the shore, terminated by a road leading to the steam-boat pier, and at the end, on the land side, was a good-sized hotel, while between the shed and the lake were gardens with cottages and other buildings. Where once were houses and gardens there is now a kind of bay of the lake. It is as though a pit had been excavated parallel with the shore, which, about 120 metres wide at the water-side, extends inland from 60 to 80 metres, widening as it does so on the eastern side to about 150 metres. This "harbour" is bounded by a low cliff, which rises gradually from a little above the water's edge to a height of about four yards; the surface, however, instead of being occupied by vessels, is a scene of the wildest confusion: slabs of pavement here, a pile of bricks there, the broken framework of a roof with its displaced tiles, a group of beams, some trees yet living, in one place the wooded gable of a house, project from the surface of the water, which is covered thick with timber and floating debris. A sadder scene of ruin it would be difficult to imagine. On the land side, part of the pavement of the street yet crests the little cliff, displaced near its edge by a series of vertical faults, with a throw of a few inches. Below, large slabs, with the squared blocks still in contact, lie at various angles on a slope of rubbish which just rises above the water. Houses, cracked and shattered, with their fronts in some cases partially fallen, look down on the scene of ruin, and not a few more in the neighbourhood are so injured that they will have to be rebuilt. It is stated that thirty-eight buildings were destroyed in the actual landslip, of which twenty-five were inhabited houses.

The cause of the landslip is made obvious by examination of the sections which the broken ground affords. That beneath the broken street will serve as an example. Under the pavement for about a yard is a stony deposit, the upper part probably made ground, the lower resembling a coarse gravel. As is natural, it is difficult to decide where undisturbed ground begins: it is enough to call the whole a stony soil, many of the fragments being from the size of the fist to nearly as big as the head. Probably, however, the lowest foot has been little disturbed. Then comes about fifteen or eighteen inches of a well-stratified gravel—rather iron-stained, the pebbles not exceeding a couple of inches in diameter; under this is about the same thickness of a rather peaty silt—either an old soil, or part of the lake floor, on which aquatic plants have grown; for what seem to be dead rootlets are abundant. Then comes a thick mass of gray silt. It extends downwards below the level of the lake—probably to a depth of many metres. This it is which has been the prime cause of the catastrophe. The thick substratum of silt, at times little better than a quicksand, has always formed an unsafe foundation. Too heavy a load, either locally by building too large a house, or generally by building many smaller dwellings, any weakening of the cohesion of the mass, exceptional seasons,[1] may at any time suffice to pull the trigger of a weapon which, so to say, is always charged. It is doubtful whether this part of the town can ever be regarded as absolutely safe: at the same time there have been but three slips in four centuries and a half, and no doubt precautions will be taken to reduce the danger to a minimum. It is possible that the building of the esplanade has been the immediate cause. Prof. Heim, however, does not so regard it, though I cannot say that his arguments entirely satisfied me. However, this is certain, that of the completed building only a few feet were damaged; the frontage which slipped was that into which piles alone had been driven.

The most remarkable thing about the slip is that the displacement has been nearly vertical. There has been but little outward lateral movement of the ruined buildings. As Prof. Heim words it in the above-named report, "Ground which formerly was from 6 to 2 metres above the water is now from 2 to 6 metres below it." The silty substratum must have flowed outwards into the deeper water, or in some way been displaced laterally to allow of the surface thus sinking. In accordance with this it is stated that the piles driven for the new wall—which were fixed in the silt alone—were thrust outwards for distances of from 100 to 300 metres from the shore, and were pushed up above the level of the water. The catastrophe, then, cannot be numbered with the bergfalls, or even with the ordinary landslips, though perhaps an analogy may be established with some sea-side slipping of cliffs; but it is none the less lamentable, for, in addition to five deaths, many families have lost their all—goods, house, and even the site itself being destroyed; and great additional expenditure will be required before the neighbourhood can be regarded as safe.

T. G. BONNEY.

[1] It is stated that the weather changed on the evening of July 5; storms and rain succeeding to a long period of dry weather. At the time the "ground water" beneath the town was rather above, the lake rather below, its usual level.

