REVIEW.

THIRD INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

[Held in Vienna, July 27-August 4, 1898.]

Dr. C. E. Munroe, President of the American Chemical Society:

SIR: I have the honor to submit the following report of my observations as a delegate of the American Chemical Society to the Third International Congress of Applied Chemistry, held in Vienna, July 27 to August 4, 1898.

The president of honor of the congress was Dr. Alexander Bauer, K. K. Hofrath and professor of chemistry in the Imperial Technical High School of Vienna.

The acting president was Dr. Hugo Ritter von Perger, Regierungsrath and professor in the Imperial Technical High School.

The vice-presidents were chosen from the several sections in proportion to their membership. Nearly all the vice-presidents were selected from among the delegates of foreign nations. Our society was represented among the vice-presidents by Prof. W. B. Rising, of the University of California; Dr. F. G. Wiechmann, chief chemist of the American Sugar Refining Co.; and Dr. H. W. Wiley, chief chemist of the U. S. Department of Agriculture. Among other vice-presidents whose names are well known, may be mentioned Professors Fischer, Buchner, Herzfeld, Claassen, Vogel, and von Lippman, of Germany; Moissan, Fernbach, Dupont, and Lindet, of France; Lobry de Bruyn, of Holland; and Piutti and Verdrödi, of Italy. The members of the Austro-Hungarian Cabinet were also made presidents of honor.

A preliminary meeting of the committees and an informal reception to visiting members took place on the evening of July 27th in the Cursalon of the City Park. A concert by a military band and abundant refreshments were offered to the members of the congress on this occasion.

On the 28th of July the general opening of the congress took place in the Aula of the Vienna University.

The opening discourse was given by Prof. Dr. von Perger, as follows:

"Most esteemed gentlemen: As chosen chairman of this select assembly, I have the great honor of opening the Third International Congress of Applied Chemistry. Permit me, before I fulfil this pleasant duty, to express the wish that this association of the most prominent men of science, honored as it is by the presence of illustrious representatives of various governments, may accomplish the grand purpose which has created it in fully as brilliant a manner as at Brussels and Paris, so that it

will justify the intentions of those who see in the personal intercourse of the representatives of applied chemistry, in this international association, an important means of furthering common interests.

" Cooperation in work has, as a look into the past will show, always accomplished great ends. I am certain that I need not enumerate examples as proof of this.

" The great thoughts which have irresistibly guided future progress, the thousands of discoveries and inventions which have rendered possible the development of chemical technics, the tedious labors in the laboratory and factory, are as an open book to you who are cooperating in this grand work directed toward the betterment of all, for they represent at least in part your own experiences. A comparison of the present with the past fully guarantees the constantly increasing importance of technical knowledge, and correspondingly the growing reputation of its representatives. It enables us to determine the paths in which our knowledge of material growth proceeds with regularly increasing rapidity, and even now permits us to recognize great problems whose solution is approaching.

"While in the field of the chemical technology of inorganic compounds the raw materials used on the large scale have remained the same, there being added only the preparation of the carbides and rare earths, the methods of production have been amended with great success with reference to rational management and control.

" The application of electrical energy has caused and will, in the future, result in important changes.

" The raw materials of the chemical technology of organic bodies have in numerous branches of the latter hitherto remained the products of the processes of life, and progress has been confined for the most part to a further development of methods, both analytical and practical, apart from the notable improvements in the fermentation industries.

" The triumphs of synthesis have been mostly identified with the chemistry of coal tar and its constituents. They have not only caused a complete revolution in the textile industries, but have also accomplished much in the preparation of valuable medicinal compounds.

" The theory of the constitution of aromatic compounds, which have proved of such value in the technology of dyeing, has not been without influence on other branches of research. The gulf, which existed for many years between compounds of the ' aliphatic' and ' aromatic' series, has been bridged by the discovery of the ' hydrocyclic' compounds.

" The unitarian system represents fully as great an advance as the synthesis of urea (1828) by Wöhler, which marked an

epoch in the history of chemistry in that it once for all overthrew the doctrine that life was an essential to the production of organic compounds.

"The separation of optically inactive substances into other substances which are dextro- and laevo-rotatory, which disproved the hypothesis that the rotatory power of compounds containing carbon is a characteristic proof of their derivation from organized bodies, was but a further result of the knowledge previously acquired.

"Just as Chevreul at the beginning of this century explained the constitution of the fats by his notable investigations on the process of saponification, the results of which have never been questioned, so has Emil Fischer ushered in a new epoch by his illustrious work on the synthesis of the carbohydrates.

"The well-known hydrolysis of starch, the separation of complex molecular compounds into simpler compounds, whose constitution has been determined, the first synthesis of a 'glucoside' by Emil Fischer, the recent experiments of Marchlewsky on the synthesis of sucrose from artificially produced 'levulose' and 'dextrose', all lead directly to the desire to find 'Reversion-reactions,' which will enable us to build up compounds of high molecular weight, whose molecular complex has been approximately determined by Raoult's method.

"The feasibility of such syntheses being assumed, we more closely approach a solution of the question of organization, and the gap which exists between this and the so-called inorganic compounds will be bridged over similarly to that which formerly separated the fatty and aromatic series.

"The reversion-reactions will secure the synthesis of substances, whose production in this manner will be of great economic value, just as the synthesis of alizarin by Graebe and Liebermann has, and as the preparation of synthetic indigo will become, the latter acquiring more and more practical importance every day.

"The outlook with reference to the results of our present knowledge is elevating; it indicates the satisfactory solution of questions which interest not only the chemist, but the national economist, and possibly the philosopher.

"Encouraged by previous successes and having absolute faith in the unchangeable advance of knowledge, we look into the approaching century with the confidence born of successful investigation, the unity of being, the exploration of the synthesis of organic compounds, those complex compounds, whose synthesis will lead to the secret of the organization of life.

"With this view of the future I have ventured to address this most distinguished assembly and with these modest words I may be permitted to open the Third International Congress."

Dr. Bauer addressed the congress briefly after Dr. von Perger had finished. He said:

"Gentlemen: As honorary president of the committee of organization for this meeting I have the great honor to bid you a cordial welcome, and I take advantage of this occasion to express our satisfaction at seeing so many illustrious members in our midst.

"Our program is rather a large one and involves a great many and various subjects. I think the most satisfactory part of it will be shown in the fact that there is always an agreement in human labor between practical work and theoretical investigation.

"If chemistry has not to be the servant of any one art, as Robert Boyle said two hundred years ago, the chemistry of to-day allows us to serve the arts and at the same time and in the same way to devote ourselves to the study of the highest problems of science.

"In the name of the Austrian chemists I thank most sincerely those who have shown their interest in the success of this congress by personally appearing here; also those who have become members of the congress in all parts of the world, but who have been prevented from attending its meetings. If we shall succeed in making this congress a success, it will be due chiefly to the important position which science and industry have taken in our fatherland.

"For this we thank first of all the wise care and thoughtfulness of our most gracious Emperor, and we are most happy, gentlemen, to have you here on the occasion of the celebration of the fiftieth year of his reign. I invite you, therefore, to join with me in crying, 'His Majesty, our most gracious Emperor and Lord, his royal and Imperial Catholic Majesty, Franz Josef First, er lebe hoch! und dreimal hoch!'"

All the members arose and joined in the cheers, and thereafter the following telegram was sent to the Emperor:

"*To His Excellency, Count Paar,*

"*Chief Adjutant of His Majesty, Ischl.*

"The Third International Congress of Applied Chemistry, now sitting in Vienna, begs your Excellency to present to His Majesty in the name of the Congress the request that His Supreme Majesty will most graciously accept the homage and the most cordial wishes of the Congress on this jubilee year.

"For the Congress: RITTER VON PERGER."

To this telegram the following reply was received:

"In accordance with the imperial command I have the honor to return to the honored chairman of the Third International Congress of Applied Chemistry the thanks of the Emperor for

the telegram of homage addressed to His Imperial and Royal Apostolic Majesty.

