

UPPER AIR TEMPERATURES.¹

THIS interesting publication of fifty-eight pages gives an account of some fifty to sixty ascents made at Batavia, Java, and over the neighbouring seas. Batavia lies in the latitude of 5° S., and observations from a place so near the equator are of especial value; these observations also were designed for the purpose of giving information on several interesting points.

The first half of the book gives the detailed account of each ascent, that is to say, the temperature and relative humidity at each 100 metres both on the ascent and descent, and the second half discusses the results obtained. The first point discussed is the thickness of the land wind at night and the temperature inversion. The highest temperature was found at 170 metres, and the depth of the land breeze was 130 metres. The high pressure which prevails over Australia in winter, the winter, that is, of the southern hemisphere, sometimes stretches as far northwards as Batavia, and interesting figures relating to one of these periods are given. Very similar conditions seem to prevail there as in Europe in anticyclonic areas; on rising from the surface, a decrease of temperature with an increasing humidity is met with, but at a height between 2.0 and 3.0 km. excessive dryness with a temperature inversion, or at least a great slackening in the temperature gradient, occurs.

These observations do not depend on kite or balloon observations alone, since the summits of some of the mountains are high enough to give similar records.

In England, the dreary type of anticyclonic cloud that so often covers the sky for days together in winter nearly always, perhaps always, lies just under a sharp inversion of temperature and a layer of excessively dry air, but the height of this inversion seldom reaches 2 km. In Batavia, the cloud layer is replaced by a sheet of moist air in which small cumuli prevail (in the daytime). In both cases the damp and the dry strata are sharply divided, and Dr. Braak discusses the reasons of this arrangement. There cannot be much doubt that the extreme dryness is due to the air having descended from a colder, and therefore dryer, level, dryer, that is, in the sense of having a smaller amount of water vapour; but dry air, as Tyndall pointed out long since, cannot radiate or absorb radiation with any freedom. Probably radiation from the vapour of the damp strata, which can occur freely through the dry air above, has a good deal to do with the formation of the cloud, especially the sea, but they are not numerous enough to show the magnitude with any certainty.

The daily temperature change by day over the sea and the nightly change over the land are also discussed. Dr. Braak finds over the land in the early afternoon a gradient from 0 to 300 m. of 1.34° per 100 m. Over the sea he finds practically no daily change at the sea surface, the amplitude being about one-third of a degree, but the value increases somewhat up to 600 m. The observations suffice to show that there is little daily change of temperature over the sea, but are not numerous enough to show the magnitude with any certainty.

Some interesting remarks are made on the fall of temperature at night, and on an irregularity in the change. The double daily oscillation of the barometer in low latitudes is quite sufficient to produce measurable changes of temperature. It is so commonly stated that the adiabatic change of

¹ "Koninklijk Magnetisch en Meteorologisch Observatorium te Batavia." *Verhandelingen No. 3. Drachen Freiballon- und Fesselballon-herbachtungen.* Von Dr. C. Braak. Pp. 58. (Batavia: Javasche Boekhandel en Drukkerij.)

temperature in air is produced by change of height that one is apt to overlook the fact that change of height by itself is absolutely without effect upon temperature, and that the rise or fall is due to pressure changes only, change of pressure being usually, but by no means always, due to change of height.

W. H. DINES.

A MANX TRIBUTE TO EDWARD FORBES.

THE London Manx Society has issued a report of the meetings held in London on February 13 to celebrate the centenary of the birth of Edward Forbes. The report ("Edward Forbes, Great Manx Naturalist, Botanist, Geologist, Zoologist," 45 pp., 1s.) contains an address by Sir Archibald Geikie, Forbes's biographer, on his life and geological work, appreciations of his zoological work by Prof. Ewart, Prof. McIntosh, and Prof. Herdman, and of his botanical work by Prof. Bottomley; also contributions by Prof. Boyd Dawkins, Mr. Whitaker, and Dr. J. W. Evans, a letter by Mr. Ulrich on behalf of the Palæontological Society of the United States, and the words of Forbes's "Dredging Song." Forbes was born in 1815 in the Isle of Man, and was educated in Edinburgh; in 1841 he was appointed naturalist to H.M.S. *Beacon* during her survey of the Ægean Sea and coasts of Asia Minor. The following year he became Professor of Botany at King's College, which he held, for part of the time, together with the appointments of Palæontologist to the Geological Survey and Lecturer on "Natural History as applied to Geology" at the Royal School of Mines, until his election to the chair of Natural History in Edinburgh in 1854. His death a few months later was, according to Sir Archibald Geikie, "one of the most grievous losses which British science has sustained in our time." His work was remarkable for its wide range, brilliant originality, and philosophic insight. Huxley wrote of him in 1851 that "he has more claims to the title of a philosophic naturalist than any man I know in England." Some of his conclusions on the relations of the British flora to fauna were rejected by his contemporaries and immediate successors, but, according to Prof. McIntosh and Dr. Scharff, they have been established in the main. Mr. E. V. Ulrich, of Washington, reports that Forbes's teaching has "exerted a profound influence on palæontologists the world over," that the principles he enunciated now "assume a commanding importance," and that probably no British author on his subjects has been more followed and quoted in America than Forbes. Forbes was a man of great literary distinction; he was a first-class humorist, and a frequent contributor to *Punch*; and Sir Joseph Hooker has recorded that owing to his talents and his personality "he was beloved and admired beyond any natural historian of his day."

EDUCATION AND INDUSTRY.¹

I.

THE British Association, by establishing Section L, has recognised education as a branch of science and made provision for its advancement.

But education—I am speaking of that part of it in which human educators intervene—is still regarded as belonging to politics and literature, rather than to economics and physiology. To many people the very title of this paper, "Education and Industry," will appear incongruous. Is there not a great gulf fixed, say they, between hazy views of education high in the clouds above, and the hard facts of science or technology far in the depths beneath?

¹ Abridged from a paper read to the Educational Science Section (L) of the British Association on September 11, by Principal J. C. Maxwell Garnett.