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THE INTERNATIONAL AERONAUTICAL CONFERENCE AT MILAN

THE history and organization of the International Commission for Scientific Aeronautics, whose name does not indicate that its purpose is to explore the atmosphere, are briefly described in SCIENCE, Vol. XXI., page 461. The fifth meeting of the commission had been appointed for Rome in 1906, but on account of the exposition at Milan, with its aeronautical section, the place of meeting was changed to the latter city. The conference began on October 1 and lasted through the sixth, there being about forty members of the commission and guests in attendance. The proceedings were opened by Professor Celoria, representing the exposition of Milan, and a further welcome was extended by Signor Gavazzi on the part of the municipality, by Professor Palazzo for the Italian government and by Professor Hergesell as president of the commission. Two presiding officers for each session were chosen from among the foreigners present, who were chiefly Germans. England, however, was unusually well represented by four delegates and guests. The writer was the official representative of the United States Weather Bureau, as well as of the Blue Hill Observatory, and on his proposition Dr. O. L. Fassig, research director at the new Weather Bureau observatory on Mount Weather, Virginia, was elected a member of the commission, as were also M. Lancaster to represent Belgium and Signori Gamba and Oddone from Italy.

Professor Hergesell reported on the progress of the work which the commission furthers, since its meeting at St. Petersburg in 1904. In Spain unique observations had been obtained with balloons during the total solar eclipse of August 30, 1905; two expeditions had been sent from France by Messrs. Teisserenc de Bort and Rotch to explore the atmosphere above the tropical Atlantic; in Italy manned and registration balloons at Rome, Pavia and Castelfranco had contributed data, while kites had been employed in the vicinity of Monte Rosa; in Russia the observatory at Pawlowsk was making aerial soundings and other stations were being equipped for this purpose; in Switzerland Dr. Maurer had compared the data on mountains with those in balloons and in Austria numerous scientific balloon ascensions had taken place. In Great Britain and India kite flights were being made and in the United States the government Weather Bureau had joined the Blue Hill Observatory in making kite flights on the term-days. Germany was very active: there were daily observations in the free air at Lindenberg and Hamburg, and in Munich Baron von Bassus and Professor Ebert were experimenting with balloons; the money for a floating observatory on Lake Constance was assured, so that ascents of balloons or kites would eventually be made from a fast steamer; the German Marine had sent a surveying ship, equipped also with apparatus for exploring the air, into the tropics, and the Prince of Monaco, with the cooperation of the speaker, had executed such explorations over the Mediterranean, and over the tropical Atlantic and Arctic oceans. Belgium was now participating in the despatch of *ballons-sondes* and Roumania had promised to cooperate. The cost of publishing these observations executed in the free air, amounting to about 12,000 francs a year, is defrayed by the countries which collect them. General Rykatchef, in reporting on the resolutions adopted at St. Petersburg, stated that it had not been possible to secure the free entry into the different countries of the balloons and instruments which were used in the experiments.

The topics discussed in the subsequent sessions related to the methods of investigation or the results obtained and a summary of the most important follows. Dr. Erk, of Munich, advocated balloon ascensions in the neighborhood of the Alps in order to study local phenomena, such as the föhn wind. Professor Ebert indicated the methods which he employed to determine the deformation of equipotential electrical surfaces around a balloon and showed a new apparatus to measure atmospheric ionization.

The use of small balloons to determine the currents in the high atmosphere was discussed by Dr. de Quervain and others. If a barometer is carried by the balloon from its trace and from the measured angles of the balloon the course can be plotted. A small balloon may be observed with a telescope to a height of ten or twelve kilometers and Professor Hergesell was able in the clear air of Spitzbergen to follow a rubber balloon, which expanded to one and a half meters in diameter, during seventy-four minutes, at the end of this time the balloon being eighty kilometers distant. Micrometric measurements of its diameter showed the velocity of ascent to be nearly constant, since the loss of gas is slight, so that the height when it enters the different currents may be calculated from a single station, even if the balloon carries no barometer or is not recovered. A mechanical triangulating device has been used by De Quervain for finding the height of the balloon, but this is similar to the apparatus which Mr. Clayton devised for

getting the height of clouds at Blue Hill. Colonel Vives y Vich recommended sending up paper pilot balloons simultaneously with the *ballons-sondes* in order to see how the wind changed in the isothermal zone. Baron von Bassus exhibited an apparatus for reading the curves of the self-recording instruments and Dr. de Quervain discussed the thermal inertia of the different thermometers, concluding that the metallic bar of Hergesell was more sensitive than that of Teisserenc de Bort. An interesting discussion followed as to the relative value of observations obtained with kites and balloons, General Rykatchef, Professor Berson and others favoring the former and Professor Hergesell alone championing the latter method.

