of this address, to discuss the details of such questions as house disinfection; but I may be permitted to say that the methods for disinfecting apartments have been worked out on a satisfactory experimental basis, and should be known, at least, by all public-health officers. Whether it be pertinent to this occasion or not, I cannot forbear to add my protest to that of others against placing reliance upon any method hitherto employed of disinfecting houses or apartments by fumigation; and I would furthermore call attention to the lack, in most cities of this country, of public disinfecting establishments, such as are in use with excellent results in most cities of Europe, and which are indispensable for the thorough and convenient disinfection of clothing, bedding, carpets, curtains, etc.

After this short digression, let us pass from the consideration of the air as a carrier of infection to another important external source of infection; namely, the ground. That the prevalence of many infectious diseases depends upon conditions pertaining to the soil cannot be questioned; but the nature and the extent of this influence have been and are the subjects of lively discussion. The epidemiological school led by Pettenkofer assigns, as is well known, to the ground the chief, and even a specific and indispensable, influence in the spread of many epidemic diseases, particularly cholera and typhoid-fever. The statistics, studies, and speculations of epidemiologists relating to this subject probably surpass in number and extent those concerning any other epidemiological factor. The exclusive ground-hypothesis has become an ingenious and carefully elaborated doctrine with those who believe that such diseases as cholera and typhoid-fever can never be transmitted by contagion. These authorities cling to this doctrine with a tenacity which indicates that on it depends the survival of the exclusively localistic dogma for these diseases.

To all who have not held aloof from modern bacteriological investigations it must be clear that views which have widely prevailed concerning the relations of many infectious germs to the soil require revision. The question is still a difficult and perplexing one; but on some hitherto obscure or misunderstood points these investigations have shed light, and from the same source we may expect further important contributions to a comprehension of the relations of the ground to the development of infectious diseases.

The ground, unlike the air, is the resting or the breeding place of a vast number of species of micro-organisms, including some which are pathogenic. Instead of a few bacteria or fungi in a litre, as with the air, we find in most specimens of earth thousands, and often hundreds of thousands, of micro-organisms in a cubic centimetre. Fraenkel found the virgin soil almost as rich in bacteria and fungi as that around human habitations. This vast richness in micro-organisms belongs, however, only to the superficial layers of the earth. Where the ground has not been greatly disturbed by human hands, there is, as a rule, about three to five feet below the surface an abrupt diminution in the number of living organisms; and at the depth where the subsoil water usually lies, bacteria and fungi have nearly or entirely disappeared. Fraenkel, who first observed this sudden diminution in the number of micro-organisms at a certain level beneath the surface, explains this singular fact by the formation at this level of that sticky accumulation of fine particles, consisting largely of bacteria, which forms the efficient layer in large sand-filters for water. Of course, the number of bacteria, and the depth to which they penetrate, will vary somewhat with the character, especially the porosity, of the soil, and its treatment; but the important fact that all, or nearly all, of the bacteria and fungi are retained in the ground above the level of the subsoil water, will doubtless hold true for most situations.

The conditions are not favorable for the multiplication of bacteria in the depth of the ground, as is shown by the fact that in specimens of earth brought to the surface from a depth of a few feet the bacteria which are at first present rapidly multiply. What all of the conditions are which prevent the reproduction of bacteria in the deep soil has not been ascertained, but the fact necessitates similar precautions in the bacteriological examination of the soil as in that of water.

We have but meagre information as to the kinds of bacteria present in the ground in comparison with their vast number. Many of those which have been isolated and studied in pure culture possess but little interest for us, so far as we know. To some of the micro-organisms in the soil appears to be assigned the *rôle* of reducing or of oxidizing highly organized substances to the simple forms required for the nutrition of plants. We are in the habit of considering so much the injurious bacteria, that it is pleasant to contemplate this beneficent function so essential to the preservation of life on this globe.

Among the pathogenic bacteria which have their natural home in the soil, the most widely distributed are the bacilli of malignant œdema and those of tetanus. I have found some garden-earth in Baltimore extremely rich in tetanus bacilli, so that the inoculation of animals in the laboratory with small bits of this earth rarely fails to produce tetanus. In infected localities the anthrax bacillus, and in two instances the typhoid bacillus, so far as it was possible to identify it, have been discovered in the earth. There is reason to believe that other germs infectious to human beings may have their abiding-place in the ground; certainly no one doubts that the malarial germ lives there. As the malarial germ has been shown to be an organism entirely different from the bacteria and the fungi, we cannot apply directly to its behavior in the soil, and its transportation by the air, facts which have been ascertained only for the latter species of micro-organisms; and the same precautions must be observed for other diseases with whose agents of infection we are not acquainted, as, for instance, yellow-fever.

