

rapid, so that this star has nearly completed a whole revolution. This conclusion is fully confirmed by his observations of the present spring (1831), and also by the observations of Mr. Dawes, which have been communicated to him very recently, and which agree in a very remarkable manner with his own, and actually suffice to trace the bimestral motion of the star, as had been previously done in the case of ξ Ursæ. η Coronæ, too, offers, if all the observations can be trusted, a still more remarkable instance of quick rotation, being already considerably advanced in its *second* revolution since Sir Wm. Herschel's first discovery of it; but this will require further confirmation, owing to the extreme difficulty of the measures. The periods of these two stars may be stated respectively at 55 and 43 years; that of ξ Ursæ at $56\frac{1}{2}$, which last determination agrees nearly with that of M. Savary, who has assigned $58\frac{1}{2}$ years for this element. The period of 70 Ophiuchi has been determined by Professor Encke at 73·862 years.

Lastly, Mr. Herschel subjoins some practical remarks on the management and action of telescopes, and takes occasion to introduce a set of measures of the positions of Saturn's satellites, taken under remarkably favourable circumstances, and also a single observation of the place of the comet of 1830, the only one he could succeed in procuring.

In a subsequent letter received from Mr. Herschel, he alludes to a new method of taking the angles of position, viz., by reflected as well as by direct vision. He conceives that this method possesses two capital advantages: 1st, That the quantity directly measured is double the quantity sought, by which, of course, the error of determination is halved; and, 2dly, That the error of the zero is destroyed altogether, the double arc being given by the difference of readings in the limb of one and the same circle, maintained in one and the same position. Mr. Herschel also adds, that subsequent and very satisfactory measures of η Coronæ fully confirm the conclusion above mentioned with regard to the revolution of that star.

IV. On the dependence of a clock's rate on the height of the barometer, by the Rev. Dr. Robinson.

The rate of a clock of good workmanship may be assumed to depend on three things; first, the rate at a given temperature and barometric pressure: secondly, on the variation of temperature, as shewn by the thermometer; and thirdly, upon the atmospheric pressure, measured by the barometer. The variation of temperature not only affects the materials of the pendulum, but, along with the atmospheric pressure, greatly modifies the action of the air in the way of *buoyancy* and *inertia*, &c. Possibly, the irregular action of the wheelwork, the diminution of arc from the thickening of the oil on the pallets, and even the hygrometric state of the air, may sensibly alter the rate of a clock; but the present memoir is confined to the consideration of the first-mentioned sources of error.

As the changes are minute, Dr. Robinson formed equations of condition, where the quantities sought were the rate of the clock at

49° of the thermometer, and 29·5 inches of the barometer, and the retardations corresponding to a rise of 1° and 1 inch in each of these instruments respectively. The absolute gain or loss of the clock was determined with the utmost care.

“ A thermometer placed in the clock-case, with its bulb three inches before the pendulum rod, and on a level with the cover of the jar, and a barometer with its cistern at the same level, were noted morning and evening at half-past nine; a time chosen, not merely as likely to give mean results for the whole day, but also because it nearly bisects the average period of evening observations. The thermometer was read through a square of plate glass, cemented in the door of the case; and this being screwed close, (as described in the *Armagh Observations* for 1828,) all free communication with the air is precluded, and the changes of temperature within it are slower and more regular than would be possible in clocks of the ordinary construction. This made observations at other than the stated periods unnecessary. The barometer was observed whenever its movements seemed irregular, and the mean for the day corrected, if necessary, by interpolation.”

Dr. Robinson then shews that the equations, when treated by the method of least squares, give, for the gaining rate of the clock at the standard temperature and pressure, 0^s,263; for the gain by an increase of 1° in the temperature (his clock was over compensated), 0^s,069; and for the gain by a depression of 1 inch in the barometer, 0^s,241. As the mere effect of the air's buoyancy on the mercurial pendulum is 0^s,15 for a change of 1 inch in the barometer, the remainder is due to the inertia of the air carried along with the pendulum in its oscillations.

Dr. Robinson finds that the barometrical pressure has no sensible effect upon the *arc of vibration*, and, consequently, does not affect the clock through this cause.

With respect to the barometric variation of rate, having once determined its co-efficient, nothing is easier than to allow for it when any sudden change occurs: it may, however, be corrected mechanically with the utmost facility. A rise in the barometer tends to make a clock go slower. Suppose a syphon barometer to be attached to the pendulum, then a rise in the barometer will transfer a portion of the mercury in the syphon to the tube, and the effect will be the same as if a small weight were shifted from the syphon end to the tube end of the barometer. Now if the syphon be so adjusted to the pendulum, as to bore and situation, that this alteration of the mercury in the barometer will accelerate the rate as much as the increase of the air's buoyancy and inertia retard it, the clock will be unaffected by any variation of the atmospheric pressure.

Dr. Robinson shews how the syphon barometers (he places two, one on each side of the pendulum rod) may be constructed and adjusted for any particular case.

“ I had previously recognised the influence of the barometer on the clock before the mercurial pendulum was applied; and, without