

THE Public Health Department of the City of London directs attention (Report of the Medical Officer of Health, No. 52) to the filthy and dangerous habit of indiscriminate spitting, the chief source, probably, of tuberculous infection. Many cities in the United States, Canada, Australia and in Europe have made the habit a penal offence, and the Corporations of Liverpool, Manchester and Glasgow and the County Council of Glamorgan have bye-laws prohibiting it in public places. The Medical Officer for the City suggests that similar powers should be obtained by the Corporation of London for dealing with it.

NEW editions have been published of "Palæontology, Invertebrate," by Mr. Henry Woods (Cambridge University Press) and "Maps, their Uses and Construction," by Mr. G. James Morrison (Edward Stanford). The former is the third edition and Mr. Morrison's book is a second edition, which has been revised and enlarged.

THE twenty-fourth annual volume of the *Proceedings* of the United States National Museum, published under the direction of the Smithsonian Institution, contains, like all its predecessors, an abundance of valuable information on anthropological, biological and geological subjects. It is impossible in this place to refer to each of the separate contributions. Messrs. Jordan and Snyder review many classes of the fishes of Japan, separate papers being given to the discobolous, gobioid, gymnodont, hypostomide, lophobranchiate, labroid, salmonoid and trachinoid fishes. Messrs. Wirt Robinson and M. W. Lyon provide an annotated list of mammals collected in the vicinity of La Guaira, Venezuela, while Dr. Leonhard Stejneger deals with the batrachians and reptiles of the same locality. In another paper, the last named author describes a new bullfrog from Florida and the Gulf Coast. Mr. D. White gives an account of two new species of algæ of the genus *Buthotrephis*, from the Upper Silurian of Indiana. The fossil fresh-water shells of the Colorado desert form the subject of a paper by Dr. R. Stearns. The humming-birds of Ecuador and Colombia are catalogued by Mr. H. C. Oberholser. Illustrations and descriptions of new, unfigured or imperfectly known shells, chiefly American, in the U.S. National Museum are given by Mr. W. H. Dall. The larks of the genus *Otocoris* are described in detail by Mr. H. C. Oberholser. Many of the papers are accompanied by numerous admirable illustrations, those connected with Mr. Oberholser's paper being especially good.

THE additions to the Zoological Society's Gardens during the past week include a Patas Monkey (*Cercopithecus patas*) from West Africa, presented by Mr. E. Chaplin; a Virginian Eagle Owl (*Bubo virginianus*), a Mexican Eared Owl (*Asio mexicanus*) from Argentina, presented by Miss Irene Thornton; a Graceful Ground Dove (*Geopelia cuneata*) from Australia, presented by Miss Cooper; a Glass Snake (*Ophiosaurus apus*) European, presented by Mr. C. H. Rawlins; a Derbian Wallaby (*Macropus derbianus*) from Australia, deposited; four Black-necked Swans (*Cygnus nigricollis*) from Antarctic America, received in exchange.

OUR ASTRONOMICAL COLUMN.

NEW COMET 1902 *d* (GIACOBINI).—A telegram from Kiel, dated December 3, announces that the fourth new comet of this year was discovered by M. Giacobini at Nice on December 2d. 12h. Its position at 10h. om. (Nice M.T.) was R.A. = 7h. 17m. '6, Dec. = 1° 58' S., and it is moving in a north-westerly direction. A second telegram, dated December 4, says that the comet was observed by Herr Graff at Hamburg on December 3d. 11h. '5, and its position for 15h. om. (Hamburg M.T.) was R.A. = 7h. 17m. '4, Dec. = 1° 51' S. The daily movement in declination is +3', and the projected path of the comet passes near to the border line between the constellations Gemini and Orion.

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THE VARIABILITY OF α ORIONIS.—From an examination of his observations of the comparative magnitudes of Betelgeux and β Orionis which he has made during this year, Herr J. Plassman has confirmed the recent variation of magnitude in the former star, and he considers that the peculiarities of the variations merit further and continuous attention on the part of variable-star observers (*Astronomische Nachrichten*, No. 3830).

ACTIVITY OF THE LUNAR CRATER LINNÉ.—In *Circular* No. 67 of the Harvard College Observatory, Prof. E. C. Pickering gives the micrometric measures of the bright spot surrounding Linné which were made at Harvard by Prof. W. H. Pickering, using the 15-inch equatorial, before and after the passage of the earth's shadow in the eclipse of October 16.