In view of the facility with which infectious germs derived from human beings or animals may gain access to the soil, it becomes a matter of great importance to determine how far such germs find in the soil conditions favorable for their preservation or their growth. We have, as is well known, a number of epidemiological observations bearing upon this subject; but, with few exceptions, these can be variously interpreted, and it is not my purpose to discuss them. The more exact bacteriological methods can, of course, be applied only to the comparatively small number of infectious diseases, the causative germs of which have been isolated and cultivated; and these methods hitherto have been applied to this question only imperfectly. We cannot regard the soil as a definite and unvarying substance in its chemical, physical, and biological properties. What has been found true of one kind of soil may not be so of another. Moreover, we cannot in our experiments bring together all of the conditions in nature which may have a bearing on the behavior of specific micro-organisms in the soil. We must therefore be cautious in coming to positive conclusions on this point on the basis of experiments, especially those with negative result. With these cautions kept constantly in mind, the question, however, is one eminently open to experimental study.

The experiments which have thus far been made to determine the behavior of infectious micro-organisms in the ground have related especially to the bacilli of anthrax, of typhoid-fever, and of cholera; and, fortunately, these are the diseases about whose relations to the ground there has been the most discussion, and concerning which we are most eager to acquire definite information.

(*Continued on p.* 78.)

NOTES AND NEWS.

ACCORDING to the Calcutta correspondent of the London *Times*, a herd of 100 wild elephants has been captured in Mysore by Superintendent Sanderson. The same correspondent states that there were 6,000 deaths by snake-bites in the North-West Provinces last year. In Madras, 10,096 cattle were killed by wild animals, and the loss of human life by snakes and wild animals was 1,642.

— The United States Bureau of Education has issued as circular of information No. 7, 1888, in the series of contributions to American educational history, edited by Herbert B. Adams, "A History of Education in Florida," by George Gary Bush, Ph.D.

— The preparations for the Niagara Falls electrical convention, Aug. 6, 7, and 8, have been completed. The convention will be welcomed to Niagara Falls by the Hon. W. C. Ely, who, in his salutatory address, will touch upon the utilization of water-power for electric-light purposes. President E. R. Weeks will open the convention with an address, including among other things a statistical

account of the present state of the electric light and power industries. The executive committee will report through its chairman, Mr. Benjamin Rhodes, who will record the general work of the association for the last six months, and more particularly that portion of it not fully covered in the other committee and official reports. This will be followed by the usual report of the secretary and treasurer. The committee on harmonizing the electric-light and insurance interests will report through its chairman, Mr. P. H. Alexander, who will present elaborate statistics on the fire losses collected and the insurance premiums paid by electric-light companies; the committee will also recommend measures by which insurance rates on electric-light stations may be lowered. The national committee on State and municipal legislation will report through its chairman, Mr. Allan R. Foote of Cincinnati. This committee, which is now composed of twenty-six gentlemen from as many different States, and whose object was set forth in Bulletin No. 1 of the National Electric Light Association of New York, is now fully organized and ready for work. The committee on the revision of the constitution will report through its chairman, Dr. Otto A. Moses, who will submit a carefully considered revision of the present constitution. Dr. Moses will also address the convention on the recent movement in New York State to introduce killing by electricity as a substitute for hanging in legal execution. He will supplement his remarks with well-digested statistics. The following papers will be read: "The Value of Economic Data to the Electric Industry," by Mr. Allan R. Foote of Cincinnati; "Electric Street-Railways," by Mr. George W. Mansfield of Boston; "An Ideal Station," a paper in two parts, — from an electrical standpoint, by Mr. Marsden J. Perry of Providence; from a mechanical standpoint, by Mr. John T. Henthorn of the same city; "The Economic Size of Line-Wire," by Benjamin Rhodes of Niagara Falls; "Station Accessories in the Shape of Measuring-Instruments," by C. C. Haskins of Chicago; "The Development and Progress of the Storage-Battery," by Mr. William Bracken of New York; "The Theoretically Perfect Arc-Light Station," by M. M. D. Law of Philadelphia; and "The Electrical Transmission of Power," by Professor E. P. Roberts of Cleveland. Mr. A. J. De Camp will address the convention on "The Methods of Arriving at the Cost of the Products of a Station." Gentlemen who propose attending the Niagara Falls convention are reminded, that, to get the two-thirds rebate on their return railroad-ticket, it will be necessary for them to procure a Trunk Line or Central Traffic Association certificate from the ticket-agent when they buy their ticket to Niagara Falls. The secretary and treasurer, Allan V. Garratt, will be at the Electric Club Saturday and Sunday evenings, Aug. 3 and 4, and at the Erie Railroad Depot, at the foot of Chambers Street, New York, at 8.45 o'clock A.M., Monday, Aug. 5, to supply tickets and certificates for the special train at 9 o'clock A.M. on the same day.

