

'The Relations of Light and Darkness to Growth and Development': D. T. MACDOUGAL.

'The North American Species of *Trichomanes*': ELIZABETH G. BRITTON.

'A Green Organism Found in Water Tanks and Reservoirs in Arizona' (by invitation): J. J. THORNER.

'Mitosis of the Primary Nucleus in *Synchytrium decipiens*' (by invitation): F. L. STEVENS.

During the first nine years of its existence the Society has steadfastly refused to permit its funds to be drawn upon for any purpose except to meet the actual expenses of administration, it being the avowed purpose of the organization to use its resources in the furtherance of botanical research. The membership of working botanists is thoroughly in sympathy with this idea, and by a formal resolution at the Denver meeting in August, 1901, the Society declared its policy of using its income as soon as the annual receipts amounted to five hundred dollars.

It was found possible to take up this purpose of the Society at the last meeting and the following enabling resolutions were passed, by which the sum of five hundred dollars is to be set aside yearly to be distributed as grants among the members and associates. It is to be noted that the making of the grants in question does not exhaust the annual income of the Society, provision being made for addition to the permanent funds. The exact wording of the resolutions is as follows:

GRANTS IN AID OF INVESTIGATION.

Resolved: That applications for grants in aid of investigations may be made at any time by members or associates in good standing. Such applications should be made to the secretary, accompanied by a detailed statement in regard to the work for which the grant is requested, and shall be referred by the secretary to the Council. The Council shall report upon all applications at the next meeting subsequent to the date at which they are received. The amount of any grant confirmed by the Society may be drawn by the applicant from the treasurer within six months

after the meeting at which the grant was made, after a proper receipt has been made therefor.

The recipient of a grant must make a report of the progress, or of the completed results of the investigations for which the grant was given, at the next annual meeting, and at every succeeding meeting until the work in question is finished. Such report must be made in writing to the Council, and may or may not be referred to the Society. Any and every paper dealing with the results of investigations carried out by the aid of grants as above, shall bear the imprint, 'Investigations prosecuted with the aid of a grant from the Botanical Society of America.'

Resolved: That at the next meeting of the Society a grant or grants in aid of investigations may be made in any amount not to exceed the total sum of five hundred dollars (\$500) to members and associates of the Society.

D. T. MACDOUGAL,
Secretary.

NEW YORK BOTANICAL GARDEN.

THE INTERNATIONAL AERONAUTICAL CONGRESS.

THE third meeting of the International Committee for Scientific Aeronautics, appointed by the meteorologists in 1896, was held at Berlin, May 20-24, and by reason of the number of military and scientific men who were invited to attend, it is more widely known than either of the preceding meetings of the committee at Strassburg in 1898 and at Paris in 1900. The Kaiser, who has done so much to advance aeronautics, both practical and scientific, was expected to attend the opening of the Congress in the great hall of the Reichstag, but, being absent from Berlin, he delegated Prince Frederick Henry of Prussia as his representative and telegraphed his wishes for the success of the deliberations. After an introduction by Professor Hergesell, president of the Committee, the representative of the Minister of Public Instruction recognized the importance of international cooperation in meteorological and magnetic researches, and predicted important results from the present conference.

Dr. von Bezold, director of the Prussian Meteorological Institute, showed how, by the use of balloons and kites, our knowledge of the high atmosphere had been increased through various nations working with a single purpose, and Professor Hergesell explained further the results and objects of international cooperation in scientific aeronautics.

There were present of the International Committee for Scientific Aeronautics, Professor Hergesell, Dr. Assmann and Mr. Berson, representing Germany, General Rykatchef and Colonel Kowanko, of Russia, Messrs. Cailletet and Teisserenc de Bort, of France, and the writer from the United States. At the first meeting of the Committee fifteen new members were chosen, including representatives of the Italian, Spanish and British governments, which had participated in this Congress for the first time. It was decided that the scientific discussions should be open to the invited specialists who numbered about one hundred, while the administrative questions should be considered by the Committee in closed session. One of these questions related to the protection of balloons and apparatus that fall in a foreign country, cameras, in particular, having been regarded with suspicion by the military authorities. Another topic of discussion was the raising of funds from the various countries for the regular publication of the results obtained from the international ascents of balloons and kites. The consideration of some of these data was now begun in the public meeting by General Rykatchef, director of the Central Physical Observatory at St. Petersburg, who described the results of the observations with kites and balloons at Pawlowsk and St. Petersburg during the past five years. By means of kites the details of the conditions prevailing up to 3,000 meters were ascertained, especially the influence of day and

