The best orbit is by Kuhnert, but it is probable that the want of observations in 1877-78 is not wholly attributable to errors of elements, but in a certain degree to the position of the planet at a considerable distance from the ecliptical belt of the sky for which charts of small stars are as yet published, and, in addition, to its faintness. *Medusa*, which appears to have a very small inclination, may possibly be recovered in the ensuing summer.

GEOGRAPHICAL NOTES

TASMANIA.—The prospects of Tasmania are reported to be improving, owing to the development of its mineral resources. Very large quantities of tin, as is well known, have been discovered at Mount Bischoff, and quite recently the vast tract of country to the north-west, which has always been looked upon as valueless, has been explored with more care, and though it is probably of little use for agricultural purposes it has been found to contain enormous quantities of iron and other minerals. Traces of gold have been met with in the beds of some of the rivers, and copper has also been found. In the dense forests which are common in this region specimens of the *Eucalyptus* have been seen which are said to be more than 300 feet in height. Further exploration is still being carried on with a view to the accurate determination of the capabilities of this part of Tasmania.

AFRICAN EXPLORATION.—Journalistic enterprise is again contributing to the exploration of Africa, and this time Paris is vying with London and New York. M. P. Soleillet, who has been equipped under the auspices of the *Moniteur Universel*, departs soon for a tour of exploration in Equatorial Africa, to follow in the footsteps of his fellow-journalist Stanley. The development of openings for French commerce is to form a prominent feature in the undertaking.

PARIS.—The Paris *Société de Géographie* has elected Baron de la Roncière Le Nourry its president for the ensuing year.

FRENCH GUAYANA.—Dr. Crevaux, who was sent out by the French government to explore the interior of French Guayana, has returned to Paris after completing one of the most arduous journeys in the annals of South American discovery. After having fulfilled his instructions to penetrate to the Tumuc-Humac range, he determined to make the passage of these mountains, and descend into the valley of the Amazon, an attempt which has several times been tried in vain during the past three centuries. Although deserted by all his attendants, with the exception of a negro, he succeeded, after overcoming numerous obstacles, and battling with famine during a march of sixteen days across an uninhabited tract, in reaching the head waters of the Yary, from whence a canoe-voyage brought him to the Amazon. Of the 500 leagues traversed in this journey, 225 were hitherto completely unknown.

SURVEY OF NEW YORK.—The Second Annual Report of the State Geographical and Topographical Survey of New York, in charge of Mr. James T. Gardner, gives an account of the labours of the commission during the year. The principal work of the year has been the precise determination by primary triangulation of points in eleven counties, embracing an area of about 3,000 square miles; 167 points were located in an area of 1,700 miles in seven counties alone; the average has been one to every ten square miles. Fifty-one monuments have been placed in defining the boundaries of counties, this being a very important part of the work of the survey. The report is accompanied by several maps showing the progress of the work, the position of the stations, &c.

BIOLOGICAL NOTES

A NEW FRUIT.—Mr. Hollister has introduced from Japan to San Francisco a fruit, which is said in its native country to have as many varieties as are grown in this country of our apple, and the sweetness of the fruit is more or less retained by all of them. It is known as the Japanese Persimmon and, according to Mr. Hollister, is the most beautiful of all the fruits he had ever seen and the most delicious to the taste—four of the fruits which ripened with him weighed three quarters of a pound each, they were of a rich yellow colour, and looked like balls of wax; these were pronounced equal to a good pear or peach. The tree is a highly ornamental one, a prolific bearer, and as hardy as a pear. Its fruit season is from October to March. It seems quite adapted to the soil and climate of California. The grafted trees bear in four years. The seedlings require double that time, and are not reliable (*Proceedings*, Acad. of Science, California, in *American Naturalist* for March, 1878). This is the well-known and beautiful fruit of *Diospyros kaki*, Linn., fil., a near ally of the Persimmon of the Southern United States of America. Mr. Hiern tells us in his Monograph of the Ebenaceæ that the Chinese preserve this fruit with sugar, and that it has for a long time been in cultivation with them and the Japanese. The fruit has a thin skin, with a sweet orange-scarlet coloured flesh, with six or eight dark smooth seeds. It was beautifully figured in the *Gardeners' Chronicle* for 1872.