"KUENBURG.

"Ischl, July 29, 1898. "Acting for Count Paar."

Dr. Strohmer, the general secretary of the Congress, then presented his preliminary report, in which the organization of the work of the congress was discussed. Committees on organization were formed by the central committee, not only in Austria, but also in other countries. The Austrian committee consisted of nearly 200 persons, of whom 153 were inhabitants of Vienna. 12,000 circulars were printed in German, French, and English, and sent to chemists in all parts of the world. Notices of the meeting were printed in more than 200 scientific journals. Special invitations were sent to more than 600 investigators in all countries to prepare papers, and the hundreds of responses received show how generally these invitations were accepted. In closing, Prof. Ströhmer said:

"In this short report I hope I have shown that the organization committee of the Third International Congress of Applied Chemistry has not in earnestness and industry fallen behind the Paris committee for the second congress, and I further hope, gentlemen, that you will find that we have laid a sufficient foundation for your work while here."

SCIENTIFIC ADDRESS BEFORE THE WHOLE CONGRESS.

Only one scientific address was delivered before the general session of the congress; *viz.*, "Fermentation without Cells," by Prof. Buchner. The speaker stated that the results he had obtained, and which he would proceed to demonstrate, showed that the old notion which supposed that fermentation could only take place under the influence of a living cell, like that of yeast, for example, was evidently erroneous. Cells capable of effecting fermentation probably acted through the production of another body, a residue of cell vitality, and it was this body that was the active principle. The method of preparing yeast liquor containing no yeast cells was described in detail. Fresh Munich beer yeast is deprived of water by a pressure of fifty atmospheres, and is then mixed with an equal weight of quartz sand and a fifth of its weight of kieselguhr, and the whole pulverized. The process is continued until the pulverized mass begins to stick together and on examination with the microscope shows that at that time about forty per cent. of the yeast cells are crushed. The mass is placed on a cloth and gradually subjected to a pressure of 500 atmospheres in a hydraulic press. The cake is removed, moistened with water, and again pressed.

From one kilo of yeast about 500 cc. of juice are obtained by the above treatment, of which only about 140 cc. should be due to the added water. The expressed yeast juice drops from the press into a folded filter, and the filtrate is received in a flask cooled with ice-water. Nearly all the yeast cells are destroyed by the pressure, the microscope showing only about four per cent. intact. The others are seen to be only empty walls, their contents having all been expressed. In the yeast juice certain enzymes are found; *viz.*, invertose, oxydases, and proteolytic ferments. The yeast juice is capable of fermenting sucrose, maltose, *d*-galactose, *d*-fructose, *l*-arabinose, and mannose. It does not act on lactose. *d*-Galactose and glycogen are fermented with difficulty.

It appears, therefore, that fermentation is not a physiological process, or, in other words, a complex vital act. It depends rather on an enzyme-like body resembling zymose, which is produced only in the organisms of living cells like those of yeast. Numerous experiments, showing the fermentative action of the yeast juice, were made during the progress of the lecture.

THE WORK OF THE SECTIONS.

The congress, after the opening session and the address of Prof. Buchner, separated into sections, of which twelve were organized for work. On account of the large number of papers offered in some of the sections, it was found necessary to organize a number of subsections. The final arrangement for sectional work was as follows:

Sec. I. General analytical chemistry and apparatus.
" *II.* Medical, pharmaceutical, and food chemistry.
Subsection A. Pharmaceutical chemistry.
" B. Food chemistry.
" C. Medical chemistry.
" *III.* Agricultural chemistry.
" *IV.* Chemistry of the sugar industry, starch and grape sugar.
" *V.* Chemistry of fermentation.
Subsection A. Beer brewing and malt manufacture.
" B. Alcohol and compressed yeast industry.
" *VI.* Chemistry of wine.
" *VII.* Chemical industries of inorganic materials.
" *VIII.* Metallurgy, mining chemistry, and explosives.
" *IX.* Chemical industries of organic bodies.
Subsection A. Coal-tars and textile dyes.
" B. " " " " "
" C. Chemistry of fats, oils, and lubricants.

Sec. IX. Subsection D. Paper and cellulose.
" E. Tanning and glue.
" *X.* Chemistry of printing (lithograph, photograph, etc.).
" *XI.* Didactic chemistry.
" *XII.* Electrochemistry.

It would not be possible to give an extract or even the titles of the hundreds of papers read before the sections. Unfortunately, no complete programs of the papers read before each section were printed, and members could only find out what was going on by going from section to section. Only brief abstracts, and of these only of the most important papers, were printed during the congress. A rather comprehensive résumé of the papers presented is appearing in the *Oesterreichische Chemiker-Zeitung*, in the *Chemiker-Zeitung* edited by Dr. Krause at Cöthen, and in the *Wockenschrift des Central-vereins für Rübenzucker Industrie in der Oesterr-Ungarische Monarchie.* Practically all the papers will appear in full, in the various chemical journals, and in the printed proceedings of the Congress.

Some of the more important papers presented in the various sections are as follows:

Sec. I.—1. Estimation of Phosphoric Acid, by Prof. H. Lasne.

2. Choice of Atomic Weights, by Dr. Bersch.

3. Proposals for the Uniform Use of Indicators in Volumetric Analysis, by Dr. Paul Degener.

4. Final action on the resolutions of the Second International Congress relating to the construction and introduction of uniform areometers, burettes, etc.

Sec. II.—1. Testing Butter for Foreign Fats and Refractometric Milk Analysis, by Dr. Wollny. In these papers Dr. Wollny described the use of his refractometer for determining the fat in the ether extract of milk obtained in much the same way as in the old Soxhlet method of determining the fat by the density of the ether solution. The method is very rapid and reasonably accurate, and especially where small quantities of fat are concerned, as in the case of skim milk.

2. Examination of Lard, by Dr. Raumer.

3. Examination of Ethereal Oils with the Polariscope, by Dr. Duyk.

4. Determination of the Purity and Activity of Serum, by the French Committee.

5. Determination of Gluten in Flours, by M. Fleurent.

6. Changes of Chlorine-holding Materials in the Organism, by Dr. Gross.

7. Analysis of Potable Waters, by M. Durand.

8. Is It Possible to Detect Pure Brandy by Chemical Means? by Dr. Werber.

9. What is the Limit of Copper Content in Preserved Vegetables, etc., by Dr. Baum.

10. Synthesis of Protein, by Dr. Leon Lilienfeld.

Sec. III.—1. Plants Suitable for Cultivation on Forest Domains, by Arthur Thezarie.

2. Culture of Peaty Lands, by Dr. B. Tacke.

3. Rational Treatment of Stall Manures in Order to Avoid Loss of Nitrogen, by Dr. Schneidewind.

4. The Chemical Composition of Indian Corn and Its Important Products, by Dr. H. W. Wiley.

5. Feeding Cattle with Molasses, by M. Vivier.

6. Unification of Methods for the Analysis of Chemical Manures, by Prof. Angelo Menozzi.

7. Determination of Phosphorus Pentoxide as a Control Method, by Dr. Ritter von Grueber.

Sec. IV.—1. The Role of Pentosans in Sugar Manufacture, by Dr. A. Stift.

2. Influence of Saccharose on the Determination of Pentosans, by Karl Andrlik.

3. Influence of Temperature on the Specific Rotatory Power of Sucrose, by H. W. Wiley.

4. New Processes of Sugar Manufacture and Increased Output, by Dr. A. Herzfeld.

5. The Electrolytic Estimation of Sugar, by J. Formanck.

6. Crystallization of Amorphous Sucrose, by F. G. Wiechmann.

7. Greek Sugar Beets, by Prof. A. Christomonas.

8. The Chemical Nature of Caramel, by N. Fradniss.

9. The Viscosity of Sirup, by Dr. A. Classen.

10. International Methods of Determining the Quality of Sugar-beet Seed, by G. Pammer.

Sec. V.—1. The Diastatic Power of Mushrooms, by Dr. Jean Effront.