— Mr. D. W. Langdon, jun., who has been for a number of years connected with the Alabama Geological Survey, has entered upon the duties of geologist and consulting mining engineer of the Chesapeake and Ohio Railway, probably with headquarters at Richmond, Va.

— Professor G. E. Morrow of the University of Illinois is now in Europe, in behalf of the United States Department of Agriculture, to make a report on the live-stock exhibited at the Royal Agricultural Society show at Windsor. He will also visit the Continent, and especially France and Germany.

— On July 15 a deep-sea exploration party started from Kiel, on board the steamer "National," for the Greenland coast, where they propose to carry on a series of submarine soundings and investigations. The expedition is directed by Professor Hensen.

— The next international archæological congress is to be held in Christiania in 1891. It was originally intended that it should be held in London. Dr. Ingvald Undseth of Christiania is the general secretary.

— According to a correspondent of the *Artisan*, a simple plan of preventing sheet-iron stacks from rusting is as follows: if before raising the new chimney, each section, as it comes from the shop, be coated with common coal-tar, then filled with light shavings and fired, it will resist rust for an indefinite period, rendering future painting unnecessary. In proof of this, he cites a chimney which was erected in 1866, treated as above described, and is to-day as bright as it was the day it was raised, without having a particle of paint applied since. The theory by which he accounts for this result is that the coal-tar is literally burned into the iron, closing the pores, and rendering it rust-proof.

— In the *Engineering and Mining Journal* for July 27, Henry Wurtz maintains that asphalts and asphaltoids are mainly produced from rock-oils by polymerization of certain constituents of such oils under the influence of the air, or of the sun's rays, or of both, together with the influence of acid, saline, or other polymerizing agents incidentally present; and the author defines polymerization as due to and dependent on the coalescence of two or more molecules of an element or compound into one; being inclusive and explanatory, as thus regarded, of the allotropism of Berzelius.

— From some notes on the color of the eyes and hair in Norway, by Drs. Abbo and Faye, with tables and annotations by M. Topinard, in the *Revue d'Anthropologie*, it appears that the population of Norway exhibits a higher percentage (97.25) of light eyes than any other country in Europe. Flaxen hair occurs in 57.5 per cent of the people of the northern provinces; and, while absolutely black hair is found only in the ratio of 2 per cent, red hair does not rise higher than 1.5 per cent in the scale of hair-coloration.

— *Nature* gives the following summary of a paper on "Hallstatt in Austria, its Places of Burial, and its Civilization," by Dr. Hornes: "This is an extremely interesting summary of the important discoveries made within the last few years in the Hallstattian burying-grounds of Slavonian Austria, more especially at Watsch in Carniola, where the beauty and finish of the carved baldrics and belts have led contemporary paleontologists to regard them as an evidence of the existence in central Europe of an early civilization, which had already attained to considerable artistic culture before its extinction under the weight of advancing hordes of barbarian invaders. The necropolis of Hallstatt, for our acquaintance with which we are indebted to Baron Sacken, still remains unrivalled for the splendor and variety of its antiquities, notwithstanding the marvellous results of the recent Carniolian and Croatian finds. Between 1846 and 1863, Sacken and Ramsäuer published reports of their explorations of nearly 1,000 tombs, while since that period the number of graves explored has risen to nearly 1,900. Both at Hallstatt and Watsch the rites of interment and incineration had been followed with nearly equal frequency; but, although in the case of the latter the graves appear to have been most richly supplied with gold ornaments and carved bronze arms, the abundance of yellow amber and of decorative objects of the toilet, which are found buried with the unburnt skeletons, renders it difficult to decide which of the two methods of disposing of the dead was regarded as the more distinguished. The cranial type is generally dolichocephalous, with a retreating forehead and long, slightly prognathic face, resembling what is known in Germany as the 'Reihengräbertypus.' According to Sacken, the necropolis of Hallstatt dates from the third or fourth century B.C., revealing the presence in those regions of the eastern Alps of the so-called Galli Faurisci, who, prior to the Roman domination, must have been familiar with an advanced stage of civilization and decorative art, in which the influence of Greek art is undeniable. This is indeed strongly manifested both in the workmanship and the forms of multitudinous objects revealed by the exploration not merely of the Hallstattian tombs, but of the prehistoric station of Salzberg, whose discovery last year has added new interest to the still contested problem of the origin of the early culture of the Alpine races of central Europe."