These measures show that the bright spot has materially increased in size since similar measures were made in 1898 and 1899, and, further, that the change in size during the passage of the umbra was surprisingly great, so great that Prof. W. H. Pickering found it necessary to reassure himself that the object he was measuring was indeed Linné. This increase of size amounted to 2".75, instead of 0".14 obtained by the same observer during the eclipse of 1899 (*Popular Astronomy*, vol. viii. p. 58).

Prof. E. C. Pickering attributes the change in the normal size to increased activity on the part of the crater, and the large increase of diameter during the eclipse to the fact that, owing to this increased activity, there was on this occasion more moisture around the crater to condense.

The increase in normal size was confirmed by measures made on October 20, when the spot had begun to shrink owing to the increased amount of evaporation in the fierce sunlight, for the value obtained then (4".61) was sensibly larger than that obtained (3".41) during a similar phase in 1898.

REDETERMINATIONS OF THE VELOCITY OF LIGHT AND THE SOLAR PARALLAX.—A communication from M. Perrotin to No. 21 of the *Comptes rendus* describes the experiments which have been made recently, at the Observatory of Nice, to redetermine with greater accuracy the velocity of light, using the toothed-wheel method of Fizeau under improved conditions.

In previous experiments, the beam of light was made to travel a distance of 12km. (7.452 miles) and back, but in the recent experiments it was reflected from a mirror placed at a distance of 46km. (28.566 miles) from the source, an objective of 0.76m. diameter being used at the plane of emission and one of 0.38m. diameter as the collimator.

As a result of 1109 observations, the final value obtained for the velocity was 299,880km. (about 186,225.5 miles) per second, and the probable error is less than 50km. per second.

In addition, M. Perrotin also gives the final value obtained for the solar parallax, from observations of the planet Eros, made at Nice, as 8".805 \pm 0".011, and from this deduces a value of 20".465 for the "constant of aberration," thus confirming the value adopted by the International Astronomical Conference of 1896.

THE "ANNUAIRE ASTRONOMIQUE."—This year-book of astronomy for 1903, compiled by M. Camille Flammarion and published at the low price of 1.50 francs, is one of the most complete and useful books of its kind. It gives practically all the data required by the amateur astronomer or meteorologist, amongst which may be mentioned the solar, lunar and planetary elements for the year, the various phenomena such as eclipses, occultations, meteors, comets, &c., tables of the positions, distances and proper motions of the brighter stars, particulars of double stars, many useful meteorological tables, and a valuable *résumé* of the more important astronomical and meteorological events of 1902, the whole being freely illustrated by interesting photographs and curves.

METEOROLOGY AT GREAT ALTITUDES.¹

AN International Aeronautical Congress was held at Berlin, May 20 to 24, 1902, on the occasion of the third meeting of the International Committee for Scientific Aeronautics, appointed by the Paris Meteorological Conference of 1896. Of this committee there were present the president, Prof. Hergesell, of Strasburg, Prof. Assmann and Mr. Berson, of Berlin, General

¹ Abridged from a Report contributed by Mr. A. Lawrence Rotch to the U.S. *Monthly Weather Review* for July.

Rykatchef and Colonel Kowanko, of St. Petersburg, Prof. Cailletet and M. Teisserenc de Bort, of Paris, and the writer, who is the American member. There were also present at the Congress, by special invitation, about one hundred military and civil aeronauts and representatives of meteorological institutions, the writer representing the United States Weather Bureau by request of its chief.

The opening of the Congress in the great hall of the Reichstag building was a brilliant event. Prince Frederick Henry of Prussia appeared for the Emperor of Germany. Both the Imperial and the Prussian Governments were represented, and the chief European nations, except France, sent the commanders or officers of their military balloon corps. After the usual formal greetings, the representative of the Prussian Minister of Instruction spoke as follows:—