General Rykatchef, for Mr. Kouznetzof, explained a method that had been employed at Pawlowsk to ascertain the height of clouds at night by projecting a searchlight upon them and measuring the vertical angle of the spot of light, which elicited the information that the same method had been tried in France, at Hamburg and at Blue Hill. Captain Scheimpflug showed how photographs of the ground taken from a balloon could be rectified so as to be transformed into topographical plans.

A number of communications giving the results of observations in the free air were presented. General Rykatchef stated deductions concerning the vertical gradient of temperature in the free air at Pawlowsk, which is greatest near the ground and during the month of June and least in December. Another paper by Dr. Rosenthal discussed the diurnal range of temperature at different heights over the sea. While in the first 100 meters there is a fall of 1° C. in the day and 0.2° at night, in the stratum between 300 and 400 meters the decrease is 0.6° during both day and night.

Mr. Rotch gave the results of the first *ballons-sondes* in America, fifty-three of the fifty-six balloons which he had despatched from St. Louis in 1904–'06, having been recovered. One of the lowest temperatures ever observed (— 79° C.) was recorded in January at a height of only 14,800 meters, and the isothermal, or relatively warm current, which had been found in Europe, was shown to exist at a greater height in the United States. Dr. de Quervain presented proofs of this isothermal stratum above 12,000 meters, which had been furnished by ascents of balloons in the daytime. Professor Hergesell related some experiments which he had made to measure the vertical movement of the atmosphere by getting the difference between the calculated rate of ascent of the balloon and the vertical movement of the air recorded, amounting in one case to a downward current of half a meter per second. Professor Berson offered two papers, one being a discussion of more than a thousand kite flights at Lindenberg, in order to ascertain the variation of wind-velocity with height, the author concluding that the velocity increases faster than the density of the air decreases. The other paper discussed the data from sixteen *ballons-sondes*, sent up from Milan the previous summer, nine of which could be followed in the telescope to a distance of eighty kilometers. Very low temperatures were recorded, and — 64° C. at 12,000 meters corresponded to a change of 100° C., from sea level, or nearly the adiabatic rate. Mr. Dines showed views of the kite windlass used by Mr. Cave and gave an example of a large inversion of temperature observed in England up to 2,000 meters.

The most interesting communications related to the exploration of the atmosphere over the ocean during the preceding year. M. Teisserenc de Bort gave the results of the last cruise of his steam-yacht *Otaria*, which had been sent across the equator by

Mr. Rotch and himself. Thirty-nine pilot balloons were launched and twenty-two balloons with instruments, of which seven were lost. A captive balloon ascended to 7,500 meters and kites were used in the lower strata. The existence on the open ocean of the southwest anti-trade above the northeast trade, and of the northwest anti-trade above the southeast trade, was demonstrated and it was shown for the first time that the temperature high above the thermal equator is lower than it is at the same height in temperate regions, owing to the absence of isothermal strata. Professor Hergesell gave a brief account of the cruise which he had made to Spitzbergen on the Prince of Monaco's steam-yacht *Princesse-Alice*. Owing to fog and cloud no lofty observations were obtained, but a slow decrease of temperature and a rapid increase of wind with height were indicated. Professor Hergesell explained his method of releasing one of the tandem balloons at a given height, so that the other balloon with the instrument would soon drop and be recovered, even in cloudy weather. It was suggested that the balloon might be liberated also by electrical waves. The same speaker and Professor Köppen described the survey steamer *Planet* of the German Marine, which is making soundings of both the water and the air in the South Seas. The thanks of the commission were voted to the German Minister of Marine, to the Prince of Monaco and to Messrs. Teisserenc de Bort and Rotch for their researches over the oceans.

