temperature of 20°, but when this is not a convenient temperature the adjustment should be made at other temperatures near that of the usual temperature of the laboratory where the polarizations are performed; and further that all polarizations should be performed at, or as nearly as possible, the temperature at which the instrument is adjusted. The influence of temperature on specific rotation has now been so thoroughly worked out that we may say without hesitation that the points established by Andrews eleven years ago, are now fully accepted by practically all the investigators of the world.

I, perhaps, in this connection might also call attention to the fact that the two important international committees on subjects particularly associated with agriculture have made more progress in their work, and received more approval from the congress than any other committees which have been appointed. I refer to the International Committee on Methods of Fertilizer Analysis and theInternational Committee on Unification of Methods of Sugar Analysis. While both of these committees have been

continued for further work, the objects for which they were established have been practically attained, and the chemists of the world are now able to stand on a common foundation in two important branches of chemical analyses. This fact shows how easy it would be to unite the methods of chemists all over the world on all points connected with analytical processes.

In Section 6, there was nothing brought out in regard to fermentation as interesting as the paper read at Vienna by Buchner on fermentation without yeast.

M. Effront, the eminent Belgian authority, presented a communication on the rational use of antiseptics in the distillery, and showed that there were four factors to be considered, *viz.*: 1, the quantity of antiseptic necessary to moderate or arrest the development of ferments; 2, the quantity of antiseptic which enfeebles the yeast itself; 3, the quantity to be used without enfeebling the active substance of the malt; and 4, the influence of antiseptics upon the malts.

M. Barbet presented a communication upon the use of pure yeast in the distillery after sterilization, a subject which is now creating a great deal of interest. We are all familiar doubtless with the imitations of the flavors of wines which are produced by the fermentation of malt extracts with ferments from the wine cellar. The production of particular flavors in fermented beverages, as well as in those which are distilled, will doubtless in the near future be controlled at will by previous sterilization of the mass and the employment of especially cultivated ferments which produce distinctive flavors.

Naturally, the section in which I was most interested was Section 7 on agricultural chemistry. The subjects discussed ranged from the character of the soil to the most difficult problems of vegetable physiology.

M. Dehérain, the distinguished chemist of the agricultural station at Grignon, read a paper showing the chemical and physical effects of the cultivation of a soil in which he showed that the aeration of the soil and the destruction of weeds were not the principal points to be kept in view. The principal value of cultivation is found in the relation of cultivated soils to moisture. Soils which tend to be too wet are dried out more readily by cultivation, while those which suffer from drought have their water retained by the same means. Soils should be cultivated every year if possible. Water charged with carbonic acid dissolves chalk and causes the clay to lose its coagulability.

M. Wiley presented a paper to the section on the economic uses of corn stalks, showing the immense quantity of valuable food material for cattle, destroyed annually in the United States, by the burning of stalks of Indian corn. He showed how the cornstalk becomes one of the best absorbents for blood and

molasses, and thus would form the basis of some of the most valuable manufactured cattle foods.

M. Schneidewind laid before the section some of the results obtained at the agronomic station at Halle on denitrification and in the transformation of soluble nitrogenous compounds into insoluble.

In Section 8, interesting communications were made in regard to the falsification of wines, and it was brought out in the discussion that the *vin ordinaire* obtained at Paris was almost wholly artificial in character, about one barrel of low grade red wine serving as a basis for at least three barrels of the material placed on sale.

M. Berger gave the results of his study in the sterilization of water by peroxide of chlorine. This compound is of such great activity that a quantity less than a milligram suffices to sterilize a liter of water.

M. Ogier states that it is certain that the composition of water treated is not modified in an unfavorable sense by the peroxide of chlorine, and, in so far as mineral matters are concerned, its use does not produce an increase, except in an infinitesimal way so small as to escape detection by analysis. The water which has been sterilized is easily freed from any excess of peroxide of chlorine so that it may be regarded as an irreproachable agent from a hygienic point of view.