"The Royal Government is much impressed with the importance and necessity of an exchange of ideas between the savants of all nations in matters concerning meteorology and terrestrial magnetism, since international cooperation in these branches of science is the indispensable forerunner of progress. This was indeed recognised as early as 1780, by the founding on German soil of the 'Societas meteorologica Palatina,' which undertook the task of beginning systematic weather observations in Europe, with the hope of extending them to other parts of the world. On account of the existing state of affairs, its efforts were of short duration and for a long time savants were allowed to labour independently, but with the foundation of magnetic investigations by Gauss and Weber, the sagacious idea of organisation acquired new life and pressed for realisation, especially through the development of navigation, which has the greatest interest in the accurate observation of weather phenomena on the ocean. The Antarctic discoveries of James Ross, and the successful efforts of American navigators to shorten ocean voyages, gave a new impulse, and so there arose the proposition of organising a meteorological service at the first congress of the maritime nations held at Brussels in 1854, although it was not until 1873, during the Vienna Exposition, that the first meteorological congress convened there laid the foundation of an international weather service. The international committee, appointed at that time, met at first annually, but later at intervals of two or three years. With its increasing activity, the necessity of dividing the work manifested itself, and thus special commissions were formed, of which one meets here to-day and whose third gathering will probably be as fruitful as its preceding meetings. In a field where there is only interest in research, may the bonds uniting the representatives of cultured nations ever become closer!"

In the name of the Prussian Meteorological Institute, its director, Dr. von Bezold, remarked that early investigators perceived the importance of aeronautics for meteorological researches. "When Charles, the inventor of the hydrogen balloon, made his first ascension in 1783, he took with him a barometer and a thermometer, as did the American aeronaut (Jeffries), who ascended from London during the next year. It was not until very lately that Germany took part in this work, or about the year 1880, but then, with an instrument markedly superior, namely, Assmann's aspiration-psychrometer, and through the munificence of the German Emperor, she was enabled to carry out the work on a large scale. For the second time, the representatives of scientific aeronautics now meet on German soil and thereby recognise the importance of our efforts. But much indeed has been done for this new research by M. Teisserenc de Bort at Trappes, near Paris, through the perfection of the *ballon-sonde*, the unmanned balloon carrying self-recording instruments, and by Mr. Rotch, of Blue Hill, through his application of kites. Both methods are so good that by their use a great impetus has been given to meteorological research, whereby it is easily understood that there should be uniform rules for their employment. Looking backward, it may be said that the international meetings for the organisation of meteorological research, in 1854 at Brussels, in 1873 at Vienna and in 1879 at Rome, are landmarks in the progress of the science, and that when, in September, 1896, the International Committee for Scientific Aeronautics was appointed, the plan had been so well considered and the technical necessity was so evident that there was entire unanimity in the deliberations and resolutions. The originator of the idea of the unmanned balloon was the late Gaston Tissandier, who enthusiastically explained the scheme to the speaker in 1886, although nearly ten years elapsed before its realisation. This work will be fruitful, for wind and clouds have no political

boundaries and the sun belongs to us all. Consequently, we are all striving, for various reasons, toward the same goal, and the motto *viribus unitis* will be, as ever, the decisive measure of the result."

Prof. Cailletet, of Paris, responded for the foreigners present, and then Prof. Hergesell, after thanking the preceding speakers, said, in the course of his remarks:—

"Everywhere—in Paris, Strasburg, Munich, St. Petersburg and Berlin—aeronautical experiments for the scientific exploration of the atmosphere had taken place, and since a general wish was expressed to unite the separate efforts in a common cause, a favourable time to do this seemed to be in the autumn of 1896 at the conference in Paris of the directors of the meteorological institutes. France, the cradle of aeronautics, was the chosen ground, because there, independently of the German and Russian experiments, a most promising method of investigation had been developed that had already produced good results; for the French experimenters, Colonel Charles Renard and Messrs. Hermite and Besançon, all members of our Commission, had simultaneously put into execution the plan of exploring the highest strata of the atmosphere with free balloons carrying only self-recording instruments. Not the least service of our Commission has been to render the method of unmanned balloons comparable with the exact measurements in manned balloons as they are made in Berlin. During our first meeting, in April, 1898, at Strasburg, the difficult problem of obtaining a uniform instrumental equipment was solved in a general way. Since then, our manned balloons, here and abroad, carry the aspiration-psychrometer, which Dr. Assmann, in cooperation with the late Captain von Sigsfeld, has devised, and the unmanned balloons are provided with the normal registration apparatus which the indefatigable Teisserenc de Bort has constructed so skilfully. The registration balloon from that time has been the most powerful tool in dynamical meteorology and has furnished astounding data for the cold atmospheric strata up to a height of 20 kilometres, which are confirmed to a height exceeding 10 kilometres by the ascensions of the brave Berlin aeronauts, Berson and Süring, who have ascended so far in these regions. Since November, 1900, on the first Thursday of every month, simultaneous ascensions have occurred in Paris, Strasburg, Munich, Berlin, Vienna, St. Petersburg and Moscow, and on May 5, 1902, the 213th registration balloon of the International Commission was sent up. The observations have proved that the temperature does not steadily decrease upward, but that strata exist which often possess great differences of temperature. This stratification is one of the most important objects of the present investigation. And the future? Systematic meteorological research is at present carried on over only a small portion of the globe. Even in Europe, in the north there is lacking Scandinavia, and in the south Italy and Spain; but the presence of representatives of these countries at our meeting gives the hope of speedy cooperation. A plan for a meteorological cruise of a steamer to fly kites will also be discussed, for the meteorological exploration of the Tropics must be extended, and the participation of England in our endeavours gives us hope that India may be claimed as a region for investigation. *Per aspera ad astra*—that may be setting our goal too high, but, *per aspera ad altas et ignotas regiones*, up to the regions which hide the great secret where the weather comes from—that we certainly should fix as our goal."

