

direction, and then appears the amendment, which is a direct negative; as an example one might cite the rotation periods of the inner planets; but one that is nearer to the present question is the problem as to the spectroscopic evidence for the existence of water vapour in Mars.

Since Huggins compared the Martian and lunar spectra in 1867, a number of observers have made similar observations under various conditions, and with contradictory results. The summarised history of the research is given by Prof. Campbell in a recent Bulletin (No. 169) from the Lick Observatory, and the majority of the conclusions are in favour of the presence of water-vapour bands; whether the conclusions were supported by the evidence, when adequately analysed, is the question. Observations made at Mount Hamilton in 1894 demonstrated to him that, to obtain satisfactory evidence, they should be repeated at an altitude sufficient to escape the greatest possible proportion of the terrestrial atmospheric effects, and, to this end, he examined the conditions obtaining on the summit of Mount Whitney, the highest point in the United States, in 1908. The preliminary survey satisfied Prof. Campbell as to the atmospheric conditions, and he decided that, if the necessary money could be obtained for shelters and equipment, an expedition from the Lick Observatory should take advantage of the favourable opposition of 1909 to carry the

posed of hoar-frost, demanding a small quantity of vapour, would probably not be out of harmony with his observations. In Bulletin No. 43 of the Lowell Observatory Mr. Abbot's report is quoted to the effect that he and Prof. Campbell were on Mount Whitney during unusually unfavourable weather, under conditions which would probably not be met with at that season one year in ten. This is important, because, no matter how much of the theoretical water-vapour content of the terrestrial atmosphere was left below, it is absolute evidence that water vapour was present, in quantity, above.

The Mount Whitney plates, at the most, only afford negative evidence, and it is not contended that they do more. Thus the question of water vapour becomes one of amount rather than of existence or non-existence, and its settlement is rather academic than practical. There is no doubt as to the difficulty of securing absolute evidence—so many variables have to be eliminated before the sought-for residual is attained.

But, as stated above, the question is now generally accepted as settled in favour of the presence of water vapour in the Martian atmosphere. The darker edge of the melting "snow" caps, the proved existence of clouds, and the changes of intensity and shape of many features, point definitely to the existence of a fluid material, and,

without any violent assumptions, to that fluid being water. We note that Prof. Campbell suggests that the observed yellowish colour of the clouds may indicate for them some other chemical compound than H_2O , but, if this is so, should not the spectrum of Mars indicate some other absorption which is not mentioned?

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FIG. 4.—Temporary Observatory on Mount Whitney, for the investigation of water-vapour in the atmosphere of Mars.

research a step further. As is usual in, and, one might say, peculiar to, America, funds were forthcoming, with the result that, at the end of August, 1909, the summit of the mountain was occupied by an especially equipped expedition ready to take spectrograms when the conditions of Mars and the moon were favourable.

Such spectrograms, six in number, were secured on the nights of September 1 and 2, and it is to the discussion of the evidence afforded by these that Bulletin No. 169 is devoted. This evidence does not appear to be positively conclusive, but Prof. Campbell deduces "that the quantity of any water vapour existing in the equatorial atmosphere of Mars at the time these observations were made was too slight to be detected by present spectrographic methods. . . . it is difficult to conceive that the quantity of vapour above unit area on Mars could exceed or equal the quantity of terrestrial vapour above the same area of Mount Whitney."

It should be remarked here that the altitude of the summit of Mount Whitney is 14,501 feet, and, according to Hann's empirical formula, 0.79 of the terrestrial water vapour would be below. A photograph of the shelter and part of the equipment is reproduced, from the Journal of the Royal Astronomical Society of Canada, in Fig. 4.

Prof. Campbell expressly states that it is not contended that Mars has *no* water vapour, and that polar caps com-

increase in the membership and in the extent of the work.