M. Brevans discussed the detection of saccharin in alimentary products, in which the method of Remsen was given the preference. As is well-known, the use of saccharin is prohibited in most European countries. Its use in this country by diabetic patients has grown to large proportions. It is extremely doubtful if it serves any useful purpose, while it is quite certain that it hinders digestion. Its general use should be regulated by law, and physicians should be admonished not to prescribe it promiscuously to their patients and never to any particular one for any length of time.

M. Halphen gave a report on the adulteration of oils, and the methods of detecting them.

MM. Abelous and Gerard presented a paper in which they described a soluble ferment found in animal tissues producing nitrates. It exists in the greater number of organs although the proportion is unequal. It not only produces nitrates, but decolorizes the blue of methylene. The ferment has its maximum activity at between 40° and 50°, and is destroyed at about 71°.

M. Molière pointed out the conditions in which it is necessary to work to obtain a regular determination of glycogen in normal and pathological tissues and pointed out the steps necessary to extract the glycogen from the tissues and precipitate the nitro-

genous matters and finally to separate the crude glycogen. The real quantity of glycogen is determined according to the weight of suboxide of copper given by the crude product hydrolyzed by sulphuric acid of 2.5 per cent. strength, and the heated product permitted to act upon Fehling's solution.

The whole subject of the determination of glycogen has lately been studied in the Department of Agriculture, by MM. Bigelow, and Haywood, with the result of showing that the method which is described above and which has been practiced for many years is not reliable. The results of these investigations will soon be published for the information of chemists interested in the determination of glycogen.

I have in the above brief résumé only touched upon some of the papers which to me were of superior interest. Another reviewer would doubtless have selected quite a different series of papers for mention. At any rate, the above will show the general character of the papers which were read, numbered as they were by the hundreds, and of the character of the discussions in regard to them. Of course it is not possible for anyone to be present at all the sections, and it is quite likely that many of the most interesting papers escaped my attention entirely.

I have already called attention to the remark made by M. Moissan in his opening address, to the effect that one of the most valuable points connected with an international congress is the opportunity which it affords of making the personal acquaintance of our professional brethren whom we have long known from their works. And so it seems to me that the most delightful as well as the most useful part of the congress was the meeting of old friends and the making of new ones, especially those whom we had known before by correspondence or otherwise.

In the absence of M. Berthelot, unhappily detained by a slight indisposition from attending the meetings of the congress, by far the most interesting figure to my mind was that of Mendeléef, of St. Petersburg. His white flowing hair and attractive countenance marked him everywhere as a man of distinction. He takes the greatest interest in the work of the chemists of this country, and spoke particularly of many of the contributions which our chemists have made to science. While we may not regard Mendeléef as the first originator of the theory of the periodic law, that being reserved to the honor of Newlands, he must be accorded the credit of having developed it in a thoroughly philosophical and practical way. Among foreign chemists, Mendeléef's work in explosives has been of the highest character and many of the smokeless powders made to-day are composed directly according to his formula or with very little variation therefrom. In fact, Mendeléef has covered almost the whole field of chemical research and, among the older men, shares with Berthelot and Crookes,

the honor of being probably the most eminent chemist now living.

Among the representatives from Germany, perhaps the most distinguished and certainly the most striking in form and figure was Otto Witt, our friend of the Chicago exposition, not less ponderous of figure, not less genial of disposition than at that time. Dr. Witt occupied a high position in the German commissions standing, I believe, next to the director-general and his assistant and was, by all odds, with the French, the most popular German representative. His well-known ability, and his suavity and tact pointed him out as the proper person to be named as president of the Committee of Organization of the next congress, which is to be held in Berlin in 1902.

From our country we had the distinguished president of the Society of Chemical Industry, Professor C. F. Chandler, of New York, who represented, with dignity and success, the advance guard of American applied chemistry.

The chemists of England were conspicuous by their absence. In this congress, as in all the others, scarcely an Englishman was to be found.