FOSSIL INSECTS.—Messrs. S. H. Scudder, of Cambridge, and F. C. Bowditch, of Boston, attached to Hayden's United States Geological and Geographical Survey, spent two months in Colorado, Wyoming, and Utah, in explorations for fossil insects and in collecting recent coleoptera and orthoptera, especially in the higher regions. They made large collections of recent insects at different points along the railways from Pueblo to Cheyenne, and from Cheyenne to Salt Lake, as well as at Lakin (Kansas), Garland and Georgetown (Colorado), and in various parts of the South Park and surrounding region. Ten days were spent at Green River and vicinity in examining the tertiary strata for fossil insects, with poor results. The tertiary beds of the South Park yielded only a single determinable insect; but near Florissant the tertiary basin described by Mr. Peale in one of the annual reports of the Survey was found to be exceedingly rich in insects and plants. In company with Rev. Mr. Lakes, of Golden, Mr. Scudder spent several days in a careful survey of this basin, and estimates the insect-bearing shales to have an extent at least fifty times as great as those of the famous locality at Œningen in Southern Bavaria. From six to seven thousand insects and two or three thousand plants have already been received from Florissant, the specimens from this locality being remarkable for their beauty. There is every reason to believe that the tertiary strata of the Rocky Mountain region are richer in remains of fossil insects than any other country in the world, and that within a few months the material at hand for the elaboration of the work on the fossil insects of the American tertiaries which Mr. Scudder has in preparation, will be much larger than was ever before subject to the investigation of a single naturalist. Mr. Scudder has in all now more than 12,000 specimens of fossil insects.

THE CLIMBING OF THE VIRGINIA CREEPER.—Mr. B. D. Halsted has studied the mechanism of climbing in the Japanese Ampelopsis, and finds that the clinging discs terminate tendrils which are homologous with main stems. While approaching a support, these discs flatten themselves on the inner side. The surface of the disc is papillose, and excretes a sticky substance; and the irregular contraction of the tendril draws the vine to its support (*Proc.* Boston Soc. Nat. Hist., January, 1878).

THE EARLIEST CHANGES IN ANIMAL EGGS.—The patient researches of van Beneden, Grieff, and Oscar Hertwig have discovered many interesting facts in the structure of simple ova when laid, the mode of fertilisation, and the first segmentation. Oscar Hertwig's last observations are on the starfish Asteracanthion (*Morphologisches Jahrbuch*, vol. iv. Part I.), and he describes the changes as follows :—The germinal spot of the unfertilised ovum first shows a separation into two portions, while part of the germinal vesicle contributes material out of which first one and then a second "directive corpuscle" is formed. By this time the germinal vesicle is undistinguishable, having left a small portion as the ovinucleus (*eikern*). When fertilisation takes place, the spermatozoon gives rise to a small body, the sperm-nucleus (*spermakern*); this body approaches the ovinucleus, and they fuse to form the segmental nucleus (*furchungskern*); this precedes the division of the whole egg into two cells. If such observations are extended to many species and confirmed by other observers, we shall have an important gain in our knowledge of the results of fertilisation.

GLACIAL AND POST-GLACIAL FISHES OF NORWAY.—We learn from the Danish *Naturen* the appearance in the third part of the *Nyt Magazin for Naturvidenskaberne*, of a paper, by M. Robert Collett, on the glacial and post-glacial fishes of Norway. These fishes, which are most perfectly preserved in chalk-lumps, the outer shapes of which more or less perfectly exhibit the outer shapes of the included fishes, are found in clay deposits some 360 feet above the sea; the fishes belong all to the existing fauna, displaying at the same time their Arctic and North Atlantic origin. Out of twelve species, described by the authors, the most common is the *Mallotus villosus*, which is found everywhere; one species, the *Clupea sprattus*, is worthy of notice, because it is now a native of more southern waters.

