bour, and disappearing from view, only to be succeeded by higher and higher strata above them. No better example of this could well be found than the map of Natal of Mr. Griesbach; the rocks all run parallel to the sea-coast, striking into the Zulu territory, and dipping steadily the one after the other into high ground, forming the watershed between the Indian and Atlantic oceans. The eastern or seaward belt about fifty miles in width, consists of ancient mica-schists, resting on granite and gneiss seen at the bottom of the deeper valleys, the whole surmounted by the "Table Mountain Sandstone," of carboniferous age, forming extensive plateaux, lying perfectly flat on a horizontal surface of clay-slate, and broken by lines of fault, into a series of steps, plateaux rising above plateaux, with precipitous sides to a height of 2,300 feet between the sea and Pietermaritzburg, where the country again descends to 2,080. These table-lands are covered with extremely poor soil, supporting a dense grass vegetation, on which feed numerous herds of cattle; not a shrub occurs to enliven the endless uniformity of the scene, broken only by the ravines formed by the rivers cutting down through the sandstones to the granite and old rocks beneath, often forming precipitous cliffs several thousand feet high, the vertical drop, from the Krantzkop Mountain to the River Tugela being nearly 3,800 feet. The top of this mountain is composed of melaphyre; these melaphyre greenstones contain copper ores and strike south-westwards to the Ingeli range in Kaffirland.

At Pietermaritzburg, the next belt of country commences, the town being built on the basement beds of the Karoo formation, belonging to the *Dicynodon* beds of South Africa, of triassic age, the name being given from the "karoos," or immense plains of the interior, forming the largest part of South Africa, including the elevated tract of "Kalahari, the Free States, and the Transvaal, as well as the country to the north, as far as Limpopo." They are present in the Zambezi, and rise to a height of 12,000 feet in Mont-aux-Sources, in the Drakenberg Mountains. The base of the Karoo series rests unconformably on the carboniferous table mountain sandstone, and consists of large angular blocks of transported granite, greenstone, and gneiss, in a matrix of clay and grit. They occupy a large area, and pass under plant-bearing shales. These boulder beds have been ascribed a glacial origin by Dr. Sutherland, Surveyor-general of Natal. Mr. Griesbach points out the overlying plant-beds correspond to the plant-beds of Southern India, associated with *Dicynodon* remains, and also resting on a boulder bed (Talchir group).

The great Karoo plains, Dr. Grey is inclined to regard as the bed of an inland sea; salts of soda predominate largely in the salines of the soil, and assist in forming the "background" of this region (sandy soil, with salt, carbonate of soda, and some salts of magnesia and alumina). Its surface forms the sweet-grass country of the Dutch "Zout-Veldt," yielding the valuable Karoo plant (*Adenchœra parviflora*). In this tract the climate is most salubrious, and the higher the country ascends the more fruitful is the ground. The yellow wood flourishes, wheat and European fruits flourish, and the cold of the winter, though not so severe as that of northern Europe, braces the European settler, and agrees with his constitution.

Fringing the Natal shore, there is a narrow belt of the Karoo formation, resting unconformably on the table mountain sandstones and older rocks, so that the latter form an exceedingly low and flat-topped anticlinal arch, throwing off the Karoo beds on either side. Landward these rise to the Drakenberg, seaward they have for the most part been denuded away, though their presence in Southern India points to the former extension over what is now the Indian Ocean of a series of lakes fringed by lands covered with plant growths, extending over Southern India, and parts of South Africa. The investigations of Mr. Blanford in Southern India support the views of Prof. Huxley and Mr. Sclater as to the existence of an extending submerged mesozoic continent, "Lemuria," which was shadowed forth in Mr. Darwin's researches on coral reefs. Mr. Blanford comments strongly on the great relation between the plants of the Indian and Australian (New South Wales) coalfields, many of the species being identical, the two localities being no less than 5,550 miles apart. In India these plant-beds rest on the supposed glacial (Permian?) beds of the Talchir group, the included scratched blocks being often forty-two feet in circumference.

The Karoo boulder bed is described by Dr. Sutherland as containing well-scratched blocks, inclosed in a material which has since been metamorphosed, and resting on scratched old silurian sandstones. The characters of the various members of the Karoo series is well capitulated by Prof. Rupert Jones in Mr. Ralph Tate's paper on South African jurassic marine mollusca, the sequence being: Stormberg beds (Huxley); Beaufort Beds; Koonap beds, and Ecca beds. The Beaufort beds most closely correspond to the Dicynodon beds of India, the boulder beds in both countries, according to Mr. Blanford, being pre-triassic, and he carries back his Indo-oceanic continent to Permian times, and extending up to a late jurassic epoch—South Africa, India, and Australia being connected at the early part of the period, Africa and India, up to the end of the miocene.

In 1824, some caves called *Izinhluzabalungu* (white men's houses) were discovered by Mr. Fynn to be fossiliferous; the name, given by the natives, was due to shipwrecked sailors having taken up their abode in them. In 1851 Capt. Garden had his attention called to these fossils, especially some gigantic *Inocerami*, two feet by one foot, by his servant, named Thomas Souton, a Private in the 45th Regiment, after whom one of the fossils obtained was named by Mr. Baily, who examined them at the request of the late Prof. Forbes. The deposit occupies a small tract on the south end of the colony, and, as Mr. Baily pointed out, may be correlated with the lower cretaceous of Southern India, one species *Pecten quinquecostatus* being common to the English greensand. The investigations of Mr. Griesbach have largely added to the number of the species, and supported Mr. Baily's conclusions, twenty-two of the species occurring in India, thirteen being peculiar. Another patch of cretaceous rocks occurs at St. Lucia Bay, in Zululand, resting unconformably on the Karoo strata.

At the close of the jurassic period, the Indo-oceanic continent was submerged beneath a shallow cretaceous sea, surrounded by coasts, covered with vegetation, extending from India to Natal. At the close of this epoch elevation commenced, and is probably still going on, as raised beaches, coral reefs, and oyster banks may be seen twelve feet above the sea. Through this action the Port of Durban must inevitably be silted up, which will be the fate of most of the ports on this coast, except the large port of Delagoa Bay, which is naturally clean swept by the north and south Mozambique current, which has gradually hollowed out the Bay.

CHAS. E. DE RANCE

OUR ASTRONOMICAL COLUMN

PRIZES OF THE PARIS ACADEMY.—At the annual public sitting of the Academy of Sciences at Paris, last week, the medal on the foundation of Lalande was awarded to M. Stanislas Meunier for his researches on the constitution of meteorites, which, in the opinion of the Commission appointed for the consideration of claims, have led to results that occasion surprise, but at the same time appear justified by M. Meunier's investigations. Astronomers had followed with interest the labours of M. Daubrée, who has contributed so much to establish

a connection, little expected, between these bodies falling from the heavens, and the lower strata of our globe, and this circumstance has caused an increased amount of attention to the researches of his pupil and follower, M. Meunier, who finds by his recent work that the analogy alluded to is not confined alone to mineralogical constitution, but that it is extended to the relation which these cosmical materials, disseminated in space, present when compared amongst themselves, as is done for the constituent rocks of our globe. The Commission considered that M. Meunier had reason to conclude, from his experiences, that all these masses once belonged to a considerable globe, like the earth, of true geological epochs, and that later it was decomposed into separate fragments, under the action of causes difficult to define exactly, but which we have more than once seen in operation in the heaven itself. Such a conclusion, it is remarked, adds greatly to the interest attaching to these "minute stars:" the astronomer, once occupied only with their motions and their probable distribution in space, finds himself confronted with a sidereal geology, as he already was under the necessity of having regard to celestial physics, celestial chemistry, and celestial mineralogy. The medal is awarded with the view to encourage M. Meunier to follow up his studies, so interesting in regard to the constitution of the solar system.

The Valz prize was adjudged to Dr. Julius Schmidt, for his great chart of the moon, and the immense labour which its production has involved during a period of thirty-four years. The report of the commission for this prize contains a brief *résumé* of earlier work in this direction, concluding with a remark, the truth of which will be sufficiently obvious, that Dr. Schmidt's work, "aujourd'hui déjà si précieux, servira dans l'avenir de base à de nombreuses investigations, et nous pensons que le temps ne fera qu'en accroître la valeur."

The Damoiseau prize, first proposed in 1869 for a revision of the theory of Jupiter's satellites, discussion of the observations, and redetermination of the constants involved, with the formation of tables of the satellites, has been renewed without effect in 1872, 1876, and 1877, and is further remitted to 1879. The value of this prize is 5,000 francs.

