

the staff of the Geological Survey of Great Britain. His chief was Sir Henry de la Beche; his first instructor in the field was J. Beete Jukes; and during the next fifty years he became acquainted with all the prominent geologists in our islands. His principal official work was in connection with the Irish branch of the Survey, of which he became director in 1869. Some of the controversies of the next twenty years may have been "strenuous"; but Dr. Hull gives only a bare hint of this. In a kindly spirit he dwells on the many friends he made, a large number of whom are fortunately still amongst us. There is an engaging *naïveté* about some of his anecdotes, as when he confesses (p. 27) that he was shocked to find that one of these friends was a Liberal; or when he mentions that he lectured on a biblical subject with an archbishop in the chair. But his reminiscences of scientific societies in Dublin will come home to all those who remember the old friendly gatherings, which have already grown a shade more formal, partly through the spread of suburban homes, and partly through the development of more "strenuous" and specialised activities.

Dr. Hull's geological expedition to Arabia Petræa and Palestine has been described elsewhere, and is here only lightly touched on. An abstract is given of his work on the submerged valleys of the European plateau (p. 105); but we miss a mention of the fact that, under his direction, the geological survey of Ireland was completed on the one-inch scale before his retirement in 1890, every sheet being accompanied, as Jukes had planned, by a descriptive memoir. These geological memoirs may vary a good deal in their degree of completeness, but their publication was very systematically carried on. We probably owe to Dr. Hull the delicate and artistic colouring of the northern sheets of the Irish Survey, which made them absolutely without rivals, until stronger tints were used in recent years. In spite of the evidence of the present reminiscences, it is hard to realise that Dr. Hull's official career ended, after full years of service, close on twenty years ago. A good portrait and a bibliography accompany the volume.

Catalogue of Bronzes, &c., in Field Museum of Natural History. Reproduced from Originals in the National Museum of Naples. By Prof. F. B. Tarbell. (Chicago: Field Museum of Natural History, 1909.)

This publication constitutes a fascicle of the seventh volume of the anthropological series of the Field Museum of Natural History, Chicago. The objects described in this "Catalogue" are reproductions in bronze of originals in the National Museum of Naples from the Campanian cities buried by the eruption of Vesuvius in 79 A.D. With a few exceptions "these objects constitute a fairly representative selection from among the bronze utensils, instruments, and articles of furniture in the great Neapolitan collection; and, while not exact in every particular, they do, nevertheless, give a fairly correct idea of the originals." As no complete and scientific account of the Naples bronzes "has ever been issued, it has seemed worth while to prepare a somewhat detailed catalogue, with illustrations, of these reproductions." The catalogue enumerates and describes with considerable detail some 300 different objects, of which seventeen are designated "pre-Roman" and illustrates almost the entire series in 117 excellent plates. To archæological students and such other Americans as may have no opportunity of visiting Naples, these reproductions will be almost as valuable as the originals, and from them the museum will receive grateful acknowledgment, both for having had the

reproductions made and for this excellent account of them, of which European students will not fail to appreciate the value when in face of the original collection in Naples.

The Building and Care of the Body. An Elementary Text-book in Practical Physiology and Hygiene. By Columbus N. Millard. Pp. x+235. (New York: The Macmillan Company, 1910.) Price 2s. 6d.

As Mr. Millard says in his preface, teaching pupils how to develop strong, healthy bodies should be one of the chief aims of our schools. One of the objects of his book is to convince children that certain practices are likely to make them happier and more comfortable, abler in play and work, and so lead them to regard the study of the laws of health as worth while. The author has already made a favourable impression among teachers in this country by his earlier book, "The Wonderful House that Jack Has," and the present volume is likely to prove useful, since it provides brightly written and well-illustrated lessons on the simple facts of human physiology and hygiene.

The English Lakes. Described by A. G. Bradley. *Canterbury.* Described by Canon Danks. *Oxford.* Described by F. D. How. All pictured by E. W. Haslehurst. Each pp. 56. (London: Blackie and Son, Ltd., 1910.) Price 2s. net each.

THE first three volumes of a series designed to bring before readers the beauties of England are certainly very attractive books. The text is interesting, touching lightly history, geography, archæology, and any other subject able to contribute facts or fancies likely to arrest the attention. We imagine the volumes are not intended to serve any serious purpose; but though unsuitable for guide-books, they will certainly become favourites with lovers of the districts they severally describe.

LETTERS TO THE EDITOR.

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The Temperature Conditions within Clouds.

AT the meeting of the British Association for the Advancement of Science held in Winnipeg last August, a paper was read before the Physics Section by Prof. A. Lawrence Rotch, director of the Blue Hill Observatory, in which a rise of temperature was described as having been recorded by a *ballon-sonde* meteorograph in passing through a cloud. In the discussion which followed considerable doubt was expressed as to the possibility of such a condition existing. That there was an increase in temperature recorded by the meteorograph as it passed upward through the cloud there can be no doubt (see diagram in *Meteorologische Zeitschrift*, December, 1909, p. 554). Dr. John Aitken, in *NATURE* of November 18, 1909, says that he sees no reason to question the truth of the record, for he has on numerous occasions observed similar increases of temperature while enveloped in a cloud upon the summit of a mountain. He directs attention to the fact that great caution must be exercised in obtaining temperatures under these conditions, for, on account of the excessive radiation that occurs within the cloud, unless the instrument is sufficiently insulated from the heat rays, the thermogram will be vitiated. In the case of the ascent referred to, the increase of temperature was not unreal, for due precaution, in the form of an especially prepared insulator, had been taken to eliminate the effects of radiation, and the ventilation was sufficient.

In order to determine the temperature conditions within and about clouds for a large number of cases, an examination was made of the records obtained in the kite-flights

made at Blue Hill Observatory. These data are particularly valuable for such a study, since in each flight continuous records of temperature, pressure, humidity, wind-velocity and direction were obtained for all heights reached by the uppermost kite, below which the meteorograph is attached to the wire. In the kite meteorograph used, the thermometer and the hair-hygrometer are screened as much as is possible, thus rendering the heat received from radiation a negligible amount.

A total of sixty-four kite flights were found in which the meteorograph penetrated a cloud, and, since in six of these flights two cloud-sheets were encountered, the temperature conditions in seventy cloud-strata were obtained as a basis for the investigation. Of these, 63 per cent. showed a rise in temperature of 3.0° F. or more in the upper part of the cloud or immediately above it, 23 per cent. showed no apparent effect of the cloud on the temperature conditions, 7 per cent. showed an inversion below the base of the cloud, while the remaining 7 per cent. showed an isothermal condition prevailing from the base to the summit of the cloud. The flights in which the records

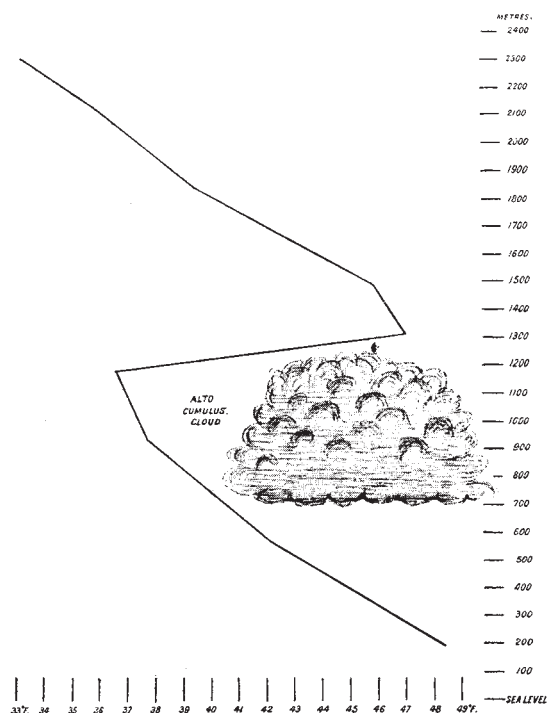


FIG. 1.—Curve of November 3, 1904, showing increase of temperature occurring within and above cloud.

were obtained were distributed with fair uniformity throughout the year, and the clouds encountered represent all kinds except cirrus and cirro-stratus, these having rarely been penetrated. Moreover, although by far the greater number of flights were made in the daytime, many flights at night are included.

In the largest of the four groups, namely, the one including the flights which showed a rise in temperature in the upper part of the cloud or immediately above it, the increase usually began about half-way between the base and the summit, and persisted until the maximum temperature for the inversion was reached a short distance above the uppermost part of the cloud. Beyond that point the usual rate of decrease, approximately the adiabatic rate for dry air, prevailed as high as the kite ascended. In the next largest group, that including flights in which the cloud had no apparent effect on the temperature conditions recorded, a fairly regular rate of decrease, somewhat similar to the adiabatic rate for saturated air, was found. In the next group, that including cases in each of which there was an inversion below the cloud, the increase in temperature persisted throughout the cloud and to various

heights above it, where a decrease again began. In every one of these cases there were the characteristic cyclonic conditions of a shallow easterly wind at the ground overlaid by a warm south-west wind, with precipitation following. It is thus evident that the increase in temperature was caused by the importation of relatively warm air, and hence began at a height independent of the cloud, the latter only reinforcing the larger warming. In the smallest group, that including the five cases in which there was a practically isothermal condition throughout the cloud, the distinguishing characteristic was really that of the largest group, for, since the usual condition in the lower free air is that of a fairly uniform decrease of temperature approaching the adiabatic rate for dry air, an isothermal state is theoretically equivalent to an increase of temperature with increasing height, such as characterise the cases of the first group. If this be granted, 70 per cent. of the instances show an increase of temperature in the upper part of the cloud and beyond for a short distance.

This phenomenon of an increase of temperature is entirely independent of the difference in the adiabatic rates of dry and of saturated air, that for the latter being about one-half that of the former. The marked decrease in

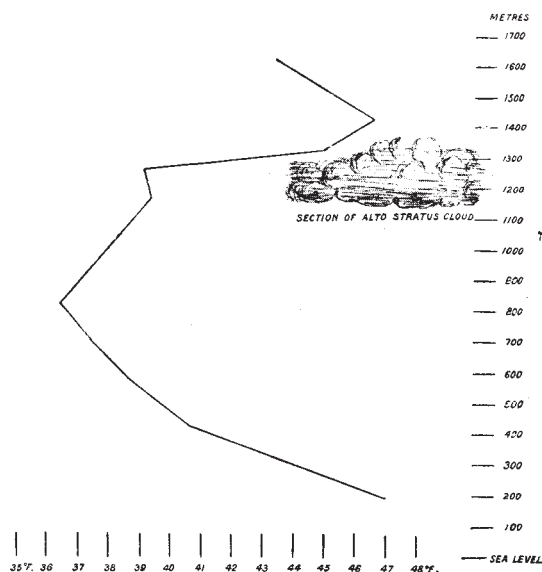


FIG. 2.—Curve of April 4, 1905, showing increase of temperature beginning below cloud.

relative humidity almost always occurring just above a cloud is probably simply the result of the increased temperature. Dr. Shaw, the director of the English Meteorological Office, in discussing the thermal relations of floating clouds, says:—"A floating cloud, a finite mass of air carrying water particles, is losing by radiation into space (at night) through the clear air above it more heat than it receives from the earth beneath; the water globules will, in consequence of this loss of heat, evaporate, and the cloud will vanish" (Quarterly Journal of the Royal Meteorological Society, vol. xxviii., 122, p. 95). It is also worthy of note that in a balloon voyage made in Germany recently, not only was there noted a "warming above the cloud, or at least above the lowest plane of formation," but an increased temperature was recorded in a stratum of ordinary haze (Elias and Field, Quarterly Journal of the Royal Meteorological Society, vol. xxxi., 134, p. 125).

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Eddy Formation—A Correction.

IN Prof. Bryan's solution of the problems in eddy formation (NATURE, February 3, p. 408) no mention is made of the fact that a vortex in one plane at rest, when the method of conformal representation is used, does not in general lead to a solution in which the corresponding vortex is at rest.