2. International Agreement of Methods of Malt Examination, by Prof. L. Aubry.

3. The Steps in the Hydrolysis of Starch, by Prof. Dr. Lintner.

4. The Pasteurization of Beer in Bottles and Barrels, by Prof. Caro.

5. Continuous Rectification, by Drs. Barbet and Fernbach.

6. Estimation of Aldehydes, by Prof. Istrati.

7. Invert Sugar Estimation, by Dr. G. Bruhus.

Sec. VI.—1. Methods for the Chemical Examination of Wine, report by Drs. Barth, Bain, Kruger, and Haas.

2. Influence of Climatic Conditions on the Wine, by Dr. Radulescu, Prof. Dr. Hilger, and Dr. Roesler.

3. Influence of Animal and Plant Parasites on the Character of the Wine, by Prof. Barth.

4. Influence of Fertilization on the Character of the Wine, by Prof. Barth.

5. Influence of the Different Ferments on the Character of the Wine, by Prof. Worthmann.

6. Methods of Controlling the Progress of Fermentation, by Dr. Joseph Bersch and W. Seifert.

7. Influence of the Electric Current on the Ripening of Wine, by Drs. Barth and Kreps.

Sec. VII.—1. The Present Condition of the Petroleum Industry, by Prof. Zalozucki.

2. The Flashing-point of Petroleum, by C. A. Lobry de Bruyn.

3. Acetylene Generators and Acetylene Burners, by Dr. N. Caro.

4. The Industrial Manufacture of Ammonium Nitrate, by M. Truchot.

5. Chemical Processes in the Burning and Slaking of Lime, by Prof. Dr. A. Herzfeld.

Sec. VIII.—1. The Manufacture of By-products from Iron Ores, by Emil Hulz.

2. International Agreement with Reference to the Handling and Transport of Explosives, by Phillip Hess and Julius Ephriam.

3. Theory of Safety Explosives, by Julius Ephriam.

4. Chemical and Microscopic Examination of Gunpowder, by A. Croquert.

5. A New Process of Producing Water-gas, by George Hangsdorf.

6. Some New Methods of Steel Analysis, by L. Verrier.

7. New Methods of Electrical Estimation of Zinc in Ores, by Dr. Henry Pawck.

Sec. IX.—1. The Present Condition of the Chemistry of Coal-tars, by Dr. P. Friedländer.

2. International Adoption of the Baumé Scale for the Determination of Specific Gravity, by Prof. Wolfbauer.

3. The Analysis of Resins, by Dr. Carl Dietrich.

4. The Technical Analysis of Bone Fats, by Dr. Slenkoff.

5. The Chemistry of Paper-making, by Dr. Kellner.

6. The Analysis of Tanning Substances, by Prof. Müller.

7. Study of the Different Kinds of Glues, by A. Cronquist.

Sec. X.—1. Influence of the Chemical Composition of Glass on the Character of Photographic Lenses, by Dr. A. Miethe.

2. Results of Experience in Photographing with Artificial Lights (Magnesium, Aluminum, Auer, Acetylene, etc.), by Henry Kessler.

3. Methods for Determining the Precious Metals in Photographic Baths, by Prof. A. Lainer.

4. Best Methods of Recovering the Precious Metals from Photographic Residues, by Prof. A. Lainer.

5. Most Sensitive Paper for the Less Refracted Spectral Rays, by Dr. M. Andresen.

Sec. XI.—1. The Education and Qualifications of Official Food Chemists, by Dr. Kaiser.

2. The Requirements for Official Technical Chemical Service in Austria-Hungary, by Dr. N. Bomburger.

Sec. XII.—1. Preparation and Properties of Metallic Calcium, by Prof. H. Moissan.

2. Novelties in Eletrochemical Technics, by Dr. Kellner.

3. Uniform Conditions in Electrochemical Work, by Dr. G. Vortmann.

REMARKS ON PAPERS.

In addition to the papers already mentioned, those by Moissan and Lilienfeld attracted general attention. American chemists are so familiar with Moissan's work that it would be a work of supererogation to refer to it here at any length. The methods of preparing metallic calcium were described, samples of the metal shown, and its physical and chemical properties illustrated.

ARTIFICIAL ALBUMEN.

The synthesis of a peptone or peptonoid by Lilienfeld marks a distinct step forward in synthetic work, in the field already partly explored by Grimaux, Pickering, Williamson, and others. We can now speak, however, only of its centesimal composition. The state of its molecular condensation and atom position can only be determined by securing large quantities of the product and submitting it to chemical and digestive studies. It is probable that, as in the case of sugars, the artificial peptone will lack the vital element. In other words, while the chemist has succeeded in building molecules which resemble, in every outward respect, those built up by nature, they are uniformly dead, without cell functions or cell activity. The details of this important scientific work must be awaited before a final judgment, in regard to its far-reaching importance, can be formulated.

The synthesis of peptone is effected by the condensation of phenol with glycocoll with the help of phosphoroxychlorid. A hydrochlorate of peptone results, which gives all the characteristic reactions of protein. By conversion into sulphate and the decomposition of the latter, the free peptone is obtained which, it is claimed by Lilienfeld, is similar both in chemical and physiological properties to the natural product.

It is evident from the method of preparation that the product contained no sulphur, since the only sulphur-containing ingredient used was sulphuric acid, and this could not possibly enter into the organic preparation. Granting that a peptonoid body

was produced, the synthesis of a true proteid, which should contain sulphur, is still undemonstrated.

The color reactions which are supposed to be characteristic of protein must not be relied on too surely. They are probably due to decomposition, and not to the action of the molecule as a whole. It is stated by Pickering that a mixture of tyrosin, indol, and biuret will give all the reactions characteristic of a proteid. If the prospects of artificial food depended on these so-called synthetic products, the vocation of the geoponist would be assured for many millions of years to come.

PAPERS BY AMERICAN CHEMISTS.

There were only a few papers presented by American chemists. Dr. Wiechmann read a paper on "The Crystallization of Amorphous Saccharose." It was shown that the presence of invert sugar, the intensity of light, and, in an indirect manner, the presence of certain inorganic salts, influenced the beginning and progress of crystallization. As a result of the investigation, it was established:

1. That the crystallization of amorphous sucrose is to be ascribed to the presence of crystals of ordinary sucrose which are contained in the melt.

2. The change of amorphous into crystallizable sucrose is hindered by the presence of invert sugar, and the retardation is proportional to the amount present.

3. Inorganic salts and certain other bodies do not, of themselves, tend to produce crystallization of the amorphous sucrose.

4. Alkaline salts which tend to prevent the inversion of sucrose, and thus keep the proportion of invert sugar down, favor a condition which results in the more rapid crystallization of the amorphous sucrose.

5. Light, or the energy produced thereby, favors the crystallization.

In introducing the paper the author referred to his previous publication on the subject, in which the methods of preparing amorphous sucrose were described.

Dr. Wyatt's paper on "American Methods of Fermentation" was listened to with great interest, especially by those who supposed that no information on this theme could come from America.