Perhaps, of all the speeches, the most interesting was Sir David Bruce's account of his observations on the African sleeping sickness and other African diseases. In 1903 it had been hard or impossible to persuade the Uganda chiefs that the sleeping sickness is carried by the tsetse-fly. "But these same so-called uncivilised natives, whose untutored minds could not perhaps at once grasp the position, a few years later were so convinced of the truth of what we told them that they cleared the lake-shore and islands of their inhabitants, with the result that, so far as I am aware, at present not a single new case of sleeping sickness is being contracted in Uganda proper, and the toll of human lives to this plague has ceased to be paid. This toll has been estimated at 200,000 out of a population of 300,000. In one island alone, Buvuma, with a population of 32,000, 18,000 are reported to have perished." From this fact Sir David Bruce went on to speak of experiments which had shown how long the fly, once infective, may remain infective, and of the question of the infectivity of animals. Then he referred to a disease which destroys 70 to 80 per cent. of the calves born in Uganda; the cause and the nature of this disease had been discovered by experiments on animals. "By animal experimentation we found out the nature of several of the most important diseases of the

domestic animals in Uganda, and on more than one occasion nipped an epidemic in the bud, thus earning, if they had known it, the gratitude of the animals themselves."

Of no less interest was his account of "muhinyo," a fever among the Uganda natives, which had been mistaken, by clinical observation, for diverse other fevers. The Sleeping Sickness Commission, by animal experimentation, proved it to be, practically, Malta fever, and further proved that the germs of muhinyo were present in some of the goats from an infected district. The evidence thus appears complete that the fever, like Malta fever, might be transmitted in the goat's milk.

Finally, Sir David Bruce spoke of the discovery that the common sand-fly is capable of transmitting simple continued fever. Here the experiments were made on volunteers in the cause of science. "The study of the habits of the sand-fly is being pursued with energy, and I hope that within a short time simple continued fever will have disappeared as completely from Malta as Malta fever has done." Of the completeness of the disappearance of Malta fever from our army in Malta, since the goat's milk was prohibited, the following figures are proof:—in 1905 there were 643 cases; in 1906, 147; in 1907, 11; in 1908, 5; in 1909, 1; and in 1910, thus far, 0.

We hope that the Research Defence Society will see to it that such a record of the experimental study of diseases shall not be allowed to drop out of the public mind.

METEORIC FIREBALL OF JUNE 1.

ONE of those brilliant meteors which often appear in the twilight of our midsummer skies was seen on Wednesday, June 1, at 9.40 p.m. The atmosphere was fairly clear, and the object formed a fine spectacle to many persons in the southern counties of England. Excellent descriptions of the apparent path it traversed have come in from various places, including Coventry, Bristol, Cheshunt (Herts), and Ealing, Sydenham, and Herne Hill, London.

The meteor was much more brilliant than Jupiter, and as it sailed slowly along it apparently changed its colour from electric blue to gold, and threw off a short trail of reddish sparks. Viewed from the metropolis, the observed flight was a descending one from west to north-west, and the whole trajectory occupied about four seconds.

There is no doubt that the meteor was directed from a radiant near Antares, in Scorpio, which has furnished many June fireballs in past years. Its height was from about 62 to 48 miles, and the path of some 100 miles, traversed at a velocity of about 25 miles per second. First visibly appearing over a point near Chippenham, it passed to north-west, crossing the Severn, and disappearing south of Montgomery, in Wales. Other reports will doubtless come to hand, and enable this result to be tested, but it cannot be far wrong. The fireball supplies further corroboration of the activity of the Scorpoid shower, and of the almost unique brilliancy of its meteors. There was a fireball seen in Scotland by several observers on May 24, at 11h., and this had a height of about 70 to 44 miles over the sea north of Ireland. This object also was directed straight from the radiant in Scorpio.

W. F. DENNING

INTERNATIONAL CONGRESS ON TROPICAL AGRICULTURE AND COLONIAL DEVELOPMENT.