At the second meeting, General Rykatchef, director of the Central Physical Observatory at St. Petersburg, spoke on the preliminary results attained with kites, *ballons-sondes* and manned balloons during the past five years in Russia. Scientific aeronautics in Russia date only from 1899, with the exception of some years of preparatory work. Still, there have been a large number of ascensions; 13 of the 60 kite-flights were above 3000 metres, while the *ballons-sondes* reached 14,200 metres. The inclement climate of Russia occasions many unusual difficulties, for instance, the kite wire on the reel becomes thickly coated with frost, rendering the unwinding difficult, or both wire and kites in the air are so thickly incrustated with frost work (five millimetres or more) that the kites often fall to the ground. Kites were used chiefly at the stations in Pavlovsk and St. Petersburg, and thereby special details were obtained in the lower strata of the diurnal and annual influence on the vertical decrease of temperature up to 3000 metres. It was found that in summer and during the daytime the decrease of temperature with increasing height proceeds more rapidly, and, on the contrary, that in winter

and during the night hours there are large inversions of temperature. In anticyclones, large inversions occur in the lower strata and a rapid decrease of temperature in the higher strata. General Rykatchef exhibited an anemometer, constructed by his assistant, Mr. Kusnetzof, for the registration of wind pressure during kite flights. The instrument has bridled Robinson cups which act like a dynamometer and record the gusts of wind on a revolving drum. In closing, the speaker announced that the Czar had given a considerable sum of money for the continuation of this investigation of the different strata of the atmosphere in Russia by means of balloons and kites.

M. Teisserenc de Bort, of Paris, presented the results of his observations of the decrease of temperature in the high atmosphere, as obtained from the ascensions of 258 *ballons-sondes*, which had reached or exceeded 11,000 metres, the total number of ascensions being 540, all of which were made at night to avoid the effect of insolation. The concordant and remarkable result is that, in the layer between 8000 and 9000 metres, the decrease of temperature becomes slower, ceasing entirely at 11,000 metres, while above that height a warming may set in, with fluctuations of 1° to 3° centigrade, making the temperature here on the average nearly constant. In the summer, this isothermal layer appears to lie somewhat higher, or between 13,000 and 14,000 metres. It is lower during the prevalence of a depression, but 4000 metres higher during a high pressure, so that the zone exceeds the height of the cirrus clouds. The lowest temperatures, occurring in a high pressure, were -67° and -72°, but in March the exceptionally low temperature of -75° centigrade was observed. Whether the absolute minimum of temperature has been reached here requires further proof, and as to the cause of this striking phenomenon there are only conjectures. Have we at these great heights aerial conditions working on a grand scale, where the cyclonic whirls of the lower atmosphere do not penetrate and the currents flow uninterrupted?

Prof. Assmann said that the observations of the Berlin Aeronautical Observatory, although obtained by a somewhat different method, led to the same conclusion as that which had been reached at Trappes. Above 10,000 metres, the temperature oscillates and does not appear to decrease, although beyond the variable stratum, at 17,000 metres, and recently as high as 19,500 metres, the temperature was again found to decrease, so that the possibility of an absolute minimum of temperature is by no means excluded. The Berlin observations were executed with specially constructed balloons of Para rubber, which entirely avoided in the daytime the influence of solar radiation on the instrument, which was enclosed in double polished tubes.

