typical fossil of the intertrappean beds of the Deccan, named in honour of the well-known secretary of the Asiatic Society of Bengal, James Prinsep. Numerous photographic views, diagrams, and maps add to the interest of the work, most of which are taken with due acknowledgment from the publications of the Geological Survey of India. Of the author's own views, two have been selected for reproduction, one showing a typical landscape in the crystalline area of the peninsula, and the other that unique feature in one of the great peninsular rivers—the falls on the Narbada, near Jabalpur. T. H. D. L.

METEOROLOGY IN THREE DIMENSIONS.[1]

IN 1916 Mr. W. H. Dines put together in a concise report the information then available about the pressure, temperature, and density of the atmosphere up to heights of 15–20 kilometres. His report is now published, and should prove extremely useful and informing both to the new generation of meteorologists and to the wider circle whose interest in the atmosphere is non-professional.

The first nine sections deal with the methods and places of observation, the averages and seasonal variations of pressure, temperature, and density, and the stratosphere and troposphere; short accounts of humidity and atmospheric motion are also included.

The tenth and eleventh sections are concerned with the results of the statistical treatment of the original data; the interpretation of these results will provoke much discussion. First, the correlation coefficient between (1) the mean temperature of a vertical column extending from a height of 1 km. to a height of 9 km. and (2) the pressure at the *top* of the column is 0·95. The hydrostatic equation connecting variations of pressure at 1 km. and 9 km. with variations of the mean temperature of the column of air is

$$\frac{\delta p_9}{p_9} = \frac{\delta p_1}{p_1} + \frac{k\delta T}{T^2}.$$

From this it follows that if $\frac{\delta p_1}{p_1}$ is (1) zero or (2) proportional to $\frac{\delta p_9}{p_9}$, then the correlation coefficient between p_9 and T is unity.

The first condition is not fulfilled in temperate latitudes; the second condition would be satisfied if the isobars at 9 km. were parallel to those at 1 km.—*i.e.* if the wind-directions at these levels were identical. But in the troposphere convection is always tending to make the direction of the wind the same at all levels, so that the magnitude of the correlation coefficient found by Mr. Dines may be due to the effectiveness of convection in regulating the wind. It would be interesting to know the differences from parallelism permitted by the 0·05 by which the actual coefficient falls short of unity.

Secondly, if T_0, P_0; T_1, P_1, etc., are the temperatures and pressures at heights of 0, 1, 2, . . 13 kilometres, then the correlation coefficients between corresponding T's and P's, beginning with T_0, P_0, are as follows: ·11, ·42, ·66, ·77, ·84, ·85, ·86, ·86, ·86, ·71, ·32, −·19, −·36, −·28. It follows that pressure and temperature go up and down together with great regularity at all heights between 3 km. and 9 km. Presumably the same would hold for the surface were it not for the effects of radiation and of the surface water of the ocean upon the surface temperature of the air.

Two outstanding deficiencies in the information available call for comment. There are no records from the United States, India, Australia, South Africa, South America, and Japan. This is no doubt partly due to the difficulties of recovering records in these countries if the ordinary European method of investigation is used; but it is also due to the defects of pre-war international meteorological organisation in which no place was found for an active permanent bureau. Further, the information about atmospheric motion is hopelessly inadequate. This arises less from lack of original records than from the absence of any proper arrangements for summarising the results of pilot-balloon ascents. A young meteorologist seeking a field of independent research might do worse than turn to the statistical treatment of vectors.

Before the war the investigation of the free atmosphere was, broadly speaking, pure research; the work had no direct application in forecasting or climatology, and the means of investigation were slight and relatively expensive. During the war a knowledge of the actual conditions of the atmosphere at least up to 20,000 ft. (6 km.) became essential for heavy artillery and for aviation, and their importance for actual daily forecasting began to be dimly recognised. Now that artillery operations are over and aviation is practically restricted to low levels, there is a great risk of the investigation at higher levels by aeroplanes and kite-balloons being neglected; and instead of information being available an hour or two after it was obtained, records would again creep in months or years out of date, with no possibility of immediate practical usefulness. E. GOLD.

[1] Meteorological Office. Geophysical Memoirs, No. 13. "The Characteristics of the Free Atmosphere." (London: Meteorological Office, 1919.) Price 2s. net.

SIR THOMAS R. FRASER, F.R.S.

WHEN, in 1877, and then in his thirty-sixth year, Thomas Richard Fraser was called to succeed Sir Robert Christison as professor of materia medica in Edinburgh University, it could scarcely have been anticipated how closely he was to rival his great master in his length of tenure of the chair and in the distinction with which he was to fill it. In his varied spheres of action Fraser attained a commanding position as a physician, as an investigator, and as a professor.

Gifted with acute senses and a fearlessly logical mind, and trained in the habits of accurate observation and experiment in the laboratory, Fraser