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

the eggs in very cold water; and now experiments made with the same object in view prove that in this respect there is very little, if any, difference in the behaviour of the autumn and spring spawnings. As in the previous experiments eggs artificially fecundated were those operated with, and while some of the eggs were exposed to the salt water at its ordinary temperature at Kiel, others were placed in a wooden refrigerator, into which the same sea-water, but cooled down to the desired degree, was admitted. A most necessary precaution was keeping the eggs from being heaped together, as they then almost invariably became mouldy. Another series of experiments was made to test whether the eggs exposed to the very salt waters of the North Sea would ripen quicker or slower than those exposed to the less salt water of the Baltic, but the time of the development, the temperature of the waters being the same, was found to be very slightly, indeed hardly perceptibly different. A third series of experiments were of a very interesting nature, supplementing those already made, as to the rearing of the herring from artificially fecundated eggs. So far as is known, no one has yet succeeded in rearing the young herring, and even Dr. Meyer's repeated attempts broke down, owing to the impossibility of stopping the formation of the hyphæ of some fungus, and also in some measure to the difficulty of obtaining suitable food. Very soon after the yolk was altogether consumed they would die, so that most of the experiments on their growth were made on specimens freshly caught from time to time. Once he succeeded, in the spring of 1878, in rearing a few until they attained the size of 72 mm. However, as the result of these experiments, a great deal of insight has been obtained into the food—at first of almost microscopical dimensions—which the young herring consumes, and as to the enormous voracity of the little fish.

MADAGASCAR FORMS IN AFRICA.—At a recent meeting of the Society of Naturalists of Berlin Herr Eichler exhibited specimens of a new species of *Ouvirandra* lately discovered by Herr Hildebrandt in Eastern Africa. The remarkable form of water-plant known as the Lattice-leaf Plant (*Ouvirandra fenestralis*) with two other species of the same genus have been hitherto regarded as amongst the wonders of the peculiar flora of Madagascar, so that the discovery of a member of the same group in continental Africa is a fact of much importance in botanical distribution. The new *Ouvirandra*, although agreeing with the Madagascar species in all essential points of structure, does not present the singular holes in the leaves that distinguish the *Ouvirandra fenestralis*, but one of the other Madagascar species is likewise abnormal in this respect.

THE "DIGGER" MOLLUSC AND ITS PARASITES.—The little digger, *Donax fossor*, represents a countless mass of life off Cape May, New Jersey, large areas looking like barley grains lying on a malting floor when the tide retires. It gets uncovered by the breaking surf and instantly reburies itself with its powerful foot when the waves retire. The siphons are long and active, looking like so many wriggling worms. Although the prey of shore birds and fishes, and beset with parasites, they lie so thick as even to interfere with one another in burying themselves. The liver of these bivalves is always found beset by flukes, from half a dozen to several dozen, and a bell-shaped trichodina crowds the branchial cavity.

ACTION OF THE HEART OF THE CRAYFISH.—M. Felix Plateau, of Ghent, has succeeded in applying the graphic method to the study of the heart's action in the crayfish. A curve is obtained, of which the ascending portions correspond to diastole, and the descending to systole, contrary to what obtains in the vertebrate heart. It is strikingly like the trace of the contraction of a muscle; a rapid, almost sudden ascent, with a short flat summit, then a gradual descent, at first quicker, then slower. This, however, does not represent the whole truth; it is possible, also, to demonstrate a wave affecting the muscular wall of the heart, and travelling from behind forwards, thus demonstrating that this condensed heart is a true dorsal vessel. On the stimulus of the entrance of renovated blood, it is only the hinder half or two-thirds of the heart that contracts immediately. This forces blood into the forward half, which contracts only when the posterior division is again dilating. When the temperature is increased, as a general rule the diastolic phase is abbreviated, the number of pulsations rising at the same time. M. Plateau has also succeeded in making experiments on the action of the cardiac nerve of Lemoine, an unpaired branch of the stomatogastric ganglion. It is proved that excitation of this nerve quickens the pulsations of the heart, and augments their energy, while section of it slows the heart. Excitation of the thoracic ganglia always retards the heart, the converse of the cardiac nerve. Acetic acid applied to the heart substance arouses its contractions even when they have ceased, and maintains them for several hours. The action of a number of other substances is equally noteworthy, and M. Plateau's full communications to the Académie Royale of Belgium will be awaited with interest by physiologists.

GEOGRAPHICAL NOTES

THE various geographical journals to hand contain several papers of importance. In the January *Bulletin* of the Paris Society M. Maunier gives a full and intelligent sketch of geographical work during 1878, while Dr. Harmand gives a brief statement of the results of his recent journeys in Anam. The Paris Society seems to have followed the example set by the London Society, and has introduced a new feature, "Nouvelles," containing notes of geographical work beyond the limits of its own papers. The *Zeitschrift* of the Berlin Society contains two instructive papers, on the Andamans, by Ad. de Roepstarff, and an account of a journey in south-west Persia, by Dr. A. H. Schindler. In the two numbers of the *Verhandlungen* of the same society, the last for 1878 and first for 1879, the papers of most interest are those on the Mining Industry of Russia, by C. Skalkovsky; on the latest researches on the Aurora Borealis, by Herr Förster; and on the people of East Africa, by Herr Hartmann. In the *Mittheilungen* of the Vienna Society, No. 2 of this year, Herr Franz Heger gives some hints as to a solution of various geological questions,—glaciation, climate, coal-deposits, &c.—apparently seeking to account for many of the great geological problems by a change in the earth's axis. The March number of Petermann's *Mittheilungen* contains several papers of interest. From the journal of a Bremen merchant a narrative is given of a journey up the Jenissei, from its mouth to Jenisseisk, in the summer of 1878; and M. N. Latkin gives a detailed account of our knowledge of the Lena and its basin. Exact news of Nordenskjöld's position is given from the San Francisco whaling captain, who was the first to hear of him, and a statement as to the course to be followed by the steamer *Nordenskjöld*, now building at Malmö, and which will start in May, first to succour the Swedish expedition, and then to proceed to the mouth of the Lena. If it cannot return through Behring's Strait, the staff will spend the winter in collecting all possible data in various departments of science. Nos. 3 and 4 of the *Bulletin* of the American Geographical Society contain, the former a paper by Rear-Admiral Ammer, on the Inter-oceanic ship canal across the American Isthmus, and the latter an interesting sketch of the life and work of Mercator, by Mr. E. F. Hall.

NEWS of two African expeditions are to hand, in one case telling of misfortune, and in the other of success. The Belgian expedition, unfortunate from the beginning,