POACHING BIRDS.—Mr. N. B. Moore has made observations at the Bahamas on the *Certhiola flaveola*, which obtains nectar from the flower of *Verea crenata* by thrusting its bill at once through the petals into the nectary. It is only after the bird has made an opening that small black ants and other small insects are found in the nectary. But these birds also poach on the woodpecker's preserves. One day Mr. Moore observed a *Picus varius* extracting sap from a logwood sapling, and as the woodpecker flew away, two Certhiolæ appeared, perched near the sap-pits from which the juice was oozing, and by cunningly thrusting in their penicillate or bristle-tipped tongues, commenced to lap or suck the fluid into their mouths. This practice was constantly observed afterwards. Mr. Moore fixed the bowl of a teaspoon in a fork of the same tree, and placed some strained honey in it. In three days the Certhiolæ found this, and commenced to feed on it. They were followed by another bristle-tongued bird, *Dendræca tigrina*, and other species, who also attacked the woodpecker's sap-pits. These are interesting instances of apparent intelligence on the part of birds (*Proc.* Boston Soc. Nat. Hist., January, 1878).

GEOLOGICAL TIME[1]

IF a rigid body be in rotation about an axis of symmetry it will continue to rotate about that axis, but if it be set spinning about an axis inclined to that of symmetry the axis about which it spins will be continuously displaced relatively to the body; in other words, it will wabble.[2] This wabbling is well illustrated by the motion of a top whilst it is "going to sleep."

As the rotating body approaches more and more nearly the spherical shape, so does the wabbling become slower and slower. If the earth, which is nearly spherical, were to wabble in its diurnal rotation it would do so in about 305 or 306 days.

Dr. Haughton has lately published[1] an ingenious speculation, founded on the possibility of the wabbling of the earth, in which he seeks to determine limits to the duration of geological time from the observed absence of any motion of this kind.

The object of the short paper, of which I am here giving an account, was to combat the applicability to the case of the earth of Dr. Haughton's results.

The method pursued by him may be shortly described as follows :—If a continent were to be suddenly upheaved the earth's axis of figure (or strictly speaking, the principal axis of greatest moment of inertia) would be displaced from its previous position; immediately after the earthquake, the axis of rotation being where it was just before the earthquake, is no longer coincident with the axis of figure, and therefore a wabble is set up in the earth's motion. If it were not for frictional resistances that wabble would continue for ever after. But it is easy to see that, as the ocean is not rigidly connected with the earth, a tide of 306 days period would be set up. This tide would then rub on the sea-bottom, and would gradually reduce the wabble and bring the earth "to sleep" again like a top.

By reference to the estimate of Adams and Delaunay of the effects of tidal friction in retarding the earth's rotation, Dr. Haughton endeavours to find a numerical value for the frictional effect of such a 306-day tide as above explained. He then finds how long it would take to reduce a wabble of given amount to one of any smaller amount.

In a previous paper he had already shown that the elevation of the continents of Europe and Asia must have shifted the earth's axis of figure by 69 miles at the earth's surface. If, therefore, such an elevation took place suddenly, it must have started a wabble, in which the axis of rotation described a circle of 69 miles radius round the axis of figure.

But Dr. Haughton is of opinion that astronomical instruments are now so perfect, that a wabble of 5 feet in radius would be detected, and that it is not, therefore, permissible to suppose that the present actual wabble has a radius of even 5 feet. His numerical calculations, then, show that it would take 641,000 years to reduce the radius from 69 miles to 5 feet by means of the tidal friction, and he, therefore, concludes that, if Europe-Asia were manufactured *per saltum*, that event cannot have taken place less than 641,000 years ago, and that it may have been at a much more remote epoch.

The improbability of this supposition induces him to consider the case of elevation by 69 geological convulsions, each of which displaced the axis through one mile, and where the radius of the wabble is reduced to five feet between two successive convulsions. He here finds that the elevation of Europe-Asia must have occupied 27½ million years, and that no geological change altering the position of the earth's axis through one mile can have taken place within the past 400,000 years.

He lastly supposes that the wabble has a radius of 5 feet, and that the geological changes take place at such a rate that the increase of the radius is exactly destroyed by friction during each wabble, so that the radius of 5 feet remains constant. On this supposition he finds that the time required was 4,170 million years.

Now it appears to me, from this method of treatment, that Dr. Haughton is of opinion that a second earthquake of elevation following a first would necessarily increase the radius of the wabble. For if not, why does he postulate a lapse of time between successive earthquakes, and in the last case make the supposition of the increase of radius be exactly destroyed? It is on this point

[1] Abstract of a paper read before the Royal Society on March 14.
[2] I follow Dr. Haughton in the use of this very expressive word.

[1] Notes on Physical Geology, No. III., *Proc. Roy. Soc.*, vol. xxvi. p. 534.