

hence the number of molecules with an orbit (n, n') at any instant rapidly decreases with the increase of n and n' . If we assume that the hydrogen gas contains only the first and second kinds of molecules, viz., 35 and 65 per cent. respectively, then the calculated value exactly coincides with that observed.

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Gravity Observations in India.

THE importance of the bearing of a change in the force of gravity, if such could be established, on all problems connected with the physics of the earth, especially those of the origin of mountains, continents, and oceans, is sufficient justification for directing attention to certain peculiarities in the determinations which have been made at Dehra Dun.

When observations of gravity in India were resumed in 1904, with a group of four identical half-seconds pendulums of v. Sterneck's pattern, the value of gravity at Dehra Dun was determined, by comparison with Potsdam, as 979.063 dynes. The earlier observations of Basevi had given a value equivalent to 978.962 dynes, so there was an apparent increase of 0.101 dyne in the interval between the two sets of observations.

A fuller examination of the evidence has shown that no such conclusion can be drawn from the comparison of these two sets of observations. Basevi's final value at Dehra Dun was derived from an elaborate series of observations, made in a room specially adapted for experimenting on the effect of changes of temperature, and in this the legs of the stand were supported on brick pillars. At the time it was unknown and unsuspected that this would seriously vitiate the results, and we have also on record the value obtained from a preliminary observation, conducted under conditions similar to those in his other stations, where the stand rested directly on a concrete floor at ground-level; this preliminary observation gave a value discordant from the final ones, but differing from the 1904 value by about the same amount as is found in other of his stations which have been re-observed. The position was, therefore, that there was no proof of any change of the force of gravity at Dehra Dun, but equally there was no disproof of such change having taken place; all that could be said was that, if any change had taken place, it must have been of a much smaller order of magnitude than one-tenth of a dyne.

In the course of the new series of observations further evidence came to light. The pendulums, swung regularly every year at the commencement and close of each field season, showed a gradual decrease in the period of vibration till, in November 1909, the mean period had decreased by 0.0000043 seconds, making the apparent value of gravity 979.079 dynes. Since then the time of vibration showed a gradual increase till in April 1913 it had reached a value only 0.0000012 seconds less than in 1904. It has been suggested¹ that the increase after 1909 was due to a gradual wearing of the agate edges; the suggestion is a possible one, but it leaves unexplained the diminution between 1904 and 1909, which was evidently due to some cause which affected all four of the pendulums in about equal degree. There was no change in the routine of observation² which could account for it, and the alternatives

seem to be a gradual molecular change in the material of the pendulums, leading to change in length, or a real change in the value of the force of gravity at Dehra Dun. As all four pendulums were made at the same time, of the same material, and, so far as possible, of the same form and dimensions, the former is not impossible, but the latter would equally affect all four simultaneously and alike. The situation therefore remained as in 1904, that, so far as the Indian observations are concerned, there was neither proof nor disproof of any change in the force of gravity having taken place.

In addition to the observations of the Survey of India there have been some other determinations of gravity in India. In 1905 Hecker, at Jalpaiguri, obtained a value which was 0.002 dyne in excess, and in 1906 Alessio, at Colaba, a value of 0.004 dyne in defect, of the Survey of India values, being in substantial agreement with the value determined at Dehra Dun in January-February 1904. In 1913 another determination was made at Dehra Dun, by Prof. Alessio, with an apparatus consisting of eight pendulums prepared for the Filippi expedition to Central Asia, and the value obtained, which has only recently been announced,³ was 979.079 dynes, or 0.016 dyne in excess of the standard accepted value used by the Survey of India, as determined in 1904. The position therefore now is that, while independent direct comparisons made in the two years following the commencement of the new series of observations in India showed substantial agreement, a similar determination made nine years later showed a material difference, and this opens out the possibility that part, at least, of the changes noticed at Dehra Dun may have been due to a real change in the force of gravity at that place.

The difficulty of accepting such interpretation is less at Dehra Dun than at many other stations, for that place lies on the fringe of the Himalayas, the elevation of which has been one of the latest incidents in the geological history of the earth, and it also lies in a region where the surface deformation, established after the earthquake of April 4, 1905, shows that changes are still taking place.

It is to be hoped that when gravity observations are resumed in India the matter will be looked into; in part the doubt left by these observations might be cleared up by the re-observation of some of the Peninsular stations, where gravity was determined at the outset of the series and about 1909. For example, Colaba (1904), Mysore (1908), and Jubulpore (1910) seem convenient and suitable; a fresh determination at these stations would show whether there had been a change in the force of gravity as compared with the reference station of Dehra Dun.

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The Miraculous Draught of Fishes.

TO the several names of the Sea of Galilee, Prof. Gudger, in his very interesting letter (*NATURE*, October 28, p. 572) has thrice added "Lake of Tiberias," evidently by mistake for "Lake of Tiberias." Also he omits any reference to the important paper by Prof. Théod. Barrois, "Contr. à l'étude de quelques lacs de Syrie" (in *Rev. Biol. du Nord de la France*, tome vi., 1894), which usefully summarises what is known of the fauna of the lake in modern times from Belon in 1553 to his own date in 1894. The lake, it appears, contains twenty-two species of fish, some small fishes and some large ones in vast abundance. As of old, it is subject to sudden squalls, dangerous to navigation. Some of its inflowing waters for their

¹ H. J. Couchman, Prof. Pap., Survey of India, No. 15, p. 2.

² Records, Survey of India, vol. 2, 1913, p. 33.

³ *Rivista Marittima*, March 1922, Supplement, p. 73.