

ton in the antarctic regions. He thought the action of the Canadian Government was to be applauded, and served as an example to other Governments on this side of the Atlantic.

Mr. Bridgeman gave a note on the Crocker Land expedition, as well as an interesting eulogy on Admiral Peary, entitled "Peary: the Man and His Work." Mr. Bridgeman showed a most beautiful series of slides of arctic scenery. Among other arctic papers was one by Dr. O. J. Skattum, of Christiania, on the map of Spitsbergen. Excellent as is the recent work of the Norwegians in Spitsbergen, he made a serious omission by making no reference to the highly detailed geodetic work in Prince Charles Foreland that has been done by Dr. W. S. Bruce and Mr. John Mathieson in 1906, 1907, and 1909. Neither did he acknowledge the financial and other help given to the Norwegians by the Prince of Monaco, who has also helped the Scottish expeditions. Dr. Skattum should spell "Spitsbergen" with a central "s" and not "z," the word being of Dutch and not German origin.

An arctic paper of great interest and importance was given by General de Shokalsky, who also made several other important communications. It was on the work carried out by the officers of the Russian Navy and the Russian Geographical Society during the last twelve years. This work includes much detailed and valuable geographical research, on strictly scientific lines, that has been done along the arctic shores of Russia and Siberia, and seas adjacent. His paper on the new hypsometrical map of the Government of Moscow on a scale of 1:168,000 might also be regarded as an important contribution to arctic geographical research.

Antarctic Research.

Dr. W. S. Bruce gave an account of his plans for another Scottish Antarctic expedition, which have already been given in detail at a meeting of the Royal Scottish Geographical Society, and for which the treasurer of the society is receiving subscriptions amounting already to a considerable but, as yet, by no means adequate amount. The plans, it will be remembered, are to carry out further extensive oceanographical research in the region of the Weddell Sea, to explore the continent in the neighbourhood of Coats Land, and to complete a sectional survey of Antarctica, by a journey across from the Atlantic to the Pacific side of the continent. The plans were very strongly supported by Admiral Peary, who urged the special importance of a journey to the south pole on the Weddell Sea side of Antarctica, and the importance of detailed oceanographical research. He agreed with Dr. Bruce that there was plenty of room for many nations to work together in the antarctic region, and hoped that the United States would take part in the south polar campaign. Mr. G. G. Chisholm, secretary of the Royal Scottish Geographical Society, said that the plans had the hearty support of that society. The plans were also cordially supported by Prof. Penck, of Berlin, who referred to the work of Lieut. Filchner and his important discovery of an extension of Coats Land to the south-west. Dr. Otto Nordenskjöld's was the other antarctic contribution, namely, "A Comparison of the Inland Ice of Arctic and Antarctic Lands," an important contribution to glaciology.

Dr. Gerhard Schott, of Hamburg, gave an account of recent German oceanographical research in the Atlantic Ocean, and Prof. Drechsel, of Copenhagen, dwelt on the importance of continuous and periodic hydrographic researches carried on at definite stations, such as has been carried out recently by the Prince of Monaco and Dr. Richard in the Mediterranean. Prof.

J. Thoulet, of Nancy, dwelt on the construction and utility of bathy-lithological submarine charts, a paper that was in many respects very suggestive. Miss Owens's account of the geysers of Yellowstone Park was an important contribution.

On the whole the papers were of good quality, and showed the result of steady geographical research during the past four and a half years. But there is little doubt that the congress was seriously affected by the postponement on account of the Turco-Italian war, many who had offered contributions withdrawing them and presenting them to various geographical societies in the meantime.

It was resolved to hold the next congress at St. Petersburg on the invitation of the Russian Government, presented to the congress by General de Shokalsky.

A rather heated discussion arose on the question of introducing Spanish as an official language, but this proposal was withdrawn, a special veto being given to the proposal by General de Shokalsky threatening to introduce Russian as an official language if the proposal were insisted on.

INTERNATIONAL METEOROLOGY.

