twenty-two days that we spent off that continent, we never effected a landing but twice, and then, with the greatest difficulty, on two small volcanic islets, without a particle of vegetation on them, of which one was Possession Island (Jan. 13), a mere rock. The ship was hove to two miles off; with the greatest risk a landing was effected, on a beach of large loose stones and stranded masses of ice. It was no sooner done than the recall flag was hoisted in the ships, which were reached just as a terrific fog came on, followed by a gale of wind; ten minutes more and all hands in the boats would have been lost, for the currents ran like sluices between the land, islets, and icebergs. So much for Possession Island. (Read Ross's account of the landing, i. 188, and especially the paragraph at p. 190.)

Take a glance at the meteorological registers in Ross's voyage for the month of January 1841, which was passed between S. lat. $66^{\circ}32'$ and 78° . The mean temperature was $29^{\circ}02'$, max. $41^{\circ}5'$, min. $19^{\circ}5'$. It snowed on sixteen days; overcast, squally and misty was the usual weather, blue sky was rarely seen over more than a quarter of the heavens for a very few hours of the day, and for many days not seen at all.

In March between lat. 77° and $69\frac{1}{2}^{\circ}$, the mean temperature was $24^{\circ}28'$, max. 34° , min. 13° . Sky as in January.

In the following year our vessel went to the same seas. We "took the pack" December 17, and after being all but wrecked, penetrated it after fifty-six days of great peril, and proceeded to 78° S., never once seeing land.

During that January within $66^{\circ}32'$ and $67^{\circ}21'$ the mean temperature was $30^{\circ}46'$, max. $40^{\circ}5'$, min. 24° . It snowed on seventeen days, and we hardly ever saw blue sky.

In February between lat. $67^{\circ}18'$ and $78^{\circ}12'$, the mean temperature was $26^{\circ}68'$, max. 35° , min. $16^{\circ}5'$, and it snowed on twenty days. Blue sky was seen only on thirteen days. In 1842 the weather was worse than ever. In that year we tried to get south in the meridian a little east of Cape Horn, but never got beyond lat. $71\frac{1}{2}^{\circ}$, and then not till March 6th, having left the Falklands on the 18th December. In January of that year (1842) we were between lat. $63^{\circ}58'$ and $64^{\circ}44'$. The mean temperature was $30^{\circ}9'$, max. 45° , min. $23^{\circ}5'$. It snowed on sixteen days—sky as before.

February—between lat. $61^{\circ}37'$ and $66^{\circ}01'$. The mean temperature was $30^{\circ}50'$, max. $35^{\circ}5'$, min. $27^{\circ}5'$. It snowed on twenty-four days out of the twenty-eight! Blue sky was seen only on seven days, and this on six days over one-eighth of the sky, and on the 7th over one-fourth.

With such a midsummer climate I leave you to guess the position of a party in lat. 72° , cooped up through a winter on a rock a few yards long, covered with snow.

During the third year's cruise to the southward, Captain Crozier never once went to his cot, and we passed day and night with our hearts at the top of our throats.

The fact is, there is no summer or clear weather to be had, except by the rarest chance. For days and days we worked by Dead Reckoning alone. Storm, wind, and snow, are the prevalent summer phenomena. Still some seasons are not so bad as others, and Weddell got to $74\frac{1}{2}^{\circ}$ in an open sea in the meridian where we barely reached 66° . (Signed) J. D. HOOKER

Royal Gardens, Kew, March 6

The following is the account of the landing alluded to by Dr. Hooker:—

"We found the shores of the mainland completely covered with ice projecting into the sea, and the heavy surf along its edge forbade any attempt to land upon it; a strong tide carried us rapidly along between this ice-bound coast and the islands amongst heavy masses of ice, so that our situation was, for some time most critical; for all the exertions our people could use were insufficient to stem the tide. But taking the advantage of a narrow opening that appeared in the ice, the boats were pushed through it, and we got into an eddy under the lee of the largest of the islands, and landed on a beach of large loose stones and stranded masses of ice. . . . The island is composed

entirely of igneous rocks, and only accessible on its western side. We saw not the smallest appearance of vegetation, but inconceivable myriads of penguins completely and densely covered the whole surface of the island, along the ledges of the precipices, and even to the summits of the hills, attacking us vigorously as we waded through their ranks, which, together with their loud coarse notes, and the insupportable stench from the deep bed of guano, which had been forming for ages, made us glad to get away again, after having loaded our boats with geological specimens and penguins. Owing to the heavy surf on the beach, we could not tell whether the water was ebbing or flowing; but there was a strong tide running to the south, between Possession Island and the mainland, and the *Terror* had some difficulty to avoid being carried by it against the land-ice. Future navigators should therefore be on their guard in approaching the coast at this place."