night on the vertical changes of temperature. The decrease is greatest during the day and in summer, while during the evening and in winter large inversions of temperature occur. In the lower strata of anticyclones these inversions are marked, while in the upper regions the decrease of temperature is rapid. It was announced that the Tsar had given a considerable sum of money for the prosecution of these experiments. M. Teisserenc de Bort, of Paris, discussed the temperature of the high atmosphere, ten or fifteen kilometers above the earth, as deduced from the ascents of 258 *ballons sondes* at Trappes, and showed, contrary to the general belief that the decrease approached the adiabatic rate at these great heights, that there was a stratum eight to ten kilometers thick, depending on the season and weather conditions, where, not only does the temperature not diminish with augmenting height, but rather tends to increase. Dr. Assmann, director of the Aeronautical Observatory of the Prussian Meteorological Institute, stated that the German observations had led him to the same conclusion regarding this warm upper current.

Professor Palazzo, director of the Italian Meteorological Office, announced that in consequence of a subvention from the Ministers of Agriculture and War the project of his predecessor, M. Tacchini, to establish kite-stations on mountains could be realized. Professor Palazzo said that the observatory on Monte Rosa would be completed next year and that, besides the routine observations, it would be available for physical investigations. Dr. von Schrötter, of Vienna, urged the importance of the study in balloons of the chemical intensity of light, especially of light reflected from clouds.

Dr. Assmann next described his rubber or registration balloon, *ballon sonde*. The usual paper or silk balloon, open at the bot-

tom, has the disadvantage of rising more and more slowly as it approaches its culminating point, and, consequently, the temperatures registered are influenced by insolation to an unknown amount. Closed balloons of expansible material, however, rise with a constantly increasing velocity until they burst, thus insuring sufficient ventilation of the instruments. A parachute moderates their fall, so that they reach the earth without injury. The small size of the rubber balloon and the moderate quantity of hydrogen gas needed is an advantage as regards both cost and ease of manipulation. Such a balloon, holding at the start about one cubic meter of gas, weighs only 380 grams, or, with the instrument, 500 grams. A balloon formed by dipping a mold into a solution of india-rubber, was expanded to 68 times its original volume before it burst, which indicated that it would rise to an altitude of about 38 kilometers. The subject of sensitive thermometers for *ballons sondes* was opened with an account of some tests by Dr. Valentin, of Vienna. M. Teisserenc de Bort exhibited a thermograph in which the Bourdon tube was insulated by a piece of hard rubber and Dr. Hergesell showed another instrument in which a curved metal tube transmitted its changes of length through a bar of nickel steel that had almost no coefficient of expansion. It was proposed that these two thermometers should be tried together in a balloon sent up at night, so that the disturbing effect of insolation might be avoided. A statoscope, to indicate the rise or fall of a manned balloon, the invention of Captain Royas, was exhibited by Major Vivez y Vich, of Madrid, and a project of directing an airship from the ground by means of Hertzian waves was explained by Mr. Alexander, of Bath, England.

Kites and kite-stations were then considered, the writer first presenting his plan

to explore the atmosphere over the tropical and equatorial oceans by means of kites flown from a steamship, as outlined in SCIENCE, Vol. XIV., pages 412-13 and 896-97. He stated that application had been made to the Carnegie Institution for a grant of \$10,000 to defray a portion of the expenses, but still he hoped his German colleagues might cooperate in this large undertaking. The project was enthusiastically received, Dr. von Bezold remarking that the importance of the proposed investigation consisted in the fact that quite a different vertical distribution of temperature might be expected to prevail over the ocean from that found over the land. The conditions of equilibrium are disturbed over the ocean, not by heating the lower layers of air but by cooling the upper strata, and hence at sea and on the coast thunderstorms are most frequent during the cold season and at night, while on land the reverse obtains. More than two years ago he had proposed to explore these regions by an expedition furnished with kites which project was unavoidably postponed, but now, as Mr. Berson stated it might be carried out in cooperation with Mr. Rotch. Professor Köppen, of Hamburg, said that the Scandinavian Hydrographic Congress had arranged four cruises a year in the northern seas and the Deutsche Seewarte would operate meteorological kites on board the vessel. The Göttingen Society of Science has recently sent out a geophysical expedition to Samoa, which was to fly kites with registering instruments, both there and on the return voyage. On the Lake of Constance, also, meteorological kite ascents will be made upon a vessel furnished by Count Zeppelin, through the cooperation of the Meteorological Service of Alsace-Lorraine. A resolution was then passed, recognizing the importance of Mr. Rotch's proposed voyage to increase our knowledge of the distribution of temperature in the

atmosphere, and expressing the hope that, by government aid, the plan might soon be carried out. Professor Köppen submitted a new publication of the Deutsche Seewarte containing the results of his experiments with kites at Hamburg and he announced that, through Franco-Scandinavian cooperation, kite flights were to be made this summer at Viborg in Jutland, simultaneously with flights at Hamburg and Berlin, so that valuable vertical sections of the barometric depressions traversing north Germany would probably be obtained. Professor Hergesell mentioned the fact that kites had been flown upon the Vosges mountains.