— A successful experiment is reported to have been made recently at the laboratory of the Joseph Dixon Crucible Company, in Jersey City, N.J. A piece of iron ten inches long, two inches wide, and a sixteenth of an inch thick, was used, and one-half of its surface painted with silica-graphite paint, while the other half was left unpainted. It was suspended for several days in a bath of dilute sulphuric acid. This bath was much stronger than any sulphur-water met with in mining. On taking the iron from the bath, the unpainted part was found eaten off to about one-half its original

bulk. The painted part did not sustain even the slightest blemish, thus apparently proving the ability of this paint to withstand sulphuric acid, and demonstrating its usefulness where iron piping is laid in acid water, such as is sometimes met with in mines containing pyrite or other sulphides, which, under certain conditions, produce acid waters in the form of sulphate solutions, resulting from the decomposition of the sulphide minerals.

— We learn from *Nature* that some interesting facts concerning the element tellurium have been brought to light by Dr. Brauner of Prague during the course of a series of atomic weight determinations, an account of which is given in the July number of the *Journal of the Chemical Society*. A determination of the atomic weight of tellurium made by Berzelius in 1832 yielded the number 128.3; and a later one in 1857, by Von Hauer, gave the value of 127.9: hence 128 has usually been accepted as the true atomic weight. The properties of tellurium, however, indicate that it belongs to the sulphur group of elements, and that its position in the periodic system lies between that of antimony (of atomic weight 120) and iodine (of atomic weight 127); but, according to the above determinations, the atomic weight of tellurium is higher than that of iodine. Hence we are obliged to admit one of two things, — either that the atomic weight of pure elementary tellurium has been incorrectly determined, or that the periodic law of the elements, that grand natural generalization whose distinguished elaborator English chemists have recently been delighting to honor, breaks down in this particular case. In view of the overwhelming mass of experimental evidence which has now accumulated in support of this generalization, the latter assumption cannot for a moment be tolerated. The redetermination of Dr. Brauner becomes therefore of primary importance, and his results partake of the highest interest. The mode of procedure which afforded the most satisfactory results consisted in the analysis of tellurium tetrabromide ($TeBr_4$), purified in the most complete manner by means of silver nitrate prepared from pure silver. The mean atomic weight from these experiments was found to be 127.61; the maximum being 127.63, and the minimum 127.59: hence there can no longer be any doubt that the substance we term "tellurium" does possess a combining weight larger than that of iodine. Now comes the question, "Is this substance pure elementary tellurium?" If it is, then, as Dr. Brauner says, it is "the first element the properties of which are *not* a function of its atomic weight." Dr. Brauner, however, finds as the result of a process of fractionation that it is not pure tellurium, and that it consists of probably three elements, — pure tellurium mixed with smaller quantities of two other elements of higher atomic weights; and he is at present engaged in studying the nature of these foreign substances, and in the endeavor to isolate pure tellurium itself. A few of the as yet unpublished results obtained in these latter researches were communicated personally by Dr. Brauner at the meeting of the Chemical Society on June 6, and among them the interesting fact was stated that one of the new elements is probably identical with Professor Mendeleeff's recently predicted dwitellurium (of atomic weight 214), the other new constituent being an element closely allied to arsenic and antimony.

— "The principal business transacted at the Literary Congress at Paris, over which M. Jules Simon presided," says the London *Athenæum* of June 29, "has been the passing of the following resolutions, which it is to be hoped may be imported into the Convention of Berne, to which nearly every civilized nation, the United States of America excepted, adhered, and has legislated accordingly: 1. As an author's title to his work includes the sole right to translate it, or to authorize its translation, the author, his successors, and assigns enjoy the right of translation during the term of copyright, even though they may not have the sole right to reproduce the work in its original form; 2. There is no reason for an author notifying in any way that he reserves the right of translation; 3. There is no ground for limiting the period during which the author of a book or his representatives may translate it."