EARTHQUAKE WAVES

THE self-registering tide-gauges maintained by the United States Coast Survey at different points on the sea coast frequently exhibit, superimposed upon the tidal fluctuation, a succession of long waves, the origin of which is ascribed to distant earthquakes. In two notable instances, viz., the earthquake of Simoda in 1854, and that of Arica in 1868, the great ocean waves caused by the disturbance were distinctly registered in that way by the tide-gauges on the Pacific coast, and have been made use of for estimating the average depth along the lines of transmission. (See Coast Survey Reports for 1855, 1862, and 1869.)

Similar fluctuations were registered on the morning of November 17, 1872, shortly after local midnight, on the tide-gauge at North Haven, on the Fox Island, in Penobscot Bay, Maine. The fluctuations continued from midnight until nearly six o'clock in the morning, at somewhat irregular intervals of about seventeen minutes from crest to crest, with an average vertical range of nine inches, the greatest wave being at three o'clock, with a height of twenty inches.

No corresponding earthquake phenomena have come to the knowledge of the Coast Survey Office, and it is probable that if such was the case, the shock occurred somewhere under the Atlantic Ocean.

THE CHALLENGER EXPEDITION

H. M.S. *Challenger* cast off from the jetty at Portsmouth at 11.30 A.M. on December 21, with a low barometer. A strong south-westerly breeze was blowing, and the drum up; so that, especially in a season like the present, the prospect was not promising for the first few weeks of her voyage round the world.

The result justified the drum, and for a week we were knocking about the mouth of the Channel, and the Bay of Biscay, making slow progress southwards. It was perhaps as well to get a good shaking at first. It showed at once where there was a screw loose, and gave a chance to tighten it up. A sharp cyclone which caught the ship on her way from Sheerness to Portsmouth had already tested pretty fully the stowing of the apparatus, and although the *Challenger* rolls considerably when she is put to it (over 35°), not a single instrument shifted, and not a glass was broken, either in the zoological work-room, or in the chemical laboratory. Just before we got to Lisbon the weather improved a little, and we got some soundings and took one or two trial hauls with the dredge.

After leaving Lisbon on January 12 the wind was again fresh, but between Lisbon and Gibraltar we made some important experiments, and found, among other things, that we could work easily and successfully with the common trawl down to 600 fathoms. I am now writing about 100 miles north of Madeira, and since leaving Gibraltar the weather, though at first breezy, has been on

the whole fine. We have taken several successful navigative sounds at great depths, and we have trawled successfully at 2,125 fathoms, and recovered many interesting animal forms, several of them new to science, and others of extreme rarity and beauty. Still we must regard our work up to the present time as only tentative. The weather has been against us. It is altogether a new experiment to dredge from so large a ship, and it seems to present some special difficulties, or at all events to require some management. The weight of the ship is so great that there can be no "give and take" between it and the dredge, such as we have in the case of a smaller vessel. If there is any way on, the impulse to the dredge is irresistible, and seems to tend to jerk it off the ground. This difficulty can no doubt be met, but the only way of meeting it appears to be by using a length of rope greatly in excess of the depth—and having weights. A single dredging operation may thus occupy a great length of

time, but in compensation we have the greater size and efficiency of this dredge. The few trials which we have already made have been all in the direction of improvement, and I have little doubt that under Captain Nares' skilful management what little difficulty is still felt will shortly disappear.

As I hope to contribute to *NATURE* from time to time a series of articles giving the results of our voyage, it may be well to commence by giving a sketch of the general scope of our operations, and the means and appliances at our disposal.

The *Challenger* is a spare-decked corvette of 2,000 tons displacement. This particular build gives her an immense advantage for her present purposes, as she has all the accommodation of a frigate, with the handiness and draught of water of a corvette. Sixteen of the eighteen 68-pounders which form the armament of the *Challenger* have been removed, and the main-deck is almost entirely set aside

LABORATORY OF THE "CHALLENGER"

for the scientific work. The after-cabin is divided into two by a bulk-head, and the two little rooms thus formed—still gay with mirrors, and pictures, and new chintz, and bright with home faces—are allotted to Captain Nares and myself. The fore cabin, a handsome room, 30 ft. long by about 12 ft. wide, into which these private cabins open, the captain and I use as a sitting room, the port-end with its writing-table and work-table, and its book-cases packed with old home favourites, being appropriated to my use and that of my secretary Mr. Wild; while the captain has arrangements at the starboard end of the same kind. Two sets of cabins have been specially built on the after-part of the main-deck for this difficult part of the scientific work. On the port side a commodious zoological work-room is occupied by the naturalist of the civilian staff, while the chart room corresponds with it on the opposite side. Towards the middle of the main-deck on the port side

there is a dark room and a working room, for the photographer, and on the starboard side Mr. Buchanan has his chemical and physical laboratory.

