

The three principal days of the series are July 23, 24, and 25, but where possible ascents will also be made on July 22, 26, and 27. All the observatories engaged in upper-air research will take part. In addition, the Prince of Monaco will make observations in a high northern latitude, and a German man-of-war will send up *ballons-sondes* between Iceland and Norway. Another German expedition, under Captain Hildebrandt, will go to the neighbourhood of the Hebrides, while a French man-of-war will be stationed near the Azores. Further south, M. Teisserenc de Bort and Mr. Rotch will send an expedition, in their yacht *Otaria*, to the region of the trade winds and doldrums. It is hoped, also, that the Italian Government will cooperate by sending a man-of-war to some point in the Mediterranean. With the addition of Blue Hill Observatory and other North American stations, there will thus be a net-work of observations over a large region of the northern hemisphere.

In this country Mr. W. H. Dines will send up *ballons-sondes* and pilot balloons at a station on the west coast of Scotland; *ballons-sondes* and pilot balloons will also be sent up at Manchester by Mr. Petavel, and at Ditcham Park, Petersfield. Conditions in this country at the end of July are not likely to be favourable for flying kites, but should there be sufficient wind kites will be flown at Glossop Moor, Pynton Hill, Ditcham Park, and Brighton.

The Royal Meteorological Society is also making arrangements to cooperate in the investigations, and an allowance (in aid of the expenses) has been made to them from the Government grant for scientific investigations.

It may be possible to obtain the assistance of other observers to send up pilot balloons; by the use of two theodolites and a measured base, the velocity and direction of the wind and the heights of clouds may be determined. By using rubber balloons and filling them to a certain size corresponding to a known rate of ascent, useful observations may be made by a single observer using an ordinary theodolite.

The International Commission has also arranged for a series of observations on September 4, 5, and 6, and on November 6, 7, and 8.

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Radium and Geology.

THE temperature of 55° C. to which I referred in a former letter is the temperature of the *rock*. I find that Prof. C. Schmidt, of Basel, on his chart of isogeotherms, gives this temperature as attaining 56° C. This is in the dry part of the tunnel, towards the north end.

The difficulty attending the inflow of warm water mainly arose from the *rate* at which heat was thereby brought into the tunnel, necessitating large supplies of cold water to keep down the temperature. Prof. Schardt's paper, to which I have already referred, contains very strong evidence as to the *role* of the circulating water. The evidence is far too lengthy to quote here.

Mr. Fisher refers to the Hon. R. J. Strutt's estimates of radium in rocks as capable of accounting for a gradient of 1° F. in 42.4 feet. In point of fact, Mr. Strutt *assumes* this gradient (quoting from Prestwich) as a basis upon which to calculate the thickness of the radium-bearing crust. The gradient in question is, therefore, not derived from Mr. Strutt's observations (nor could it be), but is a gradient taken as a basis of calculation.

That special conditions affect the temperature gradients in mountain ranges appears from the results of observations on the Mont Cenis and the St. Gothard tunnels. Everett's estimate for the former, with correction for convexity of surface, is 1° F. in 79 feet. In the case of the latter there were remarkable variations observed, of which radium will very probably furnish the explanation. The central gradient is 1° F. in 85 feet. At the north end there is a gradient of 1° F. in 38 feet. This brings the general average for the whole tunnel up to 1° F. in 57.8 feet. Dr. Stapff, who conducted the temperature observations in the St. Gothard, subsequently predicted for the Simplon a maximum rock temperature of 47° C., as I have already pointed out.

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NO. 1961, VOL. 76]

AËRIAL LOCOMOTION.

IN December of last year Dr. Alexander Graham Bell delivered an address, under the above title, before the Washington Academy of Sciences. This address recently appeared in the March number of the Proceedings of that academy (vol. viii., pp. 407-448), and the interesting nature of the contents is well worth the attention of the readers of this Journal who have not had the opportunity of perusing it.

In the opening paragraphs Dr. Bell refers to the earlier attempts made to travel in the air, and points out how the problem in the last decade or so has gradually been approached from a different point of view. The principle of the gas bag has taken second place, and the heavier-than-air type of machine is now in the forefront.

The researches of Lilienthal are next referred to, followed by those of Chanute, Herring, the Brothers Wright, and Hargrave. The magnificent work accomplished by Langley is here given its proper position. "To Prof. Langley," as Dr. Bell remarks, "is due the chief credit of placing this subject upon a proper basis, and of practically originating what he termed the art of 'Aerodromics.'"

Dr. Bell witnessed the experiments made by



FIG. 1.—Langley's Aërodrome No. 5 in Flight, May 6, 1896.

Langley on May 6, 1896, when a large model of an aerodrome, with a spread of wing of about 14 feet, was driven through the air by a steam engine under the action of its own propellers. With regard to the actual flight he saw, he wrote:—"No one who witnessed the extraordinary spectacle of a steam engine flying with wings in the air, like a great soaring bird, could doubt for one moment the practicability of mechanical flight." Dr. Bell was fortunate enough to secure a photograph of the apparatus while in the air, and this record, which is reproduced in his article, is here given (Fig. 1). In time it will undoubtedly be of exceptional historical interest.

The circumstances connected with the later experiments of Langley are next described, and Dr. Bell's knowledge and great faith in Langley's work allow him to state his unbiased opinion that the full-sized aerodrome, which the newspapers described as a failure, "would have flown had it been safely launched into the air."

It is with regret, however, that we find no mention made of either Hiram Maxim or Pilcher, for the

¹ See also *The National Geographic Magazine*, vol. xviii., No. 1, January.