annexed, for the purpose of measuring pressure; and is so adjusted, that the number of pounds pressing on its piston indicates directly the number of atmospheres used for compression. The author next describes the piezometer which he employed in measuring the compression valve, consisting of a tube of water inserted in quicksilver, the contracted part of which tube contained a small steel disk, having a hair spring attached to it to keep it in its position when pressed up. The piezometer, properly arranged, was then placed in the receiver of the compressor, filled with water at 50°, the pump screwed into its place; and as soon as the intended pressure had been effected, the piezometer was examined, and the indicating spring was always found more or less raised in the tube, according to the power employed. Mr. Perkins states that water, under a pressure of 2000 atmospheres, compressed in a tube eight inches long, was diminished one twelfth of its length; and has annexed to his paper a table, showing in inches and parts the compression of a column of 190 inches of water, corresponding to every 10 atmospheres to 1000 inclusive.

The author found that acetic acid crystallized under a pressure of 1100 atmospheres; that under a pressure of 500 atmospheres water took up its volume (?) of air, none of which was again given out on removing the pressure; that air, under a pressure of 1200 atmospheres, became a limpid liquid (permanent?); and that carburetted hydrogen was entirely liquefied under the same pressure.

On the Figure of the Earth. *By* George Biddell Airy, *M.A. Fellow of Trinity College, Cambridge.* *Communicated by* J. F. W. Herschel, *Esq. Sec. R.S.* Read June 15, 1826. [*Phil. Trans.* 1826, Part III. *p.* 548.]

Account of Experiments made with an Invariable Pendulum at the Royal Observatory at Greenwich, and at Port Bowen, on the eastern side of Prince Regent's Inlet. *By Lieutenant* Henry Foster, *R.N. F.R.S.* Read April 6, 1826. [*Phil. Trans.* 1826, Part IV. *p.* 1.]

The author, in the prefatory introduction to this paper, states first of all his own previous experiments made by Captain Hall and himself, on the South American station; he then describes minutely the nature of the experiments contained in this communication; the instruments employed; the precautions used; and the method pursued in calculating their results. The experiments comprise three distinct series. The first made at the Royal Observatory at Greenwich, before his departure with Captain Parry for the North Western Expedition, in which it will suffice to remark, that all the adjustments and precautions recommended by Captain Kater in his paper of 1819 were strictly adhered to. In addition to which, observations were made, not only of the disappearances of one pendulum behind the other, but also of its reappearances, as recommended by Captain Sabine; methods which, he observes, as far as the deduction of the acceleration of the pendulum when compared at different stations

is concerned, give results perfectly identical, as he shows by actual comparison of his own final numbers.

The second series of experiments were made at Port Bowen, where the ships of the North Western Expedition wintered from 1824 to 1825. The observatory was erected near the harbour, 100 feet above the sea, on secondary limestone, on a hard frozen soil, and the locality is very minutely described. The apartment in which the observations were conducted was thickly lined with fearnaught cloth. At first it was attempted to warm it by a stove; but the fluctuations of temperature so produced proved too great, and the stove was therefore removed outside, and the observatory warmed by the smoke-pipe; while the whole apparatus was fenced from draughts of air and sudden change of temperature by a large envelope of fearnaught lined with racoon skins. These precautions proved so effectual, that the total change of temperature during the observation was seldom more than 3°, and frequently not 1°, from 50°; while by a Six's self-registering thermometer, the mean range of temperature, in 24 hours, to which the pendulum was exposed, was only 8°, and the extreme 12°; while that of the atmosphere varied from 23° to 47° irregularly.

During the whole of these observations, every precaution was used to secure and examine the stability of the whole apparatus, and that with perfect success. The time was determined by transits of the sun, Arcturus, and α Lyræ. The clock was one belonging to the Royal Society, fitted with a gridiron pendulum, suspended on knife edges. The transit instrument was of 30 inches focus and 2 inches aperture, cemented by plaster of Paris to a large stone placed on a cask full of sand.

A second distinct series of observations, under very favourable circumstances of weather, was made in July, the results of which differ only one tenth of a vibration in 24 hours from those in June; and a mean of both, according to the number of factors in each series, gives the number of vibrations for Port Bowen.

The third experiment was made at Greenwich, on the return of the Expedition in November, 1825. The number of vibrations in 24 hours derived from it, differed 0·24 of a vibration from that concluded from the first experiment, and this difference was maintained on repetition. The author attributes this to wear of the knife edges, a fine line of metal being visible on the agate planes supporting them. Supposing this wear uniform, the author takes the mean of the two determinations to compare with that at Port Bowen.

He concludes his introduction by a justly merited acknowledgement of the efficient cooperation afforded by the commander of the Expedition throughout the whole of these researches.

The remainder of this communication consists of an ample and very minute and regular detail of the series of observations. They commence with the first experiments at Greenwich, which continued from the 20th to the 25th of April, 1824. The time here has been deduced by comparison of the pendulum clock with that of the transit room of the Observatory. A table is given of these comparisons, regu-

larly made before and after each observation of coincidences, and is followed by a table of the deduced rates of the former clock.

Tables are next given of the observed coincidences, noting the times of the disappearance and reappearance, and their mean for each of ten coincidences, the arcs of vibration, the mean arc, the intervals in seconds, and the corrections for the arcs of vibration; and summed up at the end of each observation, so as to give the mean intervals; the number of vibrations in 24 hours, as observed and as corrected for the arc; the state of the barometer and thermometers is also given at the beginning and end of each observation, which were continued twice a day to the 25th. The whole of the observations are then summed up in one table, and these are then reduced for the rate of the clock, and presented together in a table of results; after taking the mean of which, the proper corrections for buoyancy and elevation above the level of the sea are applied to the result.

The same system of registering is followed in the experiments at Port Bowen; only that here the observations of the transits by which the rate of the clock is determined are prefixed, and the hygrometric state of the atmosphere is also quoted in each observation of coincidences. The observations of coincidences set down in the first series extend from June 14th to June 23rd, and were repeated four times a day. The rates of the clock, as deduced separately from the sun and stars, are tabulated, and the results separately computed for each. In each coincidence, the number of transit observations on which the time depends, multiplied by the interval in days between them, is regarded as a factor, and the sum of these factors is taken to express the weight of the mean determination. The mean of these determinations, according to their weight, is then taken, and the corrections applied as usual for buoyancy, and for geological and local situation.

The second series at Port Bowen extends from July 6 to July 10; but the arrangement of the observations being in all respects similar to that just stated, need not be repeated.

The third experiment at Greenwich is stated in a manner precisely similar to the first, and continued four days, each of ten coincidences being observed twice a day.

The general results may be summed up as follows:—

At Greenwich, the number of vibrations *per diem*, all corrections made, = 86159·368; at Port Bowen, = 86230·172.

The latitude of Greenwich is well known. The observations for that of Port Bowen are not given here, but that element is assumed from observations stated in the Appendix to Captain Parry's third voyage.

Computing on it, the author obtains an ellipticity of $\frac{1}{305\cdot17}$, and an equatorial pendulum of 39·009805 inches. These are by the method of disappearances, the difference between these and the results obtained by reappearances is insensible.