Dr. Wyatt divided the subject of fermentation into two classes; *viz.*, sugars readily fermentable, and sugars and non-sugars which do not readily ferment or which are necessary to give roundness or mellowness to beer. If the sugars of these two classes really exist as separate compounds, they may be regarded as malto-dextrin. In addition to these the brewer must also consider the dextrins which are quite unfermentable, and yet which

give body to beer. The free acidity of beers is due chiefly to phosphoric and lactic acids. A barrel of beer of ordinary composition weighs 171 pounds and contains 35.4 pounds of solid matter. The total free acid estimated, as lactic acid in a barrel of beer is 0.406 of a pound, or 0.15 per cent. Normal beer yeasts require slightly acid pabulum, while the foreign organisms found in breweries, and which cause so much trouble, flourish best in neutral or alkaline fluids. Acidity also causes various types of albumens to remain in solution in the beers. The poor flavor characteristic of pasteurized beers is mainly attributable to their lack of acidity. The mineral matters in beer are chiefly phosphates, together with some sulphates or chlorides. All the acids are chiefly in combination with potassium and lime. The nitrogenous bodies which are in solution in beer belong to the classes of albumoses, peptones, and amids. As the temperature of beer decreases, portions of these bodies tend to be precipitated, and thus a beer which is brilliant at a temperature of 50° will become cloudy if the temperature is decreased. It is important, therefore, in the storage of beers, that they be kept at a low temperature long enough to secure a complete precipitation of these bodies. The necessity for a longer cold storage of the beers is not easily established, and the prevailing opinion that they should be kept for a much longer period is probably erroneous.

Dr. Wiley's paper on "The Influence of Temperature on the Specific Rotation of Sucrose" was discussed at length by Drs. Herzfeld and von Lippmann. The methods of research employed were described in detail, and all the disturbing forces discussed and the degree of disturbance determined for each. It was shown that on using a compensating quartz wedge to determine the degree of the rotation the temperature influenced the results obtained in the following ways:

1. It causes a change in the rotatory power of the quartz wedge, this power increasing with a rising temperature. From this it follows that a less thickness of the wedge is necessary to produce a given compensation at a high temperature.

2. The volume of the flask increases with a rising temperature, and hence the volume of the solution is greater as the temperature rises.

3. The weight of water in a given volume decreases as the temperature rises, and hence arise differences in the concentration of the solution.

4. The length of the observation tube increases with a rising temperature.

5. The degree of concentration of the solution affects its specific rotatory power.

6. Any variations in specific rotatory power, which are observed after introducing the correction for the disturbances above noted, must be due to direct effect of the change of temperature on the specific rotatory power.

7. Making the corrections noted, it was found that the specific rotatory power of pure sucrose at different temperatures is as follows:

At 4° *a* D = 66.653°.
" 17.5° " = 66.547°.
" 40° " = 66.340°.

In his paper on "The Composition of Indian Corn and Its Chief Products," Dr. Wiley discussed the problem of the economic use of maize as food for man and beast. The composition of all parts of the plant was given from the latest analyses, chiefly those of the Chemical Division of the Department of Agriculture. Statistics were given, showing the magnitude and value of the crop in the United States. The extended use of maize as human food in the United States was referred to, and especially the fact that the hard labor of the southern part of the country was done chiefly on a diet of maize bread.

The utilization of the maize stalks as a cattle food, and of the pith as a packing for coffer-dams of battleships and for other purposes, was discussed. The employment of maize as a source of starch, glucose, alcohol, and whisky was described. The chief object of the paper was to call the attention of European scientists to the value of maize for the purposes mentioned, and to show the groundlessness of the prevalent notion in Europe that it is unfit for European consumption. At the close of the paper the prevailing opinion in Europe concerning maize was pointedly brought out by the following question: "Is it true that maize is actually used in your country for bread-making without admixture with the flour of some other cereal?"

The poor opinion which Europeans have of the character of maize bread arises partly from ignorance, and partly from the fact that European maize lacks that delicacy of flavor and richness of taste which belong to the American article. Further than this, it may be mentioned that maize bears, very poorly, transportation across the sea, and therefore the imported maize or maize flour often makes a very unpalatable bread. A method of transporting the maize and preserving it entirely fresh at the same time will do much to remove the unreasonable prejudice prevalent in Europe against maize as a human food.

ATTENDANCE.

According to the report of the general secretary, Dr. Ströhmer, read at the final general session, the membership of the congress exceeded 1,700. The actual attendance, however, fell

far short of this number. A great many chemists who took membership tickets did not attend the congress. No list of members actually present was published, and therefore only an estimate not very reliable can be made. Such an estimate would place the actual members in attendance at about 800.

The organizers of this congress should have attended a meeting of the American Association for the Advancement of Science before the opening of the Vienna congress. There was no official program of papers nor list of members published. This part of the work was committed to the publishers of the *Oesterreichische Chemiker-Zeitung*. The result was that no one could find out, except by an accidental meeting, who were in actual attendance. No attempt was made to give the city address of those present, and therefore, except by the aid of the police, the search for a friend was hopeless. These facts are not stated as a carping criticism of the management. On the contrary, the local committee displayed the most commendable zeal in its efforts to entertain and oblige visiting members. About thirty American chemists had taken membership tickets in the congress, but only the following Americans were actually present at the meetings: Prof. W. B. Rising, delegate from the University of California; Dr. J. M. Flint, delegate from the Navy Department; Dr. H. W. Wiley, delegate from the Department of State, the Department of Agriculture, and from the American Chemical Society; Dr. Francis Wyatt, of New York; Dr. F. G. Wiechmann, of New York; Mr. Waldron Shapleigh and Mr. H. C. Watts, of Philadelphia; and Mr. M. Ikuta, of the University of Chicago.

Of other foreign countries, France had the largest representation, the French group consisting of about sixty persons. The Germans, strange to say, were no more numerous than the French. Next in numbers came the Russian contingent, while from the other continental nations only a few representatives were present. As was the case at Paris, England had no representative. The abstention of the English chemists from these congresses is somewhat surprising. Greece was not without a delegate, and it seems somewhat strange to hear a fellow countryman of Homer and Socrates discussing the relative merits of the several varieties of sugar-beets.

PLACE OF NEXT MEETING.

There was practically no opposition to the invitation received from the French delegates to hold the fourth congress in Paris. The Germans, however, have a tacit expression of preference for the congress to go to Berlin in 1902. Since all the world will make a pilgrimage to Paris in 1900, it was almost the unanimous opinion of the delegates that it would not be wise to

attempt to hold the next meeting in any other city. In view of the fact that there will doubtless be a large attendance of American chemists at Paris in 1900, the suggestion of the propriety of arranging for their entertainment may not be amiss. If 300 members, or even a less number, of the society propose to attend this congress, it would be conducive to economy and comfort to arrange for quarters in advance. It is therefore suggested that those proposing to attend take concerted action for the purpose of securing proper accommodations. A Congress-Chemical-Exposition Club would, if strong enough in numbers, be able to secure great economy in transportation and entertainment.

PERMANENT COMMITTEE.

Heretofore each congress has been an independent body with a life of its own which has expired with the final adjournment. It was deemed wise at Vienna to make the congress a continuous body, remaining under the constant control of delegates from all represented countries. Dr. Ritter von Grueber proposed, therefore, at the final session, that such a committee be formed, and this proposal was unanimously approved. Some of the members of the committee appointed at this session are named below :

President: Prof. Moissan, of Paris; America: Doremus, Rising, Wiechmann, and Wiley; Austria-Hungary: Meissl, Ströhmer, and von Perger; Belgium: Masson; Denmark: Kjeldahl; England: Procter; France: Berthelot, Déhérain, Dupont, Lasne, Lindet, and Pellet; Germany: Delbrück, Fischer, Herzfeld, and Von Grueber; Italy: Piutti and Verdrödi.

The representatives from other countries will be appointed later by the president of the committee on suggestions from leading chemists and associations of the countries interested. The committee also has power to add to its members in the countries above named.

SECOND MEETING OF THE INTERNATIONAL COMMISSION ON UNIFORM METHODS OF SUGAR ANALYSIS.

This meeting was held on July 31st, in the hall of the Central Association of the Beet-sugar Union of the Austro-Hungarian Monarchy. The chairman of the committee, Prof. Dr. Herzfeld, presided. In all about thirty members were present, among whom may be mentioned Messrs. Dupont and Weisberg, of France; Ströhmer and Stift, of Austria; Weinstein, Thiele, Müller, and Huck, of Germany; Van Ekenstein, of Holland; Nasini, of Italy; and Wiechmann and Wiley, of America.