Prof. Palazzo, Director of the Central Meteorological Office at Rome, announced that Italy would now participate in the international scientific exploration of the atmosphere. Through the aid of the Minister of Agriculture, three stations for kites are proposed; one on Mount Cimone (2165 metres), another on Etna (2942 metres) and a third outside of Rome, near the Fort of Monte Mario. The Minister of War has ordered that the ascensions by officers of the balloon corps shall take place on the days of the international ascents. Information was given about the observatory for the study of the physics of the atmosphere, now in construction on Monte Rosa at a height of 4560 metres, which is expected to be completed next summer. In connection with this communication, there was a discussion concerning the interest of scientific aeronautics in physiological investigations, which will form an important part of the work of the high-work observatory mentioned.

Prof. Assmann, Director of the Aeronautical Observatory of the Prussian Meteorological Institute, described his registration balloon of caoutchouc or Para rubber, which was one of the novelties of the meeting. The ordinary *ballon-sonde*, made of silk or paper and open at the bottom, has the great disadvantage that, when it approaches equilibrium in the upper strata of the atmosphere, its velocity of ascent decreases and the effect of insolation on the thermograph becomes greater, without it being possible to determine afterwards the place where the solar disturbance began during the ascent or where it disappeared during the descent; in fact, it is only in certain cases that we can distinguish between the insolation influence and the curious thermal anomalies that have been described by Teisserenc de Bort and Hergesell. The use of a closed balloon made of elastic material has this advantage, that in proportion as the enclosed gas expands, the ascensional force is increased, so that the balloon rises faster with augmenting

height until it bursts, and then falls to the ground with diminishing velocity, because checked by a parachute. The meteorograph of Prof. Assmann has no clock movement, the time being unimportant; but a disc is turned by the metallic thermometer while the barometer draws a pen horizontally across the disc, and so the spiral curve indicates heights and corresponding temperatures. The apparatus exhibited weighed but 380 grams, and with the protecting basket 500 grams. Since ink would freeze at great elevations, the trace is made by a pen containing a solution of saltpetre, which writes on the disc coated with lamp-black, treated with a solution of "tonsol." The chemical reaction gives a red trace that cannot be obliterated by handling or by immersion in water. The time required for an ascent to 15,000 metres is about one hour and for the descent two hours, so that the balloons do not travel very far and are usually recovered within three days. The diameter of the envelope at the start is 1 or 2 metres only, and it does not require to be completely filled with hydrogen to exert the necessary initial lift of 2 or 3 kilograms.

Dr. Valentin, of Vienna, spoke on the sluggishness of thermographs in registration balloons. Prof. Hergesell believed that it was better to employ the most sensitive and accurate thermometers rather than to try to determine the corrections for sluggishness. He exhibited such an instrument, as did M. Teisserenc de Bort. The French instrument has the Bourdon tube insulated by a block of hard rubber, which prevents the injurious conduction of heat. Comparisons between an instrument insulated in this way and one not insulated gave differences which increased with the height of the balloon and at 12,000 to 14,000 metres reached 6°, an amount that justified the insulation.