A NOTE on the organisation of this congress was published in NATURE of April 7, and it is only necessary to say now that the congress was arranged by the International Association of Colonial Agriculture, with the assistance of the Belgian Society for the Study of Tropical Agriculture. British contributions to the congress were provided for by a British committee, including agricultural and forestry officials throughout the Empire, and of which Prof. Wyndham Dunstan, F.R.S., was president, and Dr. T. A. Henry secretary.

The congress met from May 20 to May 23 in the Palais de Congrès of the Brussels Exhibition. The date of the

first meeting coincided with the funeral of the late King, so that the president, Colonel Thys, merely declared the congress open, and the meeting was adjourned as a mark of respect to the memory of His late Majesty.

The work of the congress was divided into three sections, (1) dealing with agriculture and forestry; (2) with animal industries; and (3) with labour, transport, and trade. Altogether nearly 200 reports and papers were presented to the congress, and of these more than one-third were submitted through the British committee. It is only possible to refer briefly to a few of the more important matters discussed.

In July, 1909, the International Association appointed "General-Reporters" to collect information on various subjects connected with tropical agriculture, and to present reports on them to the congress, and the reading and discussion of these reports occupied much of the time devoted to sectional meetings.

Prof. Dunstan submitted a general report on the practical results of cotton cultivation in various countries, with observations on the scientific and economic causes of its success or failure. He pointed out that the successful development of cotton cultivation in West Africa and other suitable territories in the future will depend on the establishment of a variety of cotton suited to the country and to the requirements of manufacturers, and that this can best be achieved by persistent scientific work carried on by Government. The position of cotton cultivation in the United States, Egypt, India, and other producing countries was then reviewed. Prof. Dunstan also presented special reports from countries in which cotton cultivation is carried on commercially or experimentally, each of these recounting the difficulties met with and the experimental work in progress in the area considered. These reports were contributed by authorities on cotton cultivation in each of the countries dealt with.

A similar inquiry on the rubber plants of tropical countries resulted in the presentation of a number of reports, each of which dealt with the rubber plants, native or introduced, of the country considered, the methods of obtaining rubber therefrom, and, in most cases, the improvements needed in native methods of preparation. Reports from the following countries were submitted:—Belgian Congo (MM. Kindt, Pynaert, and Ghislain), French West Africa (M. Yves Henry), British West Africa (Mr. H. Brown), British East Africa (Mr. A. C. Macdonald), German African colonies (Dr. Warburg), Java and Sumatra (Prof. Berkhout), Mexico (Señor Flores), Brazil (Señor Argolo), &c. Special papers were also contributed by Dr. Heim (Rational study of rubber plants) and Prof. Carmody (New method of preparing Castilleo rubber).

Other inquiries undertaken were the place of botanic gardens in agricultural research in the tropics, and legislation against the spread of insect pests and fungoid diseases; but comparatively little progress was made with these, though special reports in connection with the first-named were submitted by M. Capus for Indo-China, and by Profs. A. Engler and G. Volkens, of Berlin.

Apart from these reports, many papers were submitted on more general subjects. Mr. A. E. Humphries read a useful paper on the wheat requirements of the United Kingdom, in which he outlined the characters which millers in this country seek in imported wheat. Mr. I. B. Pole-Evans described the results of investigations undertaken in the Transvaal with a view to the development of rust-resistant cereals, and Mr. Guthrie, of New South Wales, submitted two papers, one describing chemical investigations in connection with the production of improved wheats and the other giving an account of the work of the late W. J. Farrer, who initiated wheat-breeding work in New South Wales. Only two papers on tobacco were submitted, one by Mr. Odum, of Rhodesia, describing the cultivation of bright pipe tobacco, and the other by Drs. Henry and Auld on the burning quality of tobacco, in which they pointed out that defective burning quality is one of the first difficulties met with in growing tobacco in a new country, and showed, as the result of numerous analyses of tobacco ash, that good burning depends on the nature and quantity of mineral constituents in the leaf, and