The chairman of the committee gave a detailed account of the

origin of the committee and its first meeting, which was held in Hamburg. He noted with pleasure that in almost all countries which are interested in the sugar industry a desire had been shown to take part in the labors of the commission. Only English chemists have refrained from taking any part in the work of the committee.

Afterwards the chairman gave a detailed account of the international testing of quartz plates. Twenty different plates had been sent to chemists in different parts of the world. The returns were rather incomplete, only seven chemists outside of the laboratory in Berlin having reported results. The results as far as reported show quite a remarkable agreement, in general, in the values obtained. In some instances, however, considerable variations were noted. The chairman stated that the work would be continued during the coming two years with more care, and, if possible, with a greater number of chemists. He urged all those who received the plates for trial to complete their trials as soon as possible, so that the plates might be forwarded to the next person. In this way a great deal of time could be saved. The importance of temperature in the observations was referred to, especially in the light of the paper read by Dr. Wiley before the congress, showing the great variations in polarization in quartz plates in sugar solutions produced by variations in temperature. The importance of securing quartz plates in some way so that changes of temperature would not subject them to pressure, was fully discussed. Dr. Wiley called attention to the fact that the quartz wedges in compensating instruments were subject to the same influences, and therefore that they should be mounted in the same way as the quartz plates to avoid pressure by changes of temperature.

A general agreement was made to the proposition to substitute for all the different flasks in use a true decimal flask holding exactly 100 cc. To avoid expensive changes in polariscopes already in use, it was decided advisable to change normal weights of sugar employed in polarization to correspond to the flask. For the ordinary instruments, in which the normal weight for the Mohr flask is 26.048, the normal weight for the true flask is almost exactly twenty-six grams. For industrial purposes it was decided that it was not advisable to practice the inversion method of polarization with raw sugars. The slight errors which are introduced into polarization by the invert sugar are partly compensated for by the volume of the lead precipitate. As quickness of work is important in commercial operations, the introduction of the inversion method would be more objectionable than the slight errors which result from the single polarization. The use of animal charcoal for clarifying sugar solutions

was condemned on general principles, on account of its high absorptive power for sugar.

The importance of introducing uniform methods of examination in all countries was unanimously acknowledged, but it was also stated that an attempt of this kind would be attended with serious obstacles and could only be accomplished gradually. It was voted that the chairman, with the aid of the members of the commission, prepare a comprehensive review of the analytical methods used in various countries, as well as of the regulations which are followed in checking disagreeing analyses. This compilation of methods is to be used by the committee in a final report on a uniform international method of working.

Excursions and Scientific Visits.

Numerous excursions to points of general and scientific interest were offered to the congressists.

IMPERIAL JUBILEE EXPOSITION.

Special entrance cards at a reduced rate were offered to members to visit the Imperial Jubilee Exposition located in the Prater. This exposition is held in honor of the fiftieth year of the reign of the Emperor Francis Joseph I. The buildings are situated in a pleasant part of the Prater, and are well placed and built with fine architectural effect. The exposition itself possesses the salient features of modern affairs. During the day, and especially in the evening, excellent bands and orchestras provide delightful music, which is given under cover in inclement weather. The formal visit of the congress to this exposition took place on Sunday afternoon, July 31st.

EXHIBITION OF ALCHEMIC MEDALS, ETC.

The most interesting collection of objects relating to alchemy was opened to the congressists free of charge on Wednesday, July 27th, and Saturday, July 30th. This collection is the property of the Imperial family, and was kindly lent by the Emperor especially for the entertainment of the members of the congress. That Vienna was one of the centers of alchemy, was shown by the address of Prof. Bauer.

EXCURSION TO KAHLENBERG.

On the afternoon of Friday, July 29th, the excursion to Kahlenberg took place. From this renowned overlook hill the city of Vienna may be seen in all its beauty. In the words of the late Crown Prince Rudolf, "This Imperial capital city, with its magnificent buildings, the old Stephan's Dom, index of centuries of greatness, in their center, situated on the majestic Danube, surrounded with a wreath of attractive mountains,

vine-clad hills, and waving forests, so beautiful, so rich in past honors, and still so young and blooming, is a picture such as no other metropolis in the world can present."

On the plateau of the Kahlenberg Hotel a dainty luncheon was served, enlivened by a well-trained quartette of Old Vienna singers. Unfortunately a thunder storm coming on later in the evening brought to a hurried close an otherwise most delightful occasion.

VISIT TO THE WINE CELLARS IN KLOSTERNEUBERG.

By invitation of Prof. Dr. Roessler, the congressists had an opportunity to visit the celebrated Stifftkellers in Klosterneuberg on July 30th. After spending the afternoon in studying the various processes of wine manufacture and visiting the cellars, the members were entertained with " eine gessellige Zusammenkunft im Stifftshank," which was most thoroughly enjoyed.

VISIT TO THE GAS WORKS.

After the formal visit to the exposition on Sunday, those members who desired to go were driven to the city gas works in Bezirk Semmering, where the methods of supplying the city with gas were explained in detail.

VISIT TO THE SEED CONTROL STATION.

Members interested in testing the purity and vitality of seeds were given an opportunity to visit the Agricultural-botanical Experiment Station on Monday, August 1st. The director of the station, Dr. Weinzierl, conducted the visitors through the various laboratories, and explained the methods of determining the purity and vitality of seeds.

VISIT TO THE IMPERIAL OPERA HOUSE.

All delegates from foreign countries were invited to occupy stalls at the Imperial Opera House on the evening of August 2nd. The representation of " The Bride of Corea," a grand ballet with numerous tableaus descriptive of Corean life, was given with an artistic perfection which exacted the greatest enthusiasm. The Americans especially enjoyed the tableaus of the great naval fight between the Chinese and Japanese, which were given with great effect.

EXCURSION TO SEMMERING.

The official excursions connected with the congress were brought to a close on Wednesday, August 3rd, by a visit to the Austrian Vorderalpen at Semmering. The distance of the Semmering from Vienna is about seventy miles, and the trip was made through a most pleasing valley and over a gentle, but

continuous, acclivity. The altitude of the hotel which overlooks the collection of mountains and valleys constituting the Semmering is 1,200 meters. A clear sky and medium temperature served to make the day more agreeable and the views more distinct. From the hotel the Schneeberg, which is the source of the Vienna water supply, is plainly seen. The melting snow, which is the source of the water supply in summer, insures to Vienna an inexhaustible supply of cold, clear, and pure water, quite in contrast with that supplied to many other European cities. After spending the day in strolling over the shady paths and sitting in the shade, and admiring the landscape in ever-changing lights, the congressists assembled at 5 P.M. on the terrace of the hotel for a final banquet. After the dinner was served, a number of farewell addresses was made. The American delegate, in thanking the organizing committee for the many courtesies which he and his colleagues had received, expressed the hope that at no distant day an opportunity might be given to American chemists to reciprocate the favors which they had enjoyed. He feared that a summer meeting of the congress in Washington would not develop a need for overcoats, but ventured to prophesy that the reception which foreigners would receive would be at least as warm as the weather. He would undertake to at least ask the Secretary of the Navy to supply a magnificent transport to convey foreign delegates across the water, where the cementation of international friendship would be made stronger. Chemistry, which had made war so destructive, was destined, in the end, to secure universal peace and good will.

Banquets and Receptions.