M. Teisserenc de Bort submitted a memoir on the necessity of extending the territory for the international ascensions. In Europe almost all the stations are grouped within an area having less than a thousand kilometers radius, and there are none to the north and southeast. It is necessary to get data from a point to the north of the Scandinavian peninsula and also to the north of Great Britain. It would be interesting to have one station near the center of the Mediterranean, such as the Etna Observatory at an elevation of 3,000 meters. In Algeria it is proposed to launch pilot balloons and to measure their angles, and in Cairo, where there is a well-organized meteorological service, it is probable that observations can be obtained with kites and pilot balloons and possibly with *ballons-sondes*. In the United States we have observations, due to Mr. Rotch, at Blue Hill and at St. Louis and an aerial observatory has been established by the government on Mount Weather in Virginia. The most important place is Newfoundland, where *ballons-sondes* could be launched, even during storms, as the writer, M. Teisserenc de Bort, had done with success in the more restricted region of Denmark. In order to bridge the gap over the ocean, as much as possible, it is proposed to request the Canadian meteorological service to make ascensions with pilot balloons at Bermuda; to have this done at the Azores, and to secure the cooperation of the Jamaica and Havana observatories. In Mexico *ballons-sondes* might be used and the system thus developed will permit the general circulation to be determined at different heights around two or three of the most important centers of action in the atmosphere.

At the close of the meeting eleven resolutions were voted, chief of which were the following: The commission, on the recommendation of M. Teisserenc de Bort, realizing the great importance of collecting sufficient observations to chart the meteorological elements at various heights under different atmospheric conditions, believes that its efforts should be concentrated upon four groups of ascensions during the year, called 'grand international ascensions,' in order to distinguish them from the monthly ascensions. These last are optional for

stations which do not make aerial soundings their chief work. The quarterly ascensions will be made during three consecutive days, on dates to be named hereafter. It is recommended that the trajectories of the *ballons-sondes*, and of the pilot balloons, when only these are used, should be determined by angular measurements and that the same thing be done for clouds. It is also desirable, as General Rykatchef has suggested, to have at least one temporary station for these international observations in the midst of the great Asiatic anti-cyclone, especially in winter. If this can be established the observations should last seven days instead of three days, that is to say, two days before and two days after the normal days.

A subcommission consisting of Messrs. Teisserenc de Bort, Berson, Hergesell, Köppen, De Quervain and Rotch decided to adopt Professor Köppen's proposition to publish a compendium of the best methods of sounding the atmosphere, for which the several establishments actually conducting such investigations will be consulted and the publication made by the International Commission. The subcommission also recommended that a form of publication, similar to that used by the Deutsche Seewarte, be adopted for statistics relating to the kite flights and that a similar résumé for balloon ascensions be used by the institutions participating in them.

The commission expressed its satisfaction that atmospheric soundings had been begun by the United States Weather Bureau on Mount Weather and hoped that they might be extended to other stations of the service.

The conference agreed with Major Moedebeck that it would be useful for scientific as well as for ordinary balloon ascensions, if, on the topographic maps of the various states there should be indicated in red the location of collections of lights which could serve to orient the aeronaut at night, and if the lines of high electrical potential, and also the places which were sheltered from wind, should be marked on the maps.

The propositions of Professor Assmann, relative to the meetings, were adopted in this modified form: The commission shall meet but once in three years, unless there is special reason for assembling earlier. The reunions are intended to consider the organization of the work and to discuss methods and instruments, scientific communications being relegated to the last and only presented then if time allows.

It was the sense of the meeting that the entertainments in honor of the commission should be restricted henceforth and at the present convention they had been mostly combined with technical demonstrations of aeronautical apparatus in the exposition and elsewhere. Thus, on one excursion to Pavia the aero-dynamical observatory of Signor Gamba was inspected. Afterwards the university was visited and a lunch tendered by the municipality. On another excursion to Lake Maggiore, through the courtesy of Signor Mangili, president of the exposition committee, experiments in flying kites and liberating *ballons-sondes* from a steamboat, were attempted, although without much success. After the close of the meeting members of the congress had the opportunity of making balloon ascensions, under ideal conditions of weather, in eight balloons which rose from the exposition grounds and landed not far from Milan, a few hours later.

A. LAWRENCE ROTCH
BLUE HILL METEOROLOGICAL OBSERVATORY,
HYDE PARK, MASS.

THE DANGER OF OVERSPECIALIZATION[1]

IN the ever-recurring discussion of our

[1] Read before the meeting of April 5, 1907, of the New York Section of the American Chemical Society.