Switzerland sent M. Lunge, whose name is known wherever applied chemistry is practiced as being at the head of his profession.

From Italy, we had as a delegate M. Cannizzaro who not only is distinguished in the field of chemistry, but is vice-president of the Italian Senate. In fact the scientific men of Europe do not think it is beneath their notice to take an interest in public affairs and many of them, as in the cases of Berthelot and Cannizzaro, occupy the highest public positions.

From Austro-Hungary the principal representative was the genial Frederich Strohmer, the secretary-general of the Vienna Congress, who did so much at that time to make the sojourn of the foreign delegates in the capital of Austria, pleasant and profitable.

From Greece, M. Christomanos headed the list of delegates.

The distinguished men from France, of course, were numbered by the dozens. In addition to those who have already been named, it was especially pleasant to meet Dehérain, Lindet, Troost, Haller, Lippmann, and others equally as famous.

The Committee on Organization of the Congress showed a great improvement over those of former congresses in the care taken to have inscribed and identified the delegates from foreign countries. Not only was a list of all these delegates published in the daily program, but, what had never been done before in these congresses, the Paris address of each one was affixed, thus rendering it possible to communicate with these delegates in case they could not be met at the sectional meetings which, on account of the widely separated localities in which these sections met, was always a difficult matter.

Highly contributory to the good fellowship and intimate acquaintance were the luncheons, breakfasts, excursions, and banquets offered by the members of the congress to the delegates of foreign governments and learned societies.

At midday of the first day of the meeting, the congressists separated into groups of friends, and took breakfast at the different restaurants in the Latin quarter, in the neighborhood of the Sorbonne. The restaurant of La Société Savante served a special breakfast for members of the congress.

The reception given at 4.30 o'clock the same day by M. Leygues, minister of public instruction, has already been noticed.

On the second day of the meeting a breakfast was given at the Restaurant Lyonnaise of the exposition, Champs de Mars, under the presidency of M. Henry Boucher, member of the Chamber of Deputies and former minister of commerce. At the dessert M. Moissan proposed the health of the science of chemistry in a happy address in which he said:

"There was in antiquity a god who was called Janus. He had two faces, one sad, the other gay, so placed that one might choose that which was adapted the best to his impressions. Chemistry is somewhat like Janus. She has two faces. There is a good chemistry and a bad. The Phoenicians with great difficulty obtained a mineral from the Cassiterite Islands from which they obtained tin which they afterwards adulterated with lead. Chemistry has discovered mineral colors in order to add as much as possible to them of barium sulphate. Chemistry has given us the aniline colors which tint our silk in such pleasant variations and, at the same time, she has taught certain adulterators to add to the silk, 90 per cent. of foreign matter. Chemistry has taught us to obtain as much sugar as possible from the cane and the beet, but she has also invented saccharin which is used for fraudulent purposes. As to wines, I may permit myself to say that certain ones have been adulterated, but we have not noticed that to-day for we have not drunk chemical wines. Yes! by the side of every new preparation is found its falsification. Alas! this is the eternal history of life, the bad is mixed with the good and the fable of Æsop is always true. Chemistry might then be compared to the sabre of M. Prud'homme which might serve to defend our institutions, and, in case of need, to fight them; but she has an advantage over that historic sabre and that is, it is she who aids us in pursuing the adulterators. It is by her trials, by her methods, by her analyses, often very delicate, that we are able to detect the fraud. Chemistry thus heals her own wounds. In the last place, we are able to stop with this consoling thought that if in chemistry virtue is not always rewarded, at least vice is often punished. Gentlemen, I drink to the good chemistry."

The closing banquet of the congress was held at the Hotel

Continental, on the evening of July 28th, when about 300 members sat down to a dinner.

The banquet was presided over by M. Leygues, the minister of public instruction, having on his right M. Moissan, and on his left M. Cannizzaro. It is needless to add that the cuisine was of the most exquisite kind, the wines of the best vintages and served at the proper temperatures, and the good fellowship of the company was equal to the elegant repast which was served.