In addition to the excursions and visits which have already been described, a number of luncheons, banquets, and receptions were offered either to all or to certain groups of members. The most elegant and numerously attended of these was given by the Burgomaster of Vienna, Dr. Lueger, at the Rathhaus, on Friday, July 29th, from 12 to 2 P.M. At the opening session of the congress, Dr. Lueger gave the following cordial invitation to the congress to accept the official hospitality of the city of Vienna:

"Permit me, honored sirs, as mayor of the City of Vienna, to extend to you a most cordial greeting. Permit me, first of all, to thank you for having Vienna as the place of your meeting. The commonwealth of Vienna will follow your deliberations and conclusions with the greatest attentiveness. Chemistry has become necessary to every step of public life. If we want to know whether water is good or not, we must ask the chemist. If we want to know whether what is bought as human food is

wholesome or not, we must ask the chemist. When we wish to know whether a given soil is fit for this or that purpose, we must ask the chemist. Therefore it is of the highest advantage to us that these gentlemen who devote their studies to applied chemistry have chosen to meet here. You will now permit me to repeat orally the already published invitation from the Common Council and Aldermen of Vienna to visit the City Hall to-morrow to break off for an hour or two from your scientific duties, in order to enjoy a lively reunion. Such interruptions of scientific efforts, as each one knows, serve to strengthen the mind in a most marked manner, and are absolutely necessary to reach happy and successful conclusions. I hope that to-morrow I shall be permitted to welcome all the chemists of the whole earth at the City Hall. It is understood that I also will greet with great pleasure the chemists of the gentler sex. Allow me to close with the wish that the results attained by you shall meet with full and complete success, and that, contended with the end of your labors, you may have a happy return to your homes. Again, in the name of the city of Vienna, I greet you."

At noon the members of the congress assembled in the reception room of the Rathhaus, and for once the "chemists of the gentler sex" attended in great numbers. An hour was spent in visiting the paintings and collections in the various halls of the building. The members and their women friends then gathered in the dining-room, where they were again cordially welcomed by Dr. Lueger, and proceeded to act on his suggestion to hold a "lively meeting." Most convincing proofs were forthcoming to show that the Burgomaster had indulged in no empty phrases in extending the city's hospitality. So lively had the meeting become that it was with great difficulty that the postprandial orators could make themselves heard. At the close of the banquet the members assembled in front of the Rathhaus, and a photograph of the party was made.

DINNER GIVEN TO THE FRENCH GROUP.

On Friday evening, July 29th, Mr. Maurice Deutsch gave a dinner in Sacher's Garden to the French members, to which your delegate had the honor of being invited. The elegant dining-room of this famous restaurant was beautifully decorated, and a dinner of the highest artistic and gastronomic perfection was served. After-dinner addresses were made by Messrs. Deutsch, Moissan, and Wiley. Sixty guests enjoyed Mr. Deutsch's cordial hospitality.

DINNER GIVEN TO THE INTERNATIONAL COMMITTEE ON THE UNIFICATION OF METHODS OF SUGAR ANALYSIS.

The Austrian Society of Beet-sugar Industry gave a dinner at

the Hotel Bristol, on Monday, August 1st, to the members of the International Committee on the Unification of Methods of Sugar Analysis. Thirty guests were present. Dr. Herzfeld, the president of the committee, occupied the seat of honor at the right of Director Ströhmer, who presided at the dinner. After the coffee was brought on, Dr. Herzfeld spoke of the work already done by the committee, and of the aims it had in view. The discussion was continued at great length by other members, and the meeting adjourned at midnight with a sense of having accomplished a great deal of good work in conjunction with a most delightful social occasion.

OFFICIAL BANQUET.

The banquet given by the congress to the delegates from foreign countries was held on Sunday evening, July 31st, in the restaurant in the Volksgarten. It was at first intended to have the tables in the open garden, but the weather having become very cold compelled the removal of the tables, at the last moment, to the circular dining-hall surrounding the court of the restaurant. The presiding officer was the minister of commerce, the president of honor and the acting president sitting at his right and left. The vice-presidents and delegates from foreign countries sat to the right and left of the two presidents. The banquet was followed by after-dinner speeches by the presiding officers and delegates from foreign countries.

Chemical Laboratories in Vienna.

All the chemical laboratories of Vienna were thrown open to the congressists, but no formal visits were made thereto. The members, singly or in groups, visited the laboratories at such hours as proved to be the most convenient.

THE UNIVERSITY LABORATORIES.

There are three distinct chemical laboratories connected with the university. The first laboratory occupies the most of the parterre of the Chemical Institute, No. 10 Währingerstrasse. It contains working desks for seventy students and for twenty-one advanced students and assistants. The professors and assistant professors occupy six smaller halls. There are two balance rooms, but only thirteen balances for all the students. The number of students received is limited to the desks available, and consists of those students of the university who are candidates for degrees in pharmacy or philosophy. The number of papers, theses, etc., which have been published from the laboratory is 285. The director of the laboratory from its foundation to 1876 was Hofrath Prof. Dr. Franz Karl von Schneider, from 1876 to 1890 Hofrath Prof. Dr. Ludwig Barth von Barthenau, and the present director is Prof. Dr. Hugo Weidel.

The second university laboratory occupies the whole of the first story of the Chemical Institute, and contains two large working rooms for beginners and seventy desks for advanced students. There is also a large number of small laboratories for the use of the professors and assistants. As is the case with the first laboratory, it contains a small library, where the leading chemical journals and works of reference may be found. From this laboratory, since 1876, 292 original papers have been published. The present director is Hofrath Prof. Dr. Adolf Lieben.

The third laboratory connected with the university is situated at No. 1 University Place. It is devoted especially to analytical chemistry, and four preparative rooms for the experimental lectures. The director of this laboratory is Prof. Dr. Eduard von Lippmann.

The laboratory for medical chemistry is also a part of the university system under the Pathological Institute and is devoted especially to practical medical studies. It is situated in the general hospital building in Spitalgasse. It is provided with 48 working desks, and 10 for advanced students. In addition to these are found the laboratories for the professors and assistants. The number of the students is limited, and consists exclusively of those who are candidated for the degree of doctor of medicine. The papers of the laboratory are published partly in medical and partly in chemical journals. The director of the laboratory is Hofrath Prof. Dr. Ernst Ludwig.

LABORATORIES OF THE TECHNICAL HIGH SCHOOL.

The Austrian Technical High School corresponds to our Institute of Technology, and the one at Vienna is justly celebrated. There are five laboratories connected with this school.

1. The laboratory for general chemistry consists of six rooms in the parterre of the school building. The teachers and advanced students of this laboratory are occupied with researches of a scientific and technical nature. The director of this laboratory is Hofrath Prof. Dr. A. Bauer.

2. The first laboratory for chemical technology of organic bodies is located on the court of the school building, and consists of two separate halls. The first has desks for twenty students, balance rooms, preparation rooms, etc. The second has the same number of students' desks, but is used for the advanced students and for research. The director of this laboratory is Prof. Dr. Hugo Ritter von Perger.

3. The second laboratory for chemical technology of organic materials is one of the largest belonging to the high school. It occupies thirteen rooms in the middle area of the building. Students of the third year's course are received in this laboratory, and also officers of the technical troops (engineers, sappers,

and miners). The students are occupied chiefly with studies in organic chemistry. The director of this laboratory is Prof. Johann Oser.

4. The laboratory for analytical chemistry embraces eleven rooms on the first story of the school building, and has desks for 118 students. The director of this laboratory is Prof. Dr. G. Vortmann.

5. The laboratory for fermentation and bacteriology is the latest addition to the chemical equipment of the high school. It was founded in 1897, and during its first year enrolled twenty-seven students, of whom two were foreigners. It is equipped with all the latest apparatus for studying the phenomena of fermentation and bacterial activity. The director of this laboratory is Dr. Lafar.

LABORATORIES OF THE IMPERIAL HIGH SCHOOL FOR AGRICULTURE.

There are two laboratories connected with this institute:

1. The laboratory for field and forest chemical technology was opened in 1872. It consists of a chemical and fermentation-physiological department, the latter having just been established. The chemical laboratory embraces two large halls, each arranged for sixteen students. In addition, there are balance rooms, photographic ateliers, and separate laboratory rooms for the professors and assistants. There are also a large lecture-room and a special room for microscopic research, storerooms, etc. Only students of the School of Agriculture are received in this laboratory who have had at least three semesters in the laboratory for general chemistry. The program of studies embraces researches in the chemistry of sugar, starch, malt, beer, and alcohol manufactures, as well as in wine-making. The course lasts for two semesters. The director is Hofrath Prof. Dr. Schwackhöfer.