— Arrangements are being made by the local committee of the American Association at Toronto for an excursion, starting Sept. 3 or 4, to the Huronian district. Particulars will be given in a circular to be issued by the American Geological Society. Arrangements are also being made for an excursion to the Pacific coast. During the week, two popular lectures, complimentary to the citizens of Toronto, will be given by prominent members of the association. The Canadian Railway companies have made the following concessions to members from the United States who may wish to make local excursions during or after the meeting: Return tickets at single fare from Toronto to any station in Canada. Montreal and return, going and returning all rail, $8; going boat, returning rail, or *vice versa*, $10; or rail to Ottawa, river to Montreal, returning rail, $10. Quebec, going and returning all rail, $10; going steamer, returning rail, or *vice versa*, $12; rail to Ottawa, river to Quebec, returning rail, $12. Niagara Falls, going and returning all rail, $2.50; going rail and returning lake, or *vice versa*, $2; going lake and returning lake, $1.50.

— The Entomological Club of the American Association will meet at 9 A.M. on Wednesday, Aug. 28, in the room of Section F, University Buildings, Toronto, where members of the club will register and obtain the club badge. Members of the club intending to contribute papers will send titles to the president, Mr. James Fletcher, Government Experimental Farms, Ottawa, Can. The Botanical Club will hold a meeting as usual on Tuesday, Aug. 27, in the room of Section F, University Buildings. Communications should be sent to the president, Professor T. J. Burrill, Champaign, Ill., or to the secretary, Douglas H. Campbell, 91 Alfred Street, Detroit, Mich. During the week, members will be conducted by local botanists on excursions to points of interest in the neighborhood of Toronto. The Society for the Promotion of Agricultural Science will hold its tenth annual meeting in Toronto, beginning on Monday evening, Aug. 26, in the room assigned to Section I in the University Buildings, and continuing on Tuesday. For further information address Professor W. R. Lazenby, secretary, Ohio State University, Columbus, O. The American Geological Society will hold its meeting apart from Section E, in one of the halls of the university, on Aug. 28 and 29; Professor James Hall, Albany, N.Y., president, and Professor J. J. Stevenson, University of City of New York, secretary. For all matters pertaining to membership, papers, and business of the association, address the permanent secretary, at Salem, Mass., up to Aug. 20. From Aug. 20 until Sept. 9 his address will be A.A.A.S., Toronto, Ont.

— One of the most interesting features in the rapid approach of Cossack and Sepoy towards each other is the extensive planting of trees that is being carried on by the engineering branches of both countries, as reported in *Engineering*. Wherever stations are established in the Quetta district, trees, flowers, and vegetables are planted; and the same is the case with the new Russian settlements along the course of the Transcaspian Railway and the Oxus River. Of the two, the Russians have been more systematic than the English, and have spent considerably more money. This is due to the interest taken in the matter by Gen. Annenkoff, who is a born founder of colonies, and takes as much interest in all that appertains to the Transcaspian settlements as Robinson Crusoe did in his "desert island." At a recent meeting at St. Petersburg, Gen. Annenkoff gave an account of some of his operations in this direction. He admitted very frankly that the tree-planting of the last three years had not been altogether a success, many imported trees and shrubs having perished; but experience had shown what would and would not thrive, and seeds were being obtained from various parts of the world that would thrive in the sandy soil of the Kara Kum, exposed to the widest possible variations of heat and cold, or in the irrigated clayey expanses of the Merv, Tejend, and Atak oases. Meanwhile the Russian authorities are looking well after the local flora. Orders have been given that no bushes are to be cut down within ten miles of the line, and that the existing forests of saxaul are to be preserved. Saxaul is a kind of heavy, extremely knotted brier-wood, attaining a forest growth in places, and provides most of the fuel hitherto used in the country. It grows readily in sand, which it moreover serves to bind together by its long, trailing, clumsy roots. Plantations of this are to be made along the line, with camel thorn and other native bushes that thrive well, and it is expected that in time there will be a sufficient growth of vegetation not only to protect the line, but also to provide shelter for weaker trees and bushes of foreign origin. In the mean

while oil-refuse from Baku is being used as household fuel by the Russians, and, as soon as cheap suitable stoves are introduced, the population will probably become more and more accustomed to rely upon oil for fuel purposes. Every step in this direction is a boon, because it tends to save more and more the timber in Central Asia, and thereby contributes to a reforesting of a country once densely covered with trees, and at that period famous throughout Asia for its fertility. This fertility the Russian engineer is now attempting to gradually restore.