M. Moissan at the close of the dinner proposed the health of the president of the republic, and of the minister of public instruction and to this toast the minister of public instruction, in the name of the president, and in his own person made a most happy reply.

By arrangement of the delegates of foreign countries M. Lunge spoke for them in an eloquent discourse praising the hospitality of the French and expressing his great satisfaction in having been present at the inauguration of the statue of Lavoisier. He expressed great satisfaction in knowing that the United States and Europe are united, if not in the domain of politics, at least in the domain of science. He drank to the solidarity of the nations united by science, and to the success of the International Congresses of Applied Chemistry, and to the health of M. Moissan to whom he wished a long and successful career.

Numerous personally conducted tours through the most interesting parts of the exposition were enjoyed under the guidance of experts thoroughly acquainted with the character and extent of the exhibits. By this means the congressists were able to see, at small expense of time, the most interesting of the chemical exhibits. While, of course, in magnitude the French exhibits of chemical products were more extensive than those of any other country, it must be conceded that the German exhibit was superior in arrangement, beauty of design, and completeness of detail. Our own chemical exhibit was of a very modest nature and while it was excellent, in so far as it went, it did not in any way illustrate the great strides which our country has made in the last few decades in manufacturing chemistry. Our people are doubtless so busy in the conduct of their great manufacturing problems that they do not think it worth while to give their time and money to securing adequate representation in foreign expositions. In this, however, I think they make a great mistake, and let us hope that when another World's Exposition takes place in a European capital, American chemical products will be represented on a scale commensurate with their commercial magnitude.

The visit to the Pasteur Institute was full of interest, especially to those congressists who had not had a previous opportunity of seeing this monument to the greatest of modern savants. Pasteur was peculiarly and practically a chemist, and the whole suc-

cess of his career must be attributed to his early training in our science and to his constant practice of it. His late researches in the study of toxines produced in diseases and the best methods of preventing them, were largely of a biochemic nature, and his efforts were made possible by his previous training. He, indeed, would be incapable of higher feeling who could look upon the crypt which contains the mortal remains of this great man without a feeling of gratitude as well as of awe: awe in the presence of the mortal remains of so great a life, and gratitude that that life still persists in the benefits which science, under its skilful hand, confers upon suffering humanity. The scientific establishment of the principle of vaccination as applied to other diseases due to toxines was made possible by the works of Pasteur, and these works offer for the future the expectation that in the progress which will certainly be made along these lines many of the plagues which have in the past decimated nations may be wholly eradicated, or at least brought under control.

Through the munificence of the city of Paris, and of Baroness Hirsch, a magnificent addition to the Pasteur Institute is now in construction, across the street from the old building, which will be devoted exclusively to physiological and pathological studies, especially physiological chemistry.

Joined to these laboratories is a hospital built upon the most approved modern plans. The Pasteur Institute is to-day one of the greatest scientific establishments in the world, and of all the schools of biology and physiological chemistry, it is the one where the experimental method is the most fully developed. Thanks to the increase of its buildings, it will be able to receive a greater number of pupils than ever before, and thus to satisfy the immense demand which has been made upon it up to the present time.

Thus the labors of this great man will continue through the twentieth century, and no one can estimate the blessings which they will secure in immunity from disease, in longer life, and in sustained powers of labor, and enjoyment for the whole race.

All the members of the congress are under lasting obligations to M. Duclaux, the director, and to M. Roux, the assistant director, who so amiably performed the honors of this great establishment.

Returning from the visit to the institute, the congressists were received by the préfect of police, and the préfect of the Seine, at the Hotel de Ville. There the congress was addressed by the president of the municipal council who, in a happy speech, welcomed the members of the congress to the city hall, and in a few well-turned phrases jocosely alluded to the differences which exist between the municipal government and the Elysee Palace. Our own people will understand better the strain which exists

there when they know that the municipal government of Paris is in the control of a political party which is violently opposed to the present republican form of government and these relations are so drawn that the president of the municipal council no longer attends the functions of the president of the republic.