2. The laboratory for general and agricultural chemistry embraces a suite of fourteen rooms, desks for ninety-eight students, laboratories for professors and assistants, and all modern appliances for chemical agricultural studies. The director is Prof. Dr. G. Zeissel.

CHEMICAL LABORATORY OF THE GEOLOGICAL SURVEY.

This is one of the oldest laboratories in Vienna, having been established in 1849, "for the purpose of studying all kinds of soils and rocks, ores and fossils; also the different products of the mines of the Empire." A long series of publications on the chemical composition of rocks and minerals, mineral waters, and on crystals and crystal formations, has issued from this laboratory and been published chiefly in "Verhandlungen der k.k. geolog. Reichsanstalt," or in the "Jahrbuch der k.k. geolog. Reichsanstalt."

The laboratory was at first under the direction of Dr. F. Ragskys, and after him came Dr. Karl von Hauer. At first the chemists in this laboratory had no official standing, and only in 1872 were they recognized as of equal rank with the geologists. Baron Heinrich v. Foull, the late director of the institute, was slain by the natives of the Solomon Islands during a visit there in 1896. The present director is Dr. Konrad v. John, who has numerous assistants, most of them volunteers.

CHEMICAL LABORATORY OF THE TECHNICAL MILITARY COMMITTEE.

In this laboratory the government investigations of explosives are conducted. Also all the materials, such as clothing and food, which are furnished to the army and navy, are examined in this laboratory.

CHEMICAL LABORATORY OF THE MILITARY SANITARY COMMITTEE.

This laboratory was founded in 1854, and has, for its chief purpose, the examination of drugs and medicines, and medicinal supplies furnished to the army and navy. The director is Dr. Florian Kratschquer.

IMPERIAL GENERAL RESEARCH INSTITUTE FOR FOODS.

This is one of the latest foundations of the governmental scientific institutions, having been opened on the 1st of December, 1897. It is charged with the official inspection of the trade in all kinds of foods and drinks consumed by man. In addition to its official duties, this institute is authorized to make examinations of foods and drinks for private persons on the payment of fixed fees. This work, however, may be refused if it conflict with official duties. The chemists employed here must have diplomas showing that they are food experts. The scientific staff of the institute is also charged by law to make researches in respect of the composition and properties of human foods and the best methods of studying them. The director of the institute is Dr. Max Grueber, professor of hygiene in the Vienna University.

CHEMICAL LABORATORY OF THE GENERAL POLYCLINIC.

The studies of this laboratory are directed mainly to pathological products, serums and other products of biological activity, with special reference to diagnosis and therapeutics. It has roomy and well-illuminated quarters, and is under the direction of Dr. Julius Moultner, university professor of applied medical chemistry.

THE IMPERIAL AGRICULTURAL CHEMICAL EXPERIMENT STATION.

This institution is the head of all the agricultural experiment stations of the Austro-Hungarian monarchy. It was established in 1870, and now is located in commodious quarters at No. 3, Trunnerstrasse, in the Second Bezirk. The first director of the station was Dr. Ignatius Ritter von Moser. From his death until the spring of 1898 the station was under the direction of Prof. Dr. Meissl. In the spring of that year Dr. Meissl was made emeritus professor and transferred as advisor and technical assistant to the ministry of agriculture. Prof. Dr. Dafert has just been called to the directorship of the station, with Prof. Joh. F. Wolfbauer as his first assistant. This laboratory is charged with the general direction of all the great problems underlying agricultural progress; *viz.*, researches in animal and plant production, acclimatization of plants and animals, fertilizer control and analysis, making chemical, microscopical, and physiological investigations for the minister of agriculture, and, under certain conditions, for private citizens. The station is also charged with giving advice and instruction on agricultural subjects, and with training of agricultural experts. In general, this station holds the same relation to the minister of agriculture that the Divisions of Botany, Vegetable Pathology, Soils, Biochemistry, and Chemistry hold to the secretary of agriculture, in Washington. In connection with the station a vegetation house has been established at Kornenburg for practical demonstrations in plant nutrition and physiology, similar in every respect to the vegetation house of the Division of Chemistry, at Washington. The feeding experiments are conducted in a large respiration apparatus, built, in general, according to the Pettenkofer plan. Extensive experiments of a chemical-physiological nature are made with calves, cows, sheep, pigs, and even horses. This institute claims the credit of being the first to demonstrate beyond question that the carbohydrates are the chief source of all the fat of the animal organism. Among some of the subjects more recently investigated in this laboratory may be mentioned the composition and value of the different foods of the Austro-Hungarian monarchy, the proteid and fatty bodies in beans of soja hispida; the cause of the superior nutritive properties of Alpine hay; the composition of the flesh of whole animals fed under different systems of nutrition; the critical examination of the methods of analysis of the different organs of the body and their secretions; the influence of fertilization; the composition of field and garden plants; and the chemical and physical properties of peaty soils. Important dairy researches have also recently been made, especially in respect of the preparation and preservation of strong extracts of

rennet on the condensation and preservation of milk, and on the testing of milk and milk products for purity and adulterations. Extensive studies have also been undertaken on the properties and methods of estimation of the most important sugars as related to the theory and practice of fermentation. In connection with this study valuable contributions on the subject of the relative fermenting power of yeasts have been conducted. A study of the composition of the water of the Danube at Vienna for every day in the year has also lately been made.

In addition to this public work the institute is also authorized to undertake private analyses at a fixed price, the fees so obtained becoming a part of the available funds of the laboratory. The number of these analyses, which in 1877 reached scarcely 1,000, amounted in 1896 to 14.940. To your delegate this laboratory was naturally the most interesting of all those visited, and he is indebted to Director Dafert for many courtesies attending his visit. This chemical experiment station shows, in a most convincing manner, the fundamental position occupied by chemistry in almost every problem connected with agricultural research. In Europe, more than in America, is this relation recognized, and there is scarcely a single station of the 100 existing in Europe which does not have a chemist for a director. In fact it is doubtful whether any agricultural station in which the chemical idea is not dominant can ever reach the full measure of its usefulness, or study intelligently and successfully any of the really great problems connected with agricultural research. Of how little relative value the non-chemical researches are which are connected with agriculture may be readily seen by consulting the personnel of the European stations. This fact is mentioned with no purpose of discrediting the work of entomologists, botanists, and other scientists in relation to agricultural development, but only to recall to the thinking public the very foundation of agricultural science, which relates first of all to the productivity of the soil. The fertility of the fields is the first great need of agriculture. After that come the development of domestic animals, the study of their diseases, and the study of the adaptability of plants and the habits of useful and injurious insects.

PHOTOCHEMIC LABORATORY.

The chemistry of printing with light is studied in a laboratory connected with the Imperial Graphic Teaching and Experiment Station founded in the year 1888. This laboratory consists, first, of a section for teaching the theory of photography and graphic reproduction; second, of a section for teaching the theory and practice of illustrating books and periodicals; third, an experiment station for photochemistry and photo-printing;

fourth, a museum containing collections illustrating all the subjects of study and apparatus for producing them. The director of the institute is Regierungsrath Prof. Dr. Josef Maria Eder, professor in the Technical High School. The staff consists of five professors, four special teachers, two assistant teachers, one privat docent, and numerous helpers.

CHEMICAL LABORATORY OF THE ART SCHOOL OF THE IMPERIAL MUSEUM FOR ART AND INDUSTRY.

The laboratory was established in 1877 for the study of glass, porcelain, and enamels. In 1888 it was transferred to the ministry of religion and education, and enlarged to embrace all subjects of artistic manufacture. Instruction and practice are given on the materials, means, and methods of artistic work. The chief subjects of study, however, remain those for the investigation of which the institution was originally founded. The director of the laboratory is Prof. Dr. Friedrich Linke.