— The question of permeability of cements and mortars has been treated of by the board of experts appointed to report on the Washington Aqueduct Tunnel. In their report it is stated, that, even if the brick lining of the tunnel were carefully made and backed, still leakage could not be prevented, as bricks are themselves pervious under somewhat moderate heads. In some experiments made by Mr. Francis last year, about 13.8 gallons of water per square foot of surface passed through a thickness of nearly 16 inches cement in twenty-four hours, under a pressure of 77 pounds per square inch. Mr. Stauffer, another engineer, constructed a bulkhead of brick-work in cement in the Dorchester Bay Tunnel, which measures 10 feet by 10 feet. Under a pressure of 72 pounds per square inch, water percolated through at the rate of 96,000 gallons per day. Experience on the Boston main drainage work showed that it was not practicable to build a brick bulkhead which should be tight for pressures exceeding 64 pounds per square inch, and at the Croton Reservoir water under 36 feet head was found to percolate through 26 inches of brick-work and 4 feet of concrete. In some experiments made by the board of experts themselves, a good fair specimen brick was exposed to a pressure of 80 pounds per square inch on one of its faces; and, under these conditions, 23.4 cubic inches of water passed through the brick in the first hour, and 21.3 in the second hour. The mean of these figures is equivalent to 1.4 gallons per square foot of surface per hour. In the case of another brick under the same pressure, 46.8 cubic inches passed through in one hour. Blocks of cement mortar allowed to set for twenty-four hours in air, and afterwards hardened for five weeks in water, were also tested. Under 80 pounds pressure, water passed through these at the rate of 36.4 gallons of water per hour. The above figures have been reduced to English gallons of 10 pounds of water.

— The circular of the local committee for the meeting at Toronto, Ontario, Aug. 27 to Sept. 7, of the American Association for the Advancement of Science, states that arrangements have been made on the certificate plan for a very general reduction of railway-fares over the principal railways embraced in the territory of each of the different passenger agents' associations. Full fare for limited or unlimited tickets, as the case may be, will be paid going to Toronto, the purchaser receiving from the ticket-agent at the starting-point, or at the one nearest thereto in the association, a certificate giving the initials of the railways in the route to be traversed, and the amount of fare paid. A certificate must be taken covering the route in each passenger agent's association, if more than one is traversed. Conductors of trains and ticket-agents will be able to give full information as to the limits of each association's territory. Upon the presentation of such certificate, properly filled in and signed by the agent at the starting-point, and indorsed by the local secretary at Toronto, a return ticket will be sold, within three days after the meeting, for one-third the regular first-class fare. Return tickets will be sold at this price only over the route traversed in going to Toronto. Persons must obtain their blank certificates from the local secretary, Professor Loudon, at Toronto. These certificates will be mailed, with full instructions for their use, upon application to the local secretary. A separate certificate will be needed for each person coming to the meeting. Members and others making application for certificates will confer a favor upon the committee by enclosing an addressed envelope for the reply. The railway companies will adhere to the following rule: "No refund of fare will be made on any account whatever because of failure of the parties to obtain certificates." It will therefore be noticed that any person failing to obtain from the agent selling the ticket to Toronto, such a certificate as has been above described, will be obliged to pay full fare both ways. Those who desire to secure rooms in advance should communicate either directly with the hotels or with William McCulloch, secretary of the Young Men's Christian Association. The morning and afternoon meetings of the association and of its sections will be held in the University Buildings, Queen's Park, where will also be the offices of the permanent and local secretaries during the meeting. Hotel headquarters will be at "The Queen's," and the local committee's office in the vicinity at 42 York Street, where application may be made for information. In order to enable members to attend the morning and afternoon sessions without being obliged to go to the hotels in the interval, a luncheon will be served daily in the dining-hall, University College. Through the courtesy of the post-office authorities, there will be a branch post-office at the university during the meeting. All mail matter should be addressed "Care of A.A.A.S." The Great North-Western Telegraph Company has liberally offered to transmit free the social messages of members when approved by the secretary. No concessions could be obtained over the United States lines. The Canadian Express Company has generously offered to carry free packages containing scientific articles intended for use at the meeting. Members will receive whatever additional favors the local committee or the association may be able to secure or give, if they will send such packages in care of the local secretary. By the courtesy of the minister of customs, all articles intended for use at the meeting will be admitted free; subject, however, to inspection by the customs officers. In case any difficulty arises at the frontier, members are recommended to ship the articles by express in bond to the local secretary. Full reports of the proceedings will be published in the Toronto daily papers. Authors will oblige by sending, in advance, abstracts of their papers (other than those sent to the permanent secretary) to James Hedley, *Monetary Times*, Toronto, who will withhold them from publication until the papers have been read in the sections. The council will meet at the Queen's Hotel at noon on Tuesday, Aug. 27. The association will be called to order in general session at 10 A.M., on Wednesday, Aug. 28, in the University Convocation Hall, by the president, Major J. W. Powell of Washington, who will resign the chair to the president-elect, Professor T. C. Mendenhall of Terre Haute, Ind. After the adjournment of the general session, the sections will organize in their respective halls. In the afternoon the sections will meet and the vice-presidents deliver their addresses. In the evening Major Powell will deliver the presidential address in the Pavilion, Horticultural Gardens. The meetings of the sections will be held on the following days (except Saturday and Sunday) until Tuesday night, when the concluding general session will take place. Saturday will be devoted to excursions complimentary to the association, including one to Niagara Falls and one to Muskoka.