The most charming of the excursions made by the congress was a visit to Chantilly. The chateau and estates of Chantilly were formerly the property of the famous Condé, the great constable of France, and in a direct line of descent were inherited by the junior branch of the Bourbons of which the late Duc D'Aumale was the last representative. Dying in 1898 without heirs the Duc, by a will dated October 25, 1886, left this vast estate,—the chateau and its grounds, its fountains, its buildings and forests, its books, pictures, and objects of art, to the French Institute to hold in trust forever for the benefit of the French people and the people of the whole world. This patriotic man, although of royal descent, was one of the few princes of the blood who gave a genuine adhesion to the republican form of government, and he attested his devotion to his country, even as a republic, by leaving to it this magnificent estate with all its priceless objects of art and of history.

All too short were the few hours which we were able to spend in that magnificent palace, filled with treasures the equal of which can no where else be seen, when judged from the point of view of history. Although the day was extremely hot, no one suffered from fatigue with such a prospect as was presented. The chateau, the museums, the lakes, the fish ponds, the race course, the meadows, and the magnificent stables, which are the admiration of the world, all helped to make the afternoon delightful.

One of the most pleasant features in connection with the congress was the unveiling of the statue of Lavoisier in the Place de la Madeleine, under the auspices of the French Academy of Sciences. A beautiful canopy had been erected for the foreign delegates and invited guests, and, although the day was exceptionally hot, there was no lack of interest in the exercises. Nearly all the members of the congress were present to render honor to the great founder of their science, and it was in the midst of an audience composed of those learned men, of the Academy of Sciences, of the representatives of the other branches of the institute, and of numerous learned societies of France, and foreign countries, that the statue of the founder of the science of chemistry, of immortal memory, as Wurtz has said, was unveiled. This beautiful piece of sculpture represents Lavoisier with uplifted right hand in the attitude of delivering a lecture to his students. The left elbow is supported upon a lot of apparatus representing the original forms used by Lavoisier in his immortal discoveries. The piece of statuary bears the simple inscription

"Lavoisier, 1743–1794." This piece of sculpture is the work of one of the greatest of contemporaneous artists, Barrias. It can be said without exaggeration that it adds greatly to his glory. Barrias has shown us the master in all the majesty of his genius and, at the same time, in the garb of the philosopher and incomparable experimenter.

Orations were pronounced by Berthelot, in his absence read by M. Moissan, and by Leygues, the minister of public instruction. The discourse of M. Leygues was especially eloquent. He closed his address with the following words :

"There is an invincible force in things which always triumphs in the end. The scientific institutions which seemed to have disappeared forever with Lavoisier soon sprung up again vivified and rejuvenated by the powerful breath of the revolution, and remain reflected in our glorious institute of France. Among us the rights of free thought are imprescriptible. Nothing can prevail against them. Lavoisier was brave in the face of death. 'I have obtained,' he wrote to Augez de Villers, 'a career tolerably long and above all very happy, and I believe that my memory will be accompanied with some regrets, possibly even with some glory. What could I desire more? The events in which I find myself enveloped are probably going to save me the inconveniences of old age. I shall die perfectly whole. That is an advantage which I ought to count among the number of those with which I console myself.' A single remark is to be made in answer to these last words. Men like Lavoisier never wholly die, and the scaffold only serves to build a pedestal upon which grateful generations will sometime erect their images."

To my mind there could be no happier way of stating the present attitude of the French people toward those great men whom the fury of the terror conducted to the scaffold a little over a hundred years ago. To me, there are no more interesting works of art in the great city of Paris, the mother of modern art, than the two statues of two men beheaded during the revolution, Danton, representing the spirit of pure democracy, and Lavoisier representing the spirit of pure science. His judges would not listen to his plea for a few days more of life to finish some scientific work upon which he was engaged. They hurried him with all haste to the scaffold, and now the whole scientific world unites to honor his undying memory which an ignominious death has only helped to make more precious.

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