At the third meeting, the subject of kites and kite stations was opened with a paper by the writer on the exploration of the atmosphere over the ocean. The use of the kite on land is limited to favourable circumstances, since the wind must have a velocity of at least 5 or 6 metres per second to raise the kites and cannot exceed a certain maximum strength without endangering the wire by an excessive pull. At sea, however, the motion of a steamer at a velocity of 10 or 12 knots will almost always produce a suitable kite wind, if it does not already exist. In order to demonstrate this, in August, 1901, the writer crossed the North Atlantic on a steamer and found five out of eight days suitable for flying kites. Only on one day was the relative wind too light and on two days too strong, but the wind would always have been favourable had it been possible to alter the course of the vessel. These successful results led the writer to propose a meteorological kite expedition to the trade wind and equatorial regions of the Atlantic Ocean, where almost nothing is known of the upper currents. To defray part of the expense, application has been made to the Carnegie Institution for a grant of 10,000 dollars, but it was considered that the recommendation of the present Congress might aid in securing favourable action. Applause showed the approval of the meeting, which was voiced by Drs. von Bezold and Hergesell. The former, especially, pointed out the importance and the pressing need of meteorological observations over the ocean, where, in consequence of other methods of warming and cooling the air, very different conditions must exist than prevail over the land, and our ignorance of them is no longer to be tolerated. Prof. Köppen, of Hamburg, expressed himself in a similar manner, and made the interesting announcement that, according to the programme of the Scandinavian Hydrographic Congress to explore the Baltic and North seas in the interest of the fisheries, four cruises a year were proposed on which meteorologists would be given an opportunity to study the atmosphere above these seas. Prof. Wagner, of the University of Göttingen, said that the Göttingen Society of Sciences had, at the request of the Aeronautical Committee, furnished the geophysical expedition which was sent to Samoa about a year ago under the leadership of Dr. Tetens with kites and instruments, in order to obtain meteorological observations above that island and on the return voyage over the Pacific Ocean. Dr. Hergesell mentioned that on the Lake of Constance meteorological kite flights were to be undertaken, Count von Zeppelin furnishing the vessel and the meteorological service of Alsace-Lorraine the apparatus. General Rykatchef promised, on the part of the Russian Government, that similar observations would be executed over the northern portion of the Baltic as well as over the Black Sea. On the motion of Dr. Hergesell, the plan of Mr. Rotch for a meteorological

kite-expedition in the South Atlantic was fully approved, and the hope was expressed that, with the aid of Government funds, the project might be realised in the near future. Mr. Berson remarked that it was of the greatest importance that the British as well as the Dutch Governments should encourage meteorological observations in the monsoon region, and Major Trollope, speaking for Great Britain, said that he would endeavour to have this done.

M. Teisserenc de Bort showed a diagram of the results obtained from continuous soundings of the atmosphere, or those made as frequently as possible at his observatory at Trappes, viz., on thirty-six days in January and February, 1901, when kites and registration balloons (*ballons-sondes*) were sent almost daily into the higher atmosphere to an extreme height of 12,000 metres. The plotted results throw doubt on the assumption that the barometric depressions bring higher temperatures and the barometric maxima lower temperatures, and give an interesting demonstration of the diversity and complexity of the atmospheric phenomena of which it is the aim of international aeronautics to ascertain the laws.

The fourth meeting was principally occupied with the subject of high ascents, and an apparatus for breathing oxygen at great altitudes was shown by Prof. Cailletet.

Dr. Süring spoke on the ascension which he had made with Mr. Berson on July 31, 1901, to the height of 10,800 metres, the greatest height yet reached by man. He insisted upon the importance of such high ascents to control the observations otherwise obtained and to make those that require direct vision. Especially are the strata from 5000 to 10,000 metres not yet adequately explored, and for weather changes they are of great importance, as is indicated by the scarcity of clouds near 4000 metres and above 6000 metres.

Lieutenant von Lucanus, in the name of the German Ornithological Society, asked aeronauts to observe the various heights at which birds are found. It is now supposed that the height above the ground at which birds fly does not generally exceed 400 metres, and only occasionally reaches 2000 metres, the zone usually remaining below the lower clouds. Still, much uncertainty prevails concerning the tracks of birds, and especially the heights of flights, and information is greatly desired.

The fifth session was mostly devoted to a discussion of observations of atmospheric electricity and terrestrial magnetism in balloons. Prof. Hergesell explained that electrical measurements are of such vital interest that the academies of Berlin, Munich, Göttingen, Leipzig and Vienna were to have been represented at this meeting by Profs. von Bezold, Ebert, Wagner, Wiener and Exner. The latter, who is the Nestor of this branch of physics, was prevented from attending, but Prof. Elster, of Wolfenbüttel, was present among the experts. Prof. Ebert, of Munich, said that constituents containing electrical charges had been found recently in the air through their physical properties. These carriers of electricity are called "ions," or, more correctly, "electrons." At the earth's surface, their presence may be shown by the dissipation apparatus of Elster and Geitel, and the smallest quantity of electricity may be recorded by means of an electrometer. The speaker had adapted this apparatus for use in balloons, and, by employing an aspirator, a fixed quantity of air could be drawn over the dissipating body and absolute measurements made of the amount of free electricity contained in a cubic metre of air. It is of importance in geophysics to know how the capacity of the air for positive and negative electrons varies with altitude, and therefore the speaker had made such determinations, finding near the earth many more positive than negative electrons, but whether this is a result of the negatively charged earth is uncertain. In the high strata, the inequality tends to disappear, but considerations that throw doubt on the balloon observations relate partly to the electrical discharges produced by the ultra-violet light rays and partly to the indeterminate moment of aspiration in a rising or falling balloon. Prof. Ebert considered the cooperation of aeronauts valuable, and cited as a result of the investigation in the Alps that in the foehn wind an excess of positive electrons is found, and this disturbance of the electrical equilibrium perhaps may cause the foehn sickness. Prof. Elster described two experiments that proved the existence of the electrons, one being the radiation of Becquerel rays after two hours from an insulated and stretched copper wire charged with 2000 volts. It was agreed by both experts that the cleaner and clearer the air the more electrons it contains.