— Thomas G. Farrell writes from Portland, Ore., to the *American Field*, that, the varieties of native song-birds in this country being rather limited, several German citizens some time since conceived the idea of importing a number of German song-birds. In a few days quite a respectable sum was raised for this purpose, and forwarded to Germany. Not long since, the birds arrived in charge of a competent keeper, and, after being placed on exhibition for a few days, were all turned loose to multiply and prosper. There were some three hundred birds in all, consisting mainly of chaffinches, goldfinches, greenfinches, bullfinches, starlings, nightingales, skylarks, German robins, linnets, thrushes, grossbeaks, and, last but not least, several specimens of the singing-quail. It is understood that many of them have been observed nesting, and it is very likely that they will form a valuable addition to our feathered family.

— At a recent meeting of the German Meteorological Society in Berlin, according to *Nature*, Dr. Lang of Munich read a paper on "The Velocity of Propagation of Thunder-Storms in South Germany in the Ten Years 1879–88." This is, on an average, 38.4 kilometres per hour; but it has varied considerably from year to year, increasing in the years to 1884, and thereafter decreasing. To this corresponds a curious variation of Van Bebber's fourth and fifth depression-paths, which lay in the north at the beginning of the period, then moved south to South Germany till 1884, after which they retired northwards. Hail frequency has varied in an

opposite sense to the velocity; but the rapidly moving winter thunder-storms have most hail. The velocity is maximum in winter: it falls rapidly till May, slowly rising thereafter (with a second depression in September) till winter. The velocity is greatest in storms coming from the west. Dividing the region into four zones from north to south, there is a decrease in the velocity, at first slight, but getting very rapid on reaching the Alpine region. The velocity is greatest about midnight, least about midday. At the same meeting, thunder-storms and hail in Bavaria in 1880–88 were the subject of a paper by Dr. Horn. These phenomena in general correspond. Both have a maximum early in July; but the hail has a second maximum, nearly as great, in May. Both phenomena show a pronounced day maximum about 3 to 4 (in winter about 2 to 3), and a minimum in the morning from 7 to 8. Dr. Horn said hail never fell in Bavaria without electric discharge, but Dr. Assmann maintained it did sometimes in Prussia.

— The Transvaal Volksraad is reported to have placed $100,000 on the estimates for the current year, for the purpose of endowing the first university of the Republic.

— The monograph prepared by Mr. C. Meriwether, A.B., Johns Hopkins University, and recently published by the United States Bureau of Education, is designed to trace the history of higher education in South Carolina, his native State, and to give a sketch of the development of the free or public school system. The earliest educational efforts are described, and instances are given illustrating the interest of South Carolina when yet a colony in providing the means for the intellectual improvement of her sons. Not only were schools founded and maintained in the province by the government and through private and charitable aid, but many youths were sent to England for their education. The influence of such men on their return was so great and lasting, that, even to the middle of the present century, schools in Charleston, modelled on the English plan, were very popular. The birth of colleges was late, and their growth slow: there was, therefore, chance for a good system of academies to develop. These were planted in all parts of the State, so that a good training-school was within the reach of all. The number continued to increase until the outbreak of the war. The most famous academy was that presided over by Dr. Moses Waddel, the Thomas Arnold of South Carolina. Although there is mention, in the House Journal of 1723, of a proposal to establish a college, and a bill was introduced into the colonial Legislature in 1769 for this purpose, yet no action was taken until the present century. An act was passed in 1785, establishing three colleges in the State, yet only one of them ever gave collegiate instruction. The College of Charleston, while its foundation can be traced to the legislative act of 1785, has given collegiate instruction only since the first quarter of the present century. It is supported very largely by income from vested funds, the result of endowment by public-spirited citizens in and near Charleston. Over half the three hundred thousand dollars endowment was given by Mr. Baynard, during the war, in 1864. The attendance has not been large, but the training in mathematics and ancient languages has always been thorough. Every denomination of any strength in the State has founded a college. In the main, they follow the average college course, but, owing to want of funds, they cannot offer very many electives. It is gratifying to state that the funds and attendance of nearly all of them are gradually increasing. The war was most disastrous to all these institutions in sweeping away their endowments. The first attempt made to establish a general system of free schools was in 1811. The act was passed after bitter opposition on the part of some of the up-country members, and provided free instruction for all children, but gave the preference to poor children; but although the annual appropriations were doubled in 1852, being made seventy-four thousand dollars, the universal testimony was that the schools were a failure. On the adoption of a new State constitution in 1868, the present public-school system was introduced. Its usefulness has been greatly increased by the efficient management since 1876. The attention paid by the State to the education of the colored citizens is well illustrated in Claflin University, supported largely by the State. It has seventeen teachers and six courses of instruction, and its students at the last session numbered nine hundred and forty-six. The most important phases of advanced instruction in South Carolina are those connected with the State institutions. The Military Academy at Charleston was designed to furnish trained soldiers for South Carolina. Its course is modelled after that of West Point. The College of South Carolina is the best of all the institutions in the State. It was opened for students in 1804, and has ever since exercised a strong influence on the politics of South Carolina, except during the reconstruction period. Every politician of any note in the State, except John C. Calhoun, has been for a time connected with the institution.