A MEETING of the International Meteorological Committee was held in Rome on April 7-12, at the invitation of Prof. Palazzo, director of the Italian Meteorological Service. The meeting was attended by Dr. W. N. Shaw, president of the committee, Geheimrat Hellmann, the director of the Prussian Meteorological Service, secretary, and the following members, representing the meteorological services of their respective countries:—*France*, M. Angot; *Portugal and Azores*, M. Chaves; *Holland*, M. van Everdingen; *Sweden*, M. Hamberg; *Switzerland*, M. Maurer; *Italy*, M. Palazzo; *Denmark*, M. Ryder; *Russia*, M. Rykatcheff; and *Canada*, Mr. Stupart. There were also present Prof. Hergesell, the president of the International Commission for Scientific Aëronautics, and Prof. Bjerknes, who had made important proposals, at the meeting of this commission held in Vienna in 1912, regarding the form in which meteorological data for the upper air should be published. At the opening meeting letters expressing regret at their inability to attend the meeting were read from Prof. Mohn, *Norway*; Prof. Willis Moore, *United States of America*; Prof. Nakamura, *Japan*; and Dr. G. T. Walker, *India*.

It is the function of the International Committee to deal with questions of organisation in which international cooperation is required. A considerable number of such questions has become ripe for consideration by the committee in the three years which have elapsed since the last meeting, held in Berlin in 1910.

After the conclusion of the formal inaugural business the first meeting was devoted to the consideration of a letter which had been received from the president of the International Institute of Agriculture, asking for the assistance of the committee in furthering questions connected with the influence of the weather in agricultural affairs. Apart from questions connected with weather forecasting, there are many problems connected with the influence of weather on the yield or quality of crops or the suitability of particular climates for particular crops which are capable of advancement by statistical methods, but as yet little progress has been made in this direction. The committee finally appointed a permanent commission to undertake the further working out of these questions. M. Angot was asked to act as president of this commission, and MM. Börnstein Brounow, Louis Dop, Hergesell,

Palazzo, and Stupart as members, it being understood that the commission would coopt additional members.

The second day's sitting was devoted to the consideration of the report of the Commission on Weather Telegraphy, which had held a meeting in London in September last, and of the comments which had been received from the various institutes concerned on the proposals of the commission. Apart from a few minor modifications, the committee approved the recommendations of the commission, which have been already referred to in a previous number of NATURE (vol. xc., p. 107). The institutes are invited to introduce the suggested modifications in the present arrangements for exchange of telegraphic meteorological reports within the European system on May 1, 1914. From that date onwards a uniform telegraphic code will be adopted throughout Europe, though the differences between the units adopted in this country and on the Continent will persist. Arising out of the report of the commission was the question of the receipt of information from ships at sea by wireless telegraphy. Up to the present this country stands alone in having a system for obtaining wireless reports from liners. Our geographical position invests such reports with special importance to us. It is now hoped that the regulations connected with weather radio-telegrams adopted at the International Radiotelegraphic Conference, held in London in the summer of last year, will result in a considerable curtailing of the time which these messages occupy in transmission. Should this anticipation be realised, it is probable that other countries would also desire to avail themselves of this means for securing information from the Atlantic Ocean, and the president was therefore requested to make inquiries regarding the matter.

At this meeting the committee also considered a report on the velocity equivalents of the numbers of the Beaufort scale of wind force in use in different countries drawn up by Messrs. Palazzo, Köppen, and Lempfert, by request of the Commission on Weather Telegraphy. The report showed that the equivalents used in different countries differ considerably, but they all have one feature in common, viz., that they are based on comparisons of estimates of wind force with hourly means of wind velocity as measured on Robinson cup anemometers. The last few years have witnessed a considerable advance in our knowledge of wind structure in consequence of demands which have been put forward by aviators, and thus the question arises whether the velocity in gusts should not find a place in any specification of the velocity equivalents of the Beaufort numbers that may be recommended for general international use. For this and other reasons the committee considered it inexpedient at the present juncture to recommend a definite scale of equivalents for general use, and contented itself with suggesting that if any meteorological service wishes to make a change in the hourly equivalents which are now in use, the new values should be so selected that they do not fall outside the limits set by the scales adopted in Germany and in this country. The gentlemen referred to above were requested to prepare a further report, on which the committee might base a more definite recommendation on some future occasion.