TECHNICAL-CHEMICAL LABORATORY FOR THE LEATHER INDUSTRY.

The object of this laboratory is the promotion of the leather industry by scientific researches. The technical part of the work has for its object the conversion, into practical use, of the purely scientific studies. The laboratory was opened in 1874 by the minister of commerce. It contains a physical, a chemical, and a bacteriological laboratory, and a large special library of all principal works relating to leather, its preparation and uses. In 1882 the institute was transferred to the ministry of education. Since then a special course in instruction in the theory and practice of leather production has been organized for advanced students and technical workers. The director of the institute is Regierungsrath Prof. Dr. Wilhelm Eitner.

CHEMICAL-TECHNICAL EXPERIMENT STATION OF THE CENTRAL SOCIETY FOR SUGAR INDUSTRY.

Next to the agricultural chemical experiment station, this laboratory had the greatest interest for your delegate, and it was the only one to which he had time to make a second visit. It is under the direction of Prof. Dr. Friedrich Strohmer, the genial general secretary of the congress, assisted most ably by Dr. Anton Stift, one of the recording secretaries. Unfortunately for the chemical visitors, the laboratory was somewhat torn out preparatory to moving to the more commodious quarters which it will soon occupy at No. 18 Elizabethstrasse, Bezirk 1. The laboratory was founded, in 1859, by the Union for Beet-sugar Industry of the Austrian Empire. In 1867 the laboratory was transferred to Prag, at that time the center of the beet industry

in Austria. In 1869 it was moved to Gross-Seelowitz, the seat of some of the most important sugar factories of the Empire. One year thereafter the station was removed to Vienna, where it has remained ever since, and where it is now permanently located. The station is entirely independent of governmental control or assistance, and is the property of the Central-Verein für Rübenzucker-Industrie. Its purpose is the investigation of all subjects connected with beet-sugar production, whether of an agricultural, chemical, or technical character. The station also edits the journal of the society, the *Wochenschrift des Central-Vereins für Rübenzucker-Industrie* in den Oesterr.-Ungar. Monarchie. Private analyses for sugar growers and others are also made by the station at a fixed tariff, the fees derived therefrom becoming a part of the funds to sustain the station. From 1870 to 1898 there were made at the station 99,036 analyses, involving 223,120 quantitative determinations. The laboratory undertakes also to set standard solutions for the use of technical chemists in the various sugar factories, to adjust polariscopes and graduate flasks. Special botanists, entomologists, and pathologists are also employed for the study of beets, beet diseases, and injurious insects and molds. In the new quarters, to which the laboratory is about to be moved, greatly increased facilities for work will be provided, and under the able direction of Dr. Strohmer the station may be expected to accomplish even greater works than in the past.

CHEMICAL LABORATORY OF THE GENERAL AUSTRIAN DRUGGISTS' UNION.

This laboratory was founded in 1865, and has, for its chief object, teaching the theory and practice of pharmacy. A specialty is made of urine analysis for diagnostic and therapeutic purposes. The director of the laboratory is Dr. C. Glücksmann.

RESEARCH INSTITUTE OF THE GENERAL AUSTRIAN DRUGGISTS' UNION FOR FOODS, CONDIMENTS, AND DRINKS.

This laboratory was founded in 1888 in honor of the fortieth year of the reign of the Emperor. Its chief purpose is the analysis of all kinds of foods, condiments, and drinks for associations and private individuals, at a charge varying in amount with the magnitude of the work. It also gives instruction to graduates in pharmacy who wish to prepare themselves especially for food and drug analysis. A special course of lectures is given on food adulteration. The director of the laboratory is Dr. Moriz Mansfeld.

AUSTRIAN EXPERIMENT STATION AND ACADEMY FOR THE BREWING INDUSTRY.

This institute possesses one of the best appointed and most

complete laboratories for its purpose of any in Vienna. It was founded in 1887, but the Academy of Instruction was first opened in 1895. The laboratories of chemistry, fermentation, bacteriology, and botany are not only roomy and admirably equipped, but united in an organic union highly conducive to the best results. Each worker is not engaged alone in pushing his own researches, neglecting and even despising the work of others, but all in perfect harmony and under a single direction, are working together for one great purpose; namely, the placing of the brewing industry on a strictly scientific basis and promoting its progress by research and experiment. The course of instruction lasts for four semesters, and an entrance examination equivalent to that required for the voluntary one year military service is exacted. Foreigners also, who desire to pursue the course of study, must bring evidence of a suitable education. An experimental malt factory and brewery are connected with the station, where the results of all researches are subjected to practical demonstration. The director of the institute is k. k. Hofrath Fr. Schwackhöfer. The chief of the chemical laboratory is Dr. Ed. Jalowetz, and of the ferment-physiological laboratory, Dr. H. Wichmann.

CHEMICAL LABORATORY OF THE K. K. TECHNOLOGICAL TEXTILE MUSEUMS.

The object of this laboratory is to give theoretical and practical instruction to students proposing to enter the textile fabrics industry. It is one of the largest institutions of instruction in the world, and the annual expenditures of the institute amount to about 265,000 gulden. Since its foundation in 1881 more than 10,000 students have taken the course of instruction. The laboratory and school of instruction are under the direction of Dr. Paul Friedlander, who is assisted by a large corps of professors and specialists. The chemistry of dyeing is, of course, the chief subject taught.

CHEMICAL-PHYSIOLOGICAL EXPERIMENT STATION FOR WINE AND FRUIT CULTURE AT KLOSTERNEUBERG.

The instructive and agreeable excursion to this locality has already been referred to. Towards the end of 1870 this important station was founded by the k. k. minister of agriculture, and Prof. Dr. L. Roessler, at that time professor in the Technical High School at Karlsruhe, was appointed director. The charter of the institute required the most thorough scientific research into all the problems connected with wine-making and fruit culture. The work in general is directed

(*a*) To a chemical, microscopical, and bacteriological study of must and wine, of yeasts and the by-products of fermentation,

to studies of cellar fermentation and ripening, clarification, sucration, etc.

(*b*) To the chemical and mechanical analysis of vineyard soils.

(*c*) To the chemical studies of vineyard fertilizers and their effects upon the vintage.

(*d*) To the chemical and microscopical studies of the vine and fruit trees, with special reference to their constitution and ability to resist the ravages of diseases and insect pests.

The institution was also charged on its foundation with the publication of the results of its labors, and with furnishing advice and direction to those engaged in wine and fruit culture. The director of the station is Prof. Dr. Josef Leonhard Roessler, who showed many courtesies to the members of the congress who visited the station, both on the occasion of the general excursion and at other times.

The above brief review of the foundations for teaching chemistry and chemical practice in Vienna has been given as a proper adjunct to the special report of the congress, and because American chemists are not, as a rule, so well acquainted with the facilities for teaching chemistry in Vienna as they are with those in Germany and France. It is seen that there is no dearth of laboratories and experimental stations in the Austro-Hungarian capital, and the rulers of that eastern Empire are fully alive to the fact that only those nations which push chemical studies and apply them in a scientific technical manner can hope to keep abreast of the progress of the world.

These Congresses of Applied Chemistry teach, first of all, the fundamental relations of applied chemical research to all the great industries that make nations wise, rich, and powerful. The advance of any nation in wealth, civilization, and power is measured directly by the position occupied therein by chemical research applied to the arts and sciences.

And yet the makers of the wealth of nations, those who contribute most to its progress and welfare, who are most intimately related to all the industries of war and peace, strange to say, receive the least social and political distinction, and command the least compensation of all the classes who devote themselves to the public service and welfare. It is therefore suggested that a proper theme to receive the attention of the next congress, which meets in Paris in 1900, would be a "Report on the Fundamental Relations of Applied Chemistry to National Wealth and Progress."