Nearly the whole of the fore-part of the main-deck is occupied by the dredging and sounding gear, Mr. Siemens's photometric and thermometric apparatus, and the more cumbersome of our machines, such as the hydraulic pump, the aquarium, and other very valuable articles, of which a detailed description will be given hereafter.

I feel justified in going even so far as to say that the arrangements for scientific work in the *Challenger* leave little or nothing to be wished for. Captain Nares and his officers not only do everything which care and skill can accomplish to further our objects, but, having naturally a certain advantage over the civilians in rough weather, they keep us up to the mark by the lively interest which they take in the success of our operations. There is a common mess in a large ward-room on the lower deck,

and the civilians have to heartily thank the naval men for the frank courtesy with which they have received them into their fellowship.

Dredging and sounding are carried on from the main-yard. A strong pennant is attached by a hook to the cap, and then by a tackle to the end of this yard. A compound arrangement of fifty-five of "Hodges' accumulators" is hung to the pennant, and beneath it a block

through which the dredge rope passes. This arrangement appears to answer better than the old one of dredging from a derrick.

For the first two or three hauls in very deep water off the coast of Portugal, the dredge came up filled with the usual "Atlantic ooze," tenacious and uniform throughout, and the work of hours in sifting gave the very smallest possible result. We were extremely anxious to get some

NARESIA CYATHUS

idea of the general character of the fauna, and particularly of the distribution of the higher groups; and after various suggestions for modifications of the dredge it was proposed to try the ordinary trawl. We had a compact trawl with a 15 ft. beam on board, and we sent it down off Cape St. Vincent at a depth of 600 fathoms. The experiment looked hazardous, but to our great satisfaction this trawl came up all right, and contained, with many of

the larger invertebrata, several fishes. Two of these belonged to the genus *Macrourus*, and another of large size was unknown to us, approaching in many respects the genus *Mugil*. All the fishes were in a peculiar condition from the expansion of the air contained in their bodies. On their relief from the extreme pressure, their eyes especially had a singular appearance, protruding like great globes from their heads.

After this first attempt we tried the trawl several times at depths of 1,090, 1,525, and finally 2,125 fathoms, and always with success.

Several fishes, most of them allied to *Macrourus*, were added to the list. Several decomposed crustaceans, and among the lower crustaceans at 1,090 fathoms, a gigantic amphipod, of the family Hyperina, allied to *Phronima*. The eyes of this creature are very remarkable, extending in two great facetted lobes over the whole of the anterior part of the cephalo thorax, like the eyes of *Aegina* among Trilobites. This crustacean, which is three and a half inches in length, makes a splendid drawing, and reminds one of the old Eurypterids, is in process of description at the hands of Dr. von Willemoes Suhm.

Mollusca are very scarce in deep water, and our catches have hitherto been chiefly confined to such things as the species of *Nucula*, *Leaa*, *Verticordia*, &c., familiar through the deep dredgings of the *Porcupine*. Among the molluscoids a haul in 1,525 fathoms gave us a lovely thing, a bryozoan forming, out of branches closely resembling those of *Accromarchis neritina*, a graceful cup, the bases of the branches united by a transparent stem between two and three inches high, like the barrel of a quill, or the stem of a claret glass. This genus, which presents a general character totally different from anything hitherto known among recent Bryozoa, I mean to dedicate to Captain Nares, as an early recognition of the confidence and esteem which he has already fully gained from the scientific staff. *Naresia cyathus* certainly recalls, in a most singular way, the Cambrian *Dictyonema*, a form which I had, however, hitherto been inclined to refer to the Hydrozoa.

The Echinoderms have yielded some exceedingly interesting species to the trawl; among them several examples of the beautiful little urchins, of which one specimen was taken by Count Pourtales, in the Straits of Florida, and described by Alexander Agassiz under the name of *Salenia varispina*. It is undoubtedly a true *Salenia*, and to an advocate of the doctrine of the "continuity of the chalk," it is pleasant to see in the flesh this little beauty, which has hitherto been reckoned among the lost tribes.

Among the star-fishes two species of the genus *Hymenaster* have occurred, and the ophiurids are well represented chiefly by large examples of several species of the genus *Ophiomusium*.

All the hauls of the trawl, down to 2,125 fathoms, have yielded many specimens of a singular Holothurid, of which a description will shortly be published by Mr. Moseley. The animal is of a rich violet colour. Like *Psolus*, it has a distinct ambulating surface, with a central double line of water-feet. The body cavity is small, but the perisom is represented by an enormously thick layer of jelly, which rises on either side of the middle line of the back into a series of rounded lobes, each perforated for the passage of an ambulacral tube and corresponding therefore with an ambulacral foot. The upper pair of vessels of the trivium send out series of leaf-like sacs, richly loaded with pigment, which fringe on either side the ambulatory disc, and appear to be chiefly concerned in the function of respiration.

Sea-peas and Gorgoniæ have occurred frequently, always remarkable for their brilliant phosphorescence. Captain Maclear is giving special attention to this beautiful phenomenon. A *Mopsea*, which shone very brilliantly, gave a spectrum extending from the green well on into the red, while *Umbellularia* gave a very restricted spectrum sharply included between the lines *b* and *D* of this wonderfully rare sea-pea. We took with the trawl a very fine specimen, with a stem 3 ft. long, at a depth of 2,115 fathoms off Cape St. Vincent.

As usual in deep-sea work sponges preponderated, and the order has added several novelties, chiefly referable to the ventriculite group, the Hexactinellidæ.

Some fine new species of *Aphrocallistes* came up along the coast of Portugal, and off St. Vincent; with many spicules and more or less mutilated examples of *Hyalonema*, two or three species in fair condition of a species of *Euplectella*, with spicules which I cannot distinguish from those of *Euphalelles aspergillum*—the Venus flower-basket of the Philippines. The form of the two sponges is the same, but our own specimens are quite soft, the spicules not fused into a continuous siliceous network.

The physical and chemical observations will be fully detailed hereafter. The temperatures off the Coast of Portugal corresponded very closely with those taken in the *Porcupine* in 1870, and the *Shearwater* in 1871, below the first 100 fathoms through which at this season the temperature is nearly uniform. WYVILLE THOMSON

PROF. FLOWER'S HUNTERIAN LECTURES

LECTURES X. XI. XII.

THE fossil *Dasyopodida*, or their existing allies, are found in America only. They may be divided into two classes, those closely resembling existing species, and those differing considerably from them. Most of the former have only been obtained in a fragmentary state; they have been studied by Lund; one was peculiar in having the teeth compressed from before backwards, instead of laterally. The latter class includes a well-known form, *Glyptodon*, of which there are several species, and perhaps more than one genus. An exhaustive monograph is in course of publication by Burmeister on the genus, and the material he has at his command at Buenos Ayres is very large. In 1839 Prof. Owen was among the first to describe it, he did so from the specimen now in the Museum of the College, giving it the name by which we know it. The Danish naturalist, Dr. Lund, at about the same time gave the name *Hoplophorus* to the remains of a very similar animal, and Burmeister considers that there is sufficient difference between the two type specimens of these authors, that of the latter having one less hind toe, to justify the generic name proposed by each being retained. In *Glyptodon* the carapace is proportionately thicker and stronger than in existing Armadillos; it is composed of distinct pieces in contact at their edges, but not ankylosed, except in aged individuals; it is never hinged transversely, so the animal could not roll itself up. A horny epidermis undoubtedly covered the shield, and hairs may have been present, as foramina are frequently found. The scutes vary in shape in different species, and are of different sizes in different parts of the same individual. The tail formed a thick cylindrical scute-covered column, which in some cases was armed with spines and swollen near the tips, like a giant's club. An approach to this peculiar shape is seen in the existing *Chlamydo-phorus*. All known species have eight molars above, and the same number below on each side of each jaw, in a long straight, nearly parallel series, running very far back. The teeth all grew from persistent pulps, and were therefore long and slightly arched, with two deep flutings on each side, whence the name. In structure they were much as in the Armadillos, and the presence of the grooves caused the central harder osteodentine to assume a somewhat gridiron shape, which was sometimes much elaborated. The front of the skull was much truncated, and a strong ossified septum was often present. Burmeister thinks that the animal possessed a trunk. The brain was proportionately very small, the olfactory lobes and cerebellum preponderating. Much of the skull was occupied by air cells and the molar roots. The descending zygomatic process was very large, to give origin to the masseter muscle; it is absent or nearly so in the Armadillos; it may differ in character from that of the Megatherium, probably arising from the maxillaries, as it was