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,

has met with another disaster in the death, from dysentery, of M. Wautier, at a place called Kekongen (? Ukonongo). On the other hand, Major Pinto, the leader of the Portuguese African expedition, telegraphs to Lisbon from Pretoria, that he has virtually crossed Africa from the west coast, after struggling with hunger, thirst, beasts, natives, floods, drought. His route must have to some extent almost coincided with that of Livingstone, and he tells us he has saved all his papers, twenty geographical charts, many topographical maps, several vols. of notes, drawings, meteorological data, a diary of the exploration of the Zambesi's seventy-two cataracts and rapids. He says he has discovered the secret of the Cubango, by which he seems to mean the river which, under various names, was for a time taken by some to be the upper course of the Congo. He lost many followers, and his expedition seems in a small way to have been modelled on that of Stanley's.

THE *Times* Roman correspondent writes that Menotti Garibaldi and Achille Fazzari intend, if England does not object, to sail in summer or autumn with 3,000 Italians for the south coast of New Guinea, to establish a colony there, and found a new city under the name of Italia. The arrangements, it is said, are almost completed, the 30,000,000 francs required ready, and that applications to join the party are more than can be granted. Part of the equipment will be a telegraph cable, to place the colony at once in communication with North Australia. Men of all ranks and callings (except lawyers) are included in the party, and among them several men of science. The proposed colonists express the greatest good will towards England, and it seems to us the trial would be worth making. The Italians make better colonists than the French, and Italians have done so much for the exploration of New Guinea that it seems only fair that they should be allowed to reap some benefit from the labours of such men as D'Albertis and Beccari.

AT the last meeting of the Société Commerciale de Géographie at Paris Dr. Raffray gave some particulars respecting his recent explorations in New Guinea, and called attention to the fact that that country offered a vast field for discovery and study to the traveller, especially from an ornithological and entomological point of view. A report on the subject of a railway across the Desert of Sahara was afterwards read, being the result of the labours of a committee, of which M. Gazeau de Vautibault is president. M. Deloncle also made a communication respecting the Volta region in West Africa, which has been explored by M. Bonnat, and he announced that two Lyons merchants had already determined to establish business houses there.

MGR. LAVIGERIE, Archbishop of Algiers, has forwarded to *Les Missions Catholiques* the commencement of the journal of the Algerian missionaries, recording the incidents of their march towards the Nyanzas and Lake Tanganyika. This portion of their journal stops at Mukuduku in Ugogo on August 20, and the first instalment of this is now published. It had been intended to accompany it by a map of Equatorial Africa, sent home by Père Charmetant some time back, but it has been thought better to delay the publication, in order that the itinerary of the missionaries and the additional geographical information contained in their journal may be included in it.

IT is stated in an Italian newspaper that the Duke of Genoa will go on an exploring expedition, and will sail from Venice in the *Vittore Pisani* at the end of this month. The programme of the route is to be Port Said, Suez, Aden, Ceylon, and Singapore, where a longer sojourn will be made. Afterwards the traveller will proceed to the Chinese and Japanese coasts; in 1880 he will visit Australia and direct his special attention to the exploration of New Guinea. On the return journey the *Pisani* will cruise in the Persian Gulf. Capt. Sebastian and Count Antonela have started on an exploring tour through Africa.

A POSTCARD was received at Berlin on February 15 from Dr. Gerhard Rohlffs, dated January 27 and posted at Sokna, some 250 miles south of Tripolis, at the foot of the Black Mountains, stating that he was in perfect health. The postcard bears the stamp of Dr. Rohlffs's desert post, and a prettily-drawn postage-stamp with African palm-leaves.

TO accompany the map of Zululand, noticed last week, Mr. Stanford has published a few useful notes on the physical features and population of the country.

THE *Jeannette* is fitting up in San Francisco harbour, and will leave for polar exploration in the month of June. Mr. Bennett, who is now in Europe, has been making inquiry at Paris as to the best means of constructing and inflating balloons in the Arctic regions. It is thus likely that aërial navigation will play a part in this new effort to solve the mystery of the north.

EDISON'S TELEPHONE

OUR readers may remember a few months ago we stated, in an article on the Carbon Telephone (NATURE, vol. xix. p. 56), that Mr. Edison had devised an entirely new form of receiver, for use with his telephone, which delivered the voice as loudly as if the words were spoken at the distant end. This receiver has now arrived in England in charge of Mr. Edison's nephew, and to judge from its performances last Friday, it is likely to accomplish all that Edison has stated concerning it.

The principle of this new receiver is that of the *electro-motograph*, and to those of our readers who may not be acquainted with this instrument the following extract from a recently published lecture, on Edison's inventions, by Prof. Barrett will explain what the electro-motograph is.[1]

"Mere ingenuity in contriving machines does not add to the sum of human knowledge, and if Mr. Edison were merely a clever inventor and nothing more, I should feel less interest in the man. It is, however, a noticeable feature of Mr. Edison's inventions that they, in general, contain some new principle, some original observation in experimental science, which entitles him to the rank of a discoverer. Such is the character of the next invention we must consider, the so-called *electro-motograph*. This is an entirely new method of receiving telegraphic messages, discovered by Edison in 1874. As every one is aware, the ordinary system of telegraphy depends upon the production of magnetism by means of an electric current, the current either attracting and releasing a movable piece of iron, or deflecting a magnetic needle to the right or to the left. By the to-and-fro movements of the iron or the needle the conventional signals are produced which are employed in telegraphy. Now Mr. Edison made the curious and important discovery that messages could be received by the well-known Morse recorder without the use of any magnet. This, to a telegraphist, would be like attempting to perform the play of "Hamlet," while omitting the part of *Hamlet* himself. In fact, all that is necessary in this simple telegraphic instrument is a band of moistened paper drawn beneath a metal style. The accident of holding his finger against the style of a Morse instrument led Mr. Edison to notice that when an electric current passed from the paper to the point resting upon it the friction of the moving paper was lessened. Hence, if the paper were drawn with a uniform force it would slip more easily beneath the point the moment the current passed. The slipping of the

[1] "Science Lectures for the People," No. 5, Tenth Series. (Manchester, Heywood.)