Before closing the Congress, the resolutions proposed, after undergoing certain modifications, were adopted by the committee in executive session, the Congress itself being only a consulting and advisory body. Besides the resolutions mentioned already, it was determined that the international ascents of balloons and kites during the next year should take place, as has been the case this year, on the first Thursday of every month, and that at least one of the *ballons-sondes* liberated at any station should be sent up one hour before sunrise in order that its records may not be affected by solar radiation, and also that the balloon may be seen when it falls to earth in the early morning. The Richard thermograph, with Teisserenc de Bort's insulating device, should be used, and the Hergesell instrument having a tube of German silver, instead of the Bourbon tube filled with alcohol, was also recommended on account of its sensitiveness and durability. Ascensions at other hours and with different apparatus are discretionary. The president, Prof. Hergesell, in summing up the results of the Congress, which he regarded as eminently satisfactory, laid special importance on the meteorological kite flights that were proposed over seas, lakes and mountains, and hoped that the British Government, by similar work in India, would help in the investigation of the great Asiatic monsoon region. A grant of money was requested from the German Government to enable the Prussian Meteorological Institute to cooperate with the writer in his proposed investigation of the atmosphere over the Atlantic Ocean. It was announced that in order to facilitate international researches in scientific aeronautics, the formation of an organisation, sustained by the various European nations, would be attempted.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—AN election will be held at Brasenose College in March, 1903, to an ordinary fellowship, of the value of 200*l.* a year, tenable for seven years, after an examination in the subjects recognised in the Honour School of Animal Physiology. Weight will be attached to work exhibiting research in some subject of physiological study.

The electors to Dr. Lee's readership in chemistry will appoint a reader in January, 1903, and they invite candidates to submit their names and qualifications before January 1. The reader must lecture in two at least of the three University terms, and, in addition to the duties performed for the University, he may be required, as an official student of Christ Church, to take part in the educational work of the house by giving lectures or other instruction in chemistry and directing the work of the chemical laboratory.

Convocation has granted 200*l.* to the Wykeham professor of physics to defray the expenses of fittings for his laboratory.

CAMBRIDGE.—The reader in geography and the lecturers in ethnology and geology have arranged for a series of lectures and practical courses to serve as a training for persons wishing to undertake exploration or desirous of contributing to our knowledge of foreign countries. The series will be held during the Lent term, and will include history of geographical discovery, principles of physical geography, map-making and map-reading, and geography of Europe, by Mr. Oldham; anthropogeography, practical ethnology, by Prof. Haddon; geomorphology and geology, by Mr. Marr; plane-table and photographic surveying, by Mr. Garwood; and elementary astronomical surveying, by Mr. Hinks. The courses will be open to members of the University and others. The fee for all is 3*l.* 3*s.* Further particulars may be obtained from Prof. Haddon, Museum of Archæology, Cambridge.

A syndicate has been appointed to consider what changes, if any, are desirable in the regulations that affect the mathematical portions of the pass examinations of the University, in particular of the previous examination. The members of the syndicate are:—The Vice-Chancellor, Mr. C. Smith, Prof. Forsyth, Dr. Hobson, Mr. W. L. Mollison, Mr. C. A. E. Pollock, Mr. W. Welsh, Prof. G. B. Mathews, Mr. S. Barnard, Mr. W. M. Coates, Mr. E. T. Whittaker and Mr. A. W. Siddons. It is probable that the syndicate will recommend changes analogous to those which have been introduced in connection with the University local examinations, especially as regards the dominance of Euclid.