General Rykatchef exhibited a new anemometer, invented by Mr. Kusnetzof, and intended to be carried by a kite, which has bridled Robinson cups to record the force of the wind at each instant. Another anemometer, exhibited afterwards by Mr. Gradenwitz, an engineer of Berlin, had a glass cylinder partly filled with glycerine, which is rotated by the Robinson cups and the parabolic surface of the liquid shows on a concentric scale the velocity of the wind. M. Teisserenc de Bort urged the importance of sounding the atmosphere at frequent intervals and showed diagrams of such a series of soundings made with kites and *ballons sondes* almost daily during thirty-six days at his observatory near Paris, to an extreme height of twelve kilometers. The rise and fall of the isotherms during the passage of areas of high and low pressure indicated graphically the complicated conditions which still require further investigation.

The next session was occupied with the topic of high ascents. Professor Cailletet, of Paris, exhibited his apparatus for breathing oxygen at great elevations. The old method of using the compressed gas required a large and heavy receptacle, but liquid gas can be much more conveniently

carried and after it is allowed to evaporate and to mix with air, by means of a specially constructed mask the aeronaut is forced always to breathe the mixture. Dr. Süring, of Berlin, described the physiological phenomena attending his record-breaking ascent with Mr. Berson to the height of 10,800 meters on July 31, 1901, and Dr. von Schrötter stated that his own experiments in a pneumatic cabinet, under a pressure of 230 millimeters of mercury, proved that the respiration of oxygen restored both the physical and mental power. He also exhibited a breathing mask which was to be tried with the one of M. Cailletet during the next balloon ascent. Count Zeppelin called attention to the well-known fact that birds often soar above high mountains as proving that they avail themselves of the rising currents of air, and suggested that ascents of *ballons sondes* in such places might give interesting results. Lieutenant von Lucanus, on the part of the German Ornithological Society, advocated observations in balloons to determine the various levels at which birds are found. At the close of the session a telegram was sent to James Glaisher, the Nestor of scientific aeronauts, in London, with the greetings of his colleagues assembled from Europe, Asia and America.

The last session of the Congress was devoted to a discussion of measurements of atmospheric electricity and terrestrial magnetism in balloons. Assuming that the electrification of the air occurs through 'ions' or 'electrons,' as shown by the dispersion apparatus of Elster and Geitel, it is of great interest to determine how the constitution of the air, as regards positive and negative ions, varies with height. By using an aspirator to bring a definite quantity of air over the apparatus, Professor Ebert, of Munich, said that he had obtained absolute measurements of the quantity of free electricity in a cubic meter of air. In

the discussion, Dr. von Bezold remarked that the connection between the Föhn wind and the number of ions in the air was now being studied. The air brought down from a great height by the Föhn carries more ions to a lower level and there thus appeared to be a relation between mountain sickness and the well-known physiological effects of the Föhn. Professor Palazzo, of Rome, explained his photographic arrangement of Exner's electrometer, for use in balloons, and Dr. Linke, of Potsdam, described the measurements he had made in balloons to determine the change of potential and conductivity of the air. He had confirmed his early results that the potential was always positive, but found the variation of the conductivity in cloud strata depended upon the weather conditions. The vertical motion of the balloon introduced complications which made the dispersion observations very difficult. On the request of Professor Ebert, the Congress recognized the importance of executing electrical measurements in balloons. The same speaker showed an apparatus for determining the horizontal magnetic intensity in a balloon without knowing either the astronomical or magnetic meridian. This is not only of scientific importance, but may be practically useful to guide the aeronaut at night and when he is in the clouds or over the sea. Dr. Marcuse, of Berlin, then showed an instrument for determining astronomically in a balloon its position. Dr. Kassner, of Berlin, suggested that kites and kite-balloons might be employed in the following scientific investigations: in physics for the determination of the conditions affecting the velocity of sound, in geodesy and astronomy for researches as to the causes of the variation in atmospheric refraction and in meteorology for a study of the action of 'hail shooting.' Finally Director Archenhold, of the Treptow Observatory in Berlin, said that the volcanic eruptions in the

West Indies may produce optical phenomena similar to those following the Krakatoa explosion, namely, first brilliant sunsets and then the luminous night clouds which would be first perceived by aeronauts during nocturnal ascensions.