At the next meeting questions arising out of the investigation of the upper air were considered. M. Hergesell gave an account of the past work and future plans of the commission of which he is president. In connection with future plans, he stated that upper-air investigation would form an important part of the scientific work proposed by Capt. Amundsen in his projected drift across the polar basin in 1915, and it thus was very desirable to organise other

observations in polar latitudes simultaneously with Capt. Amundsen's expedition. In connection with this subject, M. Rykatcheff stated that Russia contemplated carrying out soundings of the upper air at Jakoutsik and Verkhoyansk, and that there was also some prospect of expeditions being sent to Nova Zemlya and to the mouth of the Lena at the time of Amundsen's expedition, if other countries were prepared to cooperate in other parts of the polar basin. Inquiries elicited the fact that prospects seemed favourable for such cooperation. Thus M. Hergesell hoped to be able to arrange for the German station on Spitsbergen to remain in operation, and Mr. Stupart thought that he might be able to arrange for some work of the kind contemplated by the Stefánsson expedition which the Canadian Government is sending out. The committee warmly supported the proposal, and appointed MM. Hergesell, Rykatcheff, Ryder, and Stupart a small subcommittee to deal with the question.

A second question of importance arising out of the upper-air work concerned the units to be adopted in the international publication in which the results of ascents made in all parts of the world are collected. A proposal brought forward by Prof. Bjerknes had led the commission responsible for this work to adopt at its meeting in Vienna in 1912 a resolution recommending that pressure values should be given in absolute units, millibars, instead of in millimetres of mercury, with the proviso, however, that the recommendation should only become effective when it received the approval of the International Meteorological Committee. The proposal has given rise to acute controversy in meteorological periodicals during the past year. Absolute pressure units are in many ways particularly suited to upper-air measurements, and no one would oppose their use if it were possible to start afresh without reference to the material which has been already collected and published in other units. Actually opinion has been sharply divided between those who trust that the temporary inconveniences associated with all changes will soon be outweighed by the advantages accruing from the new system, and those who deprecate any departure from established practice. After considerable discussion, the committee met the difficulty by requesting the commission to print pressure values in absolute units, millibars, as well as in millimetres of mercury. The committee further recommended that this practice should be adopted in all publications giving the results of observations in the free atmosphere. Thus a very difficult question has been settled for the present at the expense of a slight increase in the number of figures to be printed. A further proposal, originating with Prof. Bjerknes, to give heights in "dynamic meters," or rather to give geopotential instead of height in units of length, was referred back to the commission for further consideration, at M. Hergesell's request.

At the following meeting the report of M. Maurer, the president of the Radiation Commission, was received. A letter from Mr. Hunt, the meteorologist of the Commonwealth of Australia, directed the attention of the committee to the Campbell-Stokes sunshine recorder. Instruments of this type are widely used for recording the duration of bright sunshine, and their indications are generally regarded as reasonably comparable *inter se*. It appears, however, that the British Meteorological Service alone has adopted a definite specification for the instrument, but there is no similar provision in other countries. The Radiation Commission was therefore requested to take into consideration the question of instituting comparisons between instruments of different form.

At the last meeting the report of the Commission on Maritime Meteorology and Storm Warning Signals was considered. The recommendations of the commission regarding day and night signals, drawn up at the meeting held in London in September, 1912, were adopted except for a few points, such as the night signal for a hurricane, which was found to be likely to be confused with other signals already in use. These recommendations have already been described in NATURE (*loc. cit.*). A substantial measure of international agreement in the matter of day and night storm warning signals has thus been attained.

The Rome meeting of the committee was the third which has been held since the Conference of the Directors of Meteorological Observatories and Institutes which met at Innsbruck in 1905. In accordance with established practice another conference of directors should be held before the committee can hold another meeting, and it was agreed to call together such a conference for the year 1915. Holland was suggested as a suitable country for the meeting.

M. Palazzo had been at great pains to entertain his visitors and to afford them opportunities of seeing the geodynamical and meteorological observatories near Rome. On the Tuesday the committee was entertained at a dinner, at which the Chief Inspector of Mines presided on behalf of the Minister of Agriculture, who sent a message regretting his inability to be present in person. On Wednesday the members were received at the International Institute of Agriculture by its president, the Marquis de Cappelli. The whole of Thursday was devoted to an excursion which had for its object the seismological observatory at Rocca di Papa, with which was combined a visit to the Lake of Albano and to Frascati. On Friday afternoon the committee was invited to a meeting of the Physical Society at Rome, where it was welcomed by the president, Prof. Blascona, and subsequently listened to a lecture by Prof. Bjerknes on the fields of force.