FAYE'S COMET.—Dr. Axel Möller, continuing his elaborate investigations on the motion of Faye's comet, which he has conducted with so much success during the last twenty years, has communicated to the Stockholm Academy elements and an ephemeris for the next appearance, which it now appears will not take place under such favourable circumstances for observation as has been stated elsewhere. From November, 1874, to April, 1876, the distance of the comet from Jupiter was less than twice the mean distance of the earth from the sun, and in June and July, 1875, was not more than 1·5; the effect of this has been to retard the next perihelion passage by more than thirty-eight days, or to delay it till January 22, 1881, under which conditions the theoretical intensity of light can at no time be half as great as at the date of discovery by M. Faye in 1843. At the last return only four observations appear to have been secured, owing to the comet's excessive faintness, three by M. Stephan, at Marseilles, on September 3, November 28 and 30, and one by Dr. C. H. F. Peters, at Clinton, U.S., on December 23; so admirably had the calculations of the perturbations during the preceding revolution been effected by Dr. Axel Möller, that M. Stephan's first observation gave the comet's position only *four seconds of arc* from the predicted place. The chief disturber of the motion of this comet is, of course, the planet Jupiter, but Dr. Möller takes into account also the effect of the attraction of Venus, the earth, Mars, Saturn, and Uranus. The amount of perturbation during the actual revolution is greater than in any other since the comet's discovery. The next perihelion passage takes place 1881, January 22·665, G.M.T., the comet at this epoch moving in an ellipse with a period 56·526 days longer than at the previous perihelion passage in July, 1873. Dr. Axel Möller's ephemeris extends from 1880, July 1, to 1881, January 1; the comet will be nearest to the earth on October 3, distance = 1·09, and situate at this time some ten degrees south of α Pegasi.

BIOLOGICAL NOTES

FOSSILS OF THE AMAZONIAN DEVONIAN.—MR. R. Rathbun, late of the Geological Survey of Brazil, has published a list and description of the Brachiopods of the three Amazonian-Devonian localities, showing that of the twenty-one species recorded from the Mæcurú, thirteen were also found on the Caruá, including all the commoner species of the former. There is not so close a relationship between the Ereré fauna and the Mæcurú. Several of the commonest Mæcurú species do not occur at Ereré, and *vice versâ*. At Ereré there are five species of Lingula, four of Chonetes, four of Spirifera; at Mæcurú there are no species of Lingula, four of Chonetes, and six of Spirifera. Several of the Amazonian shells are identical with those of the North American Devonian; three in the Mæcurú, and Caruá, viz., *Spirifera duodenaria*, *Amphigenia elongata*, and *Strophodonta perplana*. Two forms of these are only known in the Corniferous limestone and Scholiaric grit of North America. The Ereré beds are more closely related by their fossils to the Hamilton group than to any other North American group. In Pará, on the whole, there is the same general succession of species as in the Corniferous and Hamilton groups of North America, and a similar intermingling of forms. The lamellibranchs are not published yet, but it appears probable that many species are identical with New York State forms. Among the Trilobites are species of Homalonotus, Phacops, and other genera. (*Proc.* Boston Society of Nat. Hist., 1878.)

AUSTRALIAN FOSSIL CORALS.—The subject of Australian fossil corals has occupied much attention among palæontologists of late years. The investigations of the forms found in the deep sea has brought the tertiary forms into prominent notice. Following in the line of the researches of Prof. Duncan, the Rev. J. E. T. Woods has recently published (*Journal* and *Proceedings* of the Royal Society of New South Wales, vol. xi., 1878) a paper on some Australian tertiary corals, in which he describes some new species from Muddy Creek, near Hamilton, in Western Victoria. Some of the species are very interesting, and the author concludes his paper by asserting:—1. That there is no species of the genus Caryophyllia living in the Australian seas, or to be found fossil in its rocks. 2. That there are three well-marked and peculiar forms of Deltocyathus. 3. That of the two species known of Sphenotrochus in Australia, one is still living (*S. variolaris*, n.s.) at a depth of seventy fathoms. 4. That there are two fossil analogues of the living *Conocyathus sulcatus*, which itself is supposed to be identical with a European miocene form. 5. That there is a fossil form in the miocene rocks of Australia, of the cretaceous genus Smilotrochus. The Rev. W. Woods mentions that he is preparing a monograph of the recent species of Australian corals.

HERRING CULTURE.—Dr. H. A. Meyer has published an interesting contribution to the natural history of this important fish, as part 1 of a series of short papers to be issued by the Commission for the Scientific Investigation of the German Sea (Berlin, 1878). In this he supplements his previous researches into the influence of the temperature on the development of the spring herrings' eggs. It may be remembered that in the large report published by the Commission it was found that the escape of the herring from the egg, in the case of the autumn herring, could be very considerably delayed by keeping