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NATURE

OUR ASTRONOMICAL COLUMN.

The Celestat.—The name celstat has been given by M. G. Lippmann to a modified form of siderostat which he has designed in units of the fiducial interferometer No. 10 (Observatory, August). The special feature of the instrument is that it gets rid of the rotation of the field of view which disqualifies the siderostat for some purposes, such, for instance, as long-exposure photografts simply of a mirror with its plane parallel to the earth’s axis, and turning on a polar axis exactly in forty-eight hours in the same direction as the apparent diurnal motion of the heavens. It is easily demonstrated that the image of any star whatever will be seen stationary in a mirror so mounted, and a telescope pointed at the mirror in any direction will have a constant field of view. The telescope being directed to the celstat in a given position, to observe other objects having the same declination as that in view, it will only be necessary to turn the mirror; but for objects with different declinations the telescope must also be moved. If it be desired to use a horizontal telescope, it must be directed to the point on the horizon where the object rises, and the mirror must be static. The instrument is then used in the hour-angle, but there is no limit to the use of a horizontal telescope. It is pointed out that the simplicity of the instrument makes it possible to turn it into one of great precision; stability being readily attained, while the possibility of flexure can be reduced to a minimum.

Adams’ Masses of Jupiter’s Satellites.—A question having been recently raised by Mr. Mart in as to the work of Adams on Jupiter’s satellites, Prof. R. A. Sampson has stated the results of an inspection of the MSS. with reference to this subject (Observatory, August). It appears that when engaged upon a revision of Damoiseau’s tables in 1837, with a view to their continuation, Prof. Adams determined the following revised values for the masses of the satellites:

\[ m_i = \frac{0.000228123}{m_i = \frac{0.00021355}{m_i = \frac{0.000181243}{m_i = \frac{0.00021488}{}}\text{.}}\]

"There is no reason to suppose that Adams attached any weight to the above determinations of the masses, seeing that he never published the values directly; the MS. appears to be little more than a study such as was held in the habit of making upon any work that he was examining. In order to test by cross-verification the accuracy and consistency of the whole...Considerable expectations have been built upon the fact that Adams was engaged more or less closely for some years upon the theory of Jupiter’s satellites. It will be well to say at once that the chief fruit of his attention was published in the Nautical Almanac of 1850; this, like all the rest of his published work, was the result of exhaustive labour, quite out of relation to the unpreparedness in which the outcome was presented, and only discoverable by searching tests.

Atmospheric Refraction.—The ordinary application of Bessel’s expression for refraction requires that five quantities be taken from specially prepared tables, but Prof. E. C. Comstock, Director of the Washburn Observatory, has worked out a simple formula for computing the refraction without the aid of tables. A transformation of Bessel’s formula, and the introduction of numerical constants from the Pulkowa refraction tables, leads to the following simplified form:

\[ R = (2.9 \times 10^{-15}) BF \tan Z + \frac{455}{4} + t \]

\[ \log F = \frac{423 + 0.12Z}{\tan Z}.\]

The number in brackets is a logarithm; B is the barometric pressure in English inches reduced to freezing-point; t is the temperature in degrees Fahrenheit, and Z is the zenith distance for which the refraction is required. The formula for F gives the logarithm of the fifth decimal place.

The computation by the formula is not more laborious than the direct use of the tables, and a comparison of the two methods shows that the differences in the results are far less than the uncertainties in the tabular numbers themselves. Prof. Comstock’s paper forms a series of interesting “Studies in Spherical and Practical Astronomy,” in the Bulletin of the University of Wisconsin (vol. i. No. 3).

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system of dry land (such a system was rather an extensive archipelago than a continuous continent); this last was again divided into two systems: an Arctic and Occidental one, comprising North America, together with the northern parts of Asia and Europe, and an Indian one, communicating with South India. The former was the home of the Cervidice, the rhinoceroses and most other Perissodactyla, the latter that of the Cavirodes and elephants. Very few mammals of Indian origin migrated into America much more from the Arctic system than from India. The same seems to be the case for ants. Myrmica is perhaps the only North American genus of Indian origin (Tetramorium caespitum being doubtless introduced by man), whereas a number of American genera, sub-generic species-groups, as Myrmecocystus, Mesor, Myrmica, Camponotus, penburyanus, &c., are more or less far diffused in India and Africa, Myrmica reaching Borneo, and Mesor the Cape of Good Hope.

In Europe, the study of the Baltic and Sicilian amber proves that the Arctic fauna went down from the north, as a host of conquerors, invading the territory formerly occupied by other forms. It is evident that the North American fauna was much like the actual cosmopolitan and Arctic views of the recent fauna, and might have included a number of forms actually extinct. As in the Pliocene a bridge was put between North and South America, a diminution of neotropical forms took place, walking from south to north. But it is not improbable that other forms migrated in the opposite sense, and descended from North America into the neotropical region. I suppose that the case for the genus Pagonyrma, perhaps also for Dorynyrma, Forellia, and several species of Foraminifera, is not improbable that other genera from North America migrated southward, and later became extinct in their native home. The recent work of Mr. Scudder on Tertiary Curculionidae of North America seems to confirm this view, some of these fossil beetles belonging to genera now living only in South America. It is probable that a number of insects, actually regarded as typical members of the neotropical fauna, immigrated from North America, as it is proved by palaeontological evidence for several mammals, as, for instance, the llama and alpaca of the Pampas.

The North American origin of some South American ants was suggested by Prof. H. von Jhering, in a paper published last year. The author endeavours to sustain, by the study of the ants, his theory of the multiple origin of actual neotropical forms. I agree in many points with him, but I must recognise that the forms I find more in favour of his views. Actually, the ants of South America are distributed chiefly in relation to the climate and vegetation. No strong obstacles being put to the wide dissemination of the species, some of which range from Central America or from Mexico to Paraguay and Rio Grande do Sul. Chili is, however, an isolated country, which we may call "a continental island," although it is not surrounded by water. If we should take the Chilian fauna as a standard, the neotropical fauna of Brazil, to which von Jhering's Archipelago theory should have been a very poor one, the fauna of New Zealand, with which it offers a striking resemblance. The most characteristic feature of the Chilian ant fauna is the occurrence of peculiar species of Monomorium, like those inhabiting Australia and New Zealand, and of the genus Meliponis, found only in Australia and New Zealand. These facts corroborate the hypothesis of a Cretaceous or Eocene connection between South America and Australia.

New Zealand appears as a bit of old Australia, quite free from later Papuan or Indian intrusions, like Madagascar, which, as an isolated part of old Africa, has received a few immigrants, when, at the Miocene epoch, a stream of Indian life entered into the Ethiopian continent. New Zealand may be considered as a part of ancient Archiplata, secured from Guayanee and Brazilian immigrants by the heights of the Cordilleras, but having preserved only an incomplete set of the original Archiplatan fauna.

I should add that the purpose of making the main conclusions of a special work known to a wide public. Exact knowledge of the exotic faunas, and especially of the fossils, may enable us in future to carry further these incomplete and in part hypothetical results. Similar studies made on single species of animals and plants by specialists, who do not only accumulate

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2 Other than H. von Jhering's theories, which I cannot accept, refer chiefly to the origin and antiquity of island faunas. In these points I think that Wallace's views are right.