— Since the perfection of the silo, maize or corn has come to have an increased importance in successful agriculture, especially in dairying and stock-growing. The value of corn for the silo and as a forage crop is a sufficient incentive for making a thorough and systematic study of the development of, and chemical changes in, maize during its period of growth. This work was begun last year in a preliminary way at the New York Agricultural Experiment Station, and is being continued in more detail the present season. When this season's work is completed, it is hoped the results may answer the question, "What is the proper stage of maturity for cutting corn for the silo?" To every farmer who is interested in the silo, three important questions present themselves for consideration: 1. What is the best variety of corn to grow for the silo? 2. What is the best method of planting? 3. What is the proper stage of maturity for cutting corn for the silo? As the result of experiment, the following conclusions are probable: 1. That the greatest weight of green fodder seems to have been at about the period of full silking of the ears; 2. That the total weight diminished after this date, but the total dry matter increased; 3. That the total nitrogen does not appear to increase after the ears silk; 4. That as the corn approaches maturity the per cent of amide nitrogen diminishes, while the albuminoid nitrogen increases, thus seemingly increasing the feeding-value of the crop; 5. That the sugars and starch increase rapidly during the latter period of growth and maturing of the corn-plant, and that these are the most valuable portion of the nitrogen-free extract; 6. That for the greatest amount of nutriment, considered from a chemical standpoint, corn should not be cut before it has reached the milk stage of the kernel; 7. That it remains for future investigation to determine whether it is better to be cut at the milky stage or at a later period for the greatest amount of digestible and available nutriment; 8. That the Burrell & Whitman corn cannot, in ordinary culture, be matured in this latitude.

— It is well known that plants of *Dictamnus fraxinella*, at the close of a dry, sunny day, are surrounded by a gas which is inflammable, and will ignite with a sudden flash of flame when a lighted match is applied to it. M. H. Correvon gives in *The Garden* the results of some investigations lately made with regard to this phenomenon. Certain plants, and very notably the *Rutaceæ* and *Labiatæ*, secrete various products, such as essential oils, resins, gums, balsams, etc. Secretory organs which are buried in the substance of the parenchyma elaborate these products, while hairs of various forms and textures conduct them to the surface, and there excrete them. The secretory organs are termed "internal glands," and the excretory hairs are known as "external glands." These latter glands are surrounded at the base by a part of the epidermis, which the hair has pushed up in issuing forth to make its appearance on the surface of the stem, and in the *fraxinella* this raised part of the epidermis covers a gland which is very richly provided with resin and essential oil. When this gland was examined with a microscope on a hot day, it was empty, its contents having been drawn out by the heat through the cells of the epidermis or through the hair that terminates the gland. It must be understood that the surrounding air has to be pretty strongly impregnated with the gas of the volatilized resin in order to take fire when a lighted match is applied to it. This experiment has also been carried out in France by placing a pot-plant of *fraxinella* in bloom under a bell-glass, and leaving it there for some time, when the air in the bell-glass was found to be so highly charged with the resinous gas that it ignited the moment a lighted match was applied to it, and, it may be added, without doing the slightest injury to the plant.