The Committee recommended that the international ascents of balloons and kites should take place, as heretofore, on the first Thursday of each month, and the *ballons sondes* should be liberated an hour before sunrise in order that the instruments may be unaffected by insolation and the balloons may be seen when they fall to the earth. The employment of the insulated thermometer and of the sensitive metallic thermometer already described were likewise advised. The president noted with satisfaction the arrangements by which kite flights would be made above the seas, lakes and mountains, and hoped that the British Government would aid in the investigation of the great Asiatic monsoon region. The Congress was then closed, but the Committee in executive session formulated resolutions, among them a request to the Reichschancellor for a subvention to defray half the cost of the proposed German-American kite expedition to the tropics.

The entertainments were a notable feature of the Congress. During a visit to the Aeronautical Observatory of the Prussian Meteorological Institute, at West Reinickendorf, a few miles north of Berlin, the kites, kite-balloon and rubber *ballons sondes* were sent up, one of the last attaining the unprecedentedly great height of twenty kilometers. The following day, after the adjacent establishment of the Prussian Balloon Battalion, which is the most modern and complete in the world had been inspected, field manœuvres were executed and the time required to bring the kite-balloon on the field, inflate it and send up an officer to reconnoiter was found to occupy but sixteen minutes. A number

of free balloons ascended from the grounds carrying military and civil members of the Congress, one of the latter ascents being for meteorological purposes and another for physiological experiments. A sumptuous breakfast, given by the officers of the Balloon Battalion in their Casino, was attended by the Minister of War, and at a banquet given in the Zoological Garden in honor of the Congress, Prince Frederick Henry presided. It is evident, therefore, that the organizers of the Congress succeeded in pleasing their guests and in giving the foreign military officers, who represented the chief European powers excepting France, an idea of the high efficiency of military ballooning in Germany. As regards the exploration of the atmosphere, nowhere is there a station so completely equipped as the one directed by Dr. Assmann, and yet, notwithstanding the time and money expended to bring it to this condition, the site near a great city having proved unfavorable for kite-flying, the observatory will be moved into the open country about a hundred miles northeast of Berlin. The observatory of M. Teisserenc de Bort has likewise been removed from the neighborhood of Paris for similar reasons, and this action by both a government and a private institution shows that in Europe 'the sounding of the ocean of air' is regarded as being of sufficient importance to justify its prosecution under the best possible circumstances.

A. LAWRENCE ROTCH.

BLUE HILL METEOROLOGICAL OBSERVATORY.

SCIENTIFIC BOOKS.

The Varieties of Religious Experience: A Study in Human Nature. Being the Gifford Lectures on Natural Religion delivered at Edinburgh in 1901-1902 by WILLIAM JAMES, LL.D., etc., Corresponding Member of the Institute of France and of the Royal Prussian Academy of Sciences, Professor of Philosophy at Harvard University. New York,

London and Bombay, Longmans, Green and Co. 1902.

In the portion of this book which is wholly novel in academic philosophy, that which gives a careful statement and a deliberate discussion of 'the religion of healthy-mindedness' (including 'mind-care,' 'Christian science,' etc.) the reader has a fair gauge of the author's spirit and method throughout. We have the 'human documents,' the religious feelings and ideas as set forth in extracts chosen with the happiest discrimination, the analyses and explanations of psychology, and the author's hospitable-minded but critical summing-up. We meet with that reluctance to deny, that wistful sense of 'more beyond,' which is so singularly blended in his writing with sceptical science. We have that vivid perception of the concrete in all its variety, that distrustful interest in abstract theory in all its variety, which make us feel somewhat tossed about on the waves of suggestion, and yet distinctly safer than in the hands of the artificer of consistent systems. And lastly we have the care for results, for the difference a theory makes to life, joined with an individualism, a willingness to live and let live in matters of belief, which would encourage diverse theories to bring forth practical fruit after their kind and so put themselves to the proof. We understand how it could happen that Professor James has been falsely set down as a spiritist, merely because of his completer suspension of judgment in subjects where to hesitate is deemed hardly consistent with scientific propriety. On this point he has elsewhere made his views explicit.* In these peculiarly frank pages there is no trace of any taste for the conception of spirit-possession; it figures, indeed, not at all; but there is repeated refusal to assume that human consciousness is subject to no impressions but those of sense.

Highly characteristic of their author, these lectures stand in marked contrast with the other philosophic courses of the Gifford series. Such lecturers as Professors Caird, Ward and Royce offered abstract reasoning in proof of a

* See review of Hodgson, 'Further Report on Certain Phenomena of Trance,' *Psychological Review*. 1898.