On Saturday afternoon, April 12, the military observatory at Bracciano was visited by motor. This observatory has been recently established, and many of the instruments were not yet finally installed. It is fully equipped, not only for ordinary meteorological work, but also for taking aerial soundings with kites, registering or pilot balloons. A pilot balloon ascent was carried out in the presence of the visitors, who were subsequently entertained by the commandant and his officers.

NICKEL STEELS IN CLOCK CONSTRUCTION.

IN a pamphlet on "Les Aciers au Nickel et leurs Applications à l'Horlogerie" (Paris, Gauthier-Villars), M. Ch-Ed. Guillaume gives in a simple form an account of the properties of nickel steels and of their application to the construction of compensated clocks, chronometers, torsion clocks, and even watches. The well-known peculiarities of the nickel steels as regards dilatation and variation of elastic modulus and other properties with temperature are briefly described and explained on the ground that the presence of nickel depresses the temperature of the allotropic modification which occurs in iron at 890° C., and at the same time changes the transformation point of iron into a wide range of transformation temperature in the alloys. It is when they are within this widened transformation range that these steels possess abnormally low coefficients of expansion, &c.

M. Guillaume's exposition of the applications of these steels shows, however, that although the alloy-

steel known as "invar" can be produced so as to have negligibly low expansion, that is not the result to be desired for horological purposes. In the case of clock pendulums having an invar rod, with bob and suspension of other metal, the compensation principle of Graham, used in the mercury pendulum, is employed, but the use of a nickel steel of low expansion avoids the use of a liquid and makes the attainment of compensation both simpler and more perfect in its results. A steel of zero expansion would be less convenient.

More striking still is the application of nickel steel of a desired (low) coefficient of expansion to the balance-wheels of chronometers of high accuracy. Here the use of these special steels has made it possible to eliminate the second-order errors arising from the fact that compensation effected for two definite temperatures did not, with the older materials, avoid serious errors at intermediate temperatures, owing to the fact that the expansion curves of the two compensating metals only crossed at two points and lay widely apart at intermediate temperatures.

The elimination of this secondary error has made it worth while to seek other improvements in chronometer construction, so that an almost revolutionary improvement in these instruments has been brought about. For watches in which a compensated balance-wheel is excluded on account of cost, the use of a hair-spring of a special nickel steel, to which some chromium has been added in order to raise the naturally low elastic limit, has resulted in the evolution of a cheap method of producing compensated watches. In this case the abnormal manner in which the elastic modulus of these steels varies with temperature has been utilised.

The similar anomalous variation of the torsion modulus has also been utilised in connection with the construction of clocks with torsion pendulums, and has brought these clocks into the range of reasonably accurate instruments for the measurement of time. They have the advantage of requiring very little driving power, and can therefore run for four hundred days on a single winding.

M. Guillaume points out that these important developments must all be regarded as resulting from the study of the internal transformations of solutions and of alloys and that they have resulted indirectly from the study of nickel steels for purposes of metrology. The gradual and also the transient changes of dimension to which steels of the "invar" type are known to be subject are fortunately too minute to interfere with these applications, provided the steel has been properly aged. W. ROSENHAIN.

VARIATIONS OF THE SPECTRUM OF TITANIUM IN THE ELECTRIC FURNACE.

ENHANCED lines are taking a more and more prominent part in the discussion of both terrestrial and celestial spectra, and another valuable contribution to the subject comes from the researches of Mr. A. S. King, of the Mount Wilson Solar Observatory (*Astrophysical Journal*, vol. xxxvii., No. 2, March). The investigation which he has in hand deals with variations in the spectrum of titanium by different temperatures of the electric furnace in order, if possible, to fix the place of the enhanced lines on the temperature scale. As enhanced lines are in general difficult to produce in the furnace, he made the attempt of forcing the furnace temperatures up in order to make them appear in the spectra. This he has very successfully accomplished, and in the process he has been able to observe several re-