THE NORWEGIAN NORTH ATLANTIC EXPEDITION.

NOT surpassed by the records of the Austrian Novara Reise, nor by those of our own *Challenger* Expedition, is the account of the Norwegian Expedition to the North Atlantic, the latest part of which is a Report on the Alcyonida, by D. C. Danielssen. Like the other parts of this Report the present forms a quarto or rather small folio volume, and contains over 160 pages of text with 23 plates and a map giving the details of the geographical distribution.

The author was one of the staff on board the *Vœringen*, and he now has the pleasure of describing the specimens collected, but he has not had the assistance of that excellent zoologist (Koren) whose able work on the Alcyonids of Norway had been executed in partnership with Danielssen, and whose death all those interested in natural science have to deplore.

The Alcyonids collected during the Norwegian Expedition are almost exclusively deep-sea forms; the depths varying from 38 to 1760 English fathoms. Among them there are no less than nine new genera, which all belong to the sub-family of the Alcyoninæ, with 33 new species, of which two belong to Clavularia, one to Sympodium, one to Nidalia, and the rest to the several new genera. There is also a new sub-family with a new genus and species described.

The author says quite truly, that, of all the large groups of the Alcyonaria, none have been treated more superficially by recent zoologists than that of the Alcyonids. No doubt there are many reasons for this; the delicacy of their structure, combined with the difficulties of their preservation in a state for minute investigation, has to some extent made their study a difficult one; and even the repeated endeavours of Mr. Danielssen to observe them in a recent state were unsuccessful. In regard to classification, the author for the moment follows that of Milne Edwards; in this we think he is correct, and we thoroughly agree with his reasons; for until the present material in the museums of Europe and America has been properly worked out, and much fresh material has been collected, any attempt to give a definite classification of the group will be so much lost labour.

In the diagnosis of the genera and species, especially of the latter, the form of the spicules, as well as their arrangement and position on the polyps, have been found of great value, though minuter histological details have not been used as much as they possibly will be in the near future. One very important and interesting fact is mentioned, viz. the discovery in a species of a new genus Vœringia of a nervous system. On the uppermost part

of the ventral surface of the œsophagus there is to be found a group of large ganglion cells containing extremely large nuclei with viscid protoplasm and prolonged filaments. Mention is also made of the grooves lined with long flagelliform cells, which, however, were some time since described by Hickson in a paper published in the Philosophical Transactions under the name of "Siphonoglyphe."

Another novel phenomenon was observed in a species of Nephthya, where several of the polyps seemed to be solely reproductive, and in them as soon as fertilization was effected, the tentacles became incurved over the oral aperture, which then became plugged with a viscid mucous, and apparently during the gravid period these polyps were nourished by the other polyps of the colony.

We must content ourselves with giving but a very brief summary of the forms described. The genus Vœringia is established for a series of branched Alcyonids with retractile polyps, in this differing from those of Duva; eight new species of this genus are described, to which also the *Alcyonium fruticosum*, Sars, is referred. Eight new species of the beautiful genus Duva are recorded. A new genus, Drifa, is established for an arborescent species, the spicules in which differ from those of both Vœringia and Duva; of the two species, one, *D. islandica*, exhibits an interesting structure; around the mouth and between its external opening and the base of the tentacles, there are eight little fringe-like protuberances, which form a ruff. An appearance of the same kind, only outside the circle of the tentacles, we have observed in a Plexaurid, but we are not certain but that it may be due to the sudden immersion of the polyps into strong spirits. For a graceful arborescent form with auto- and siphonozooids, which reminds us of Anthomastus, Verrill, the genus Nannodendron is proposed; the polyps are completely retractile. *Fulla schiertzi* is a new genus and species of another branching form with a somewhat flattened stem, showing a distinct bilateral symmetry, the branches only springing from the opposite sides of the main axis. Three new species of Nephthya are enumerated. For a species in which in addition to a well-marked siphonoglyphe there are also in the first part of the œsophagus two flap-like protuberances, the genus Gersemiopsis is made. The only species, *G. arctica*, was dredged in a depth of 658 fathoms. A new genus, Barathrobius, is made for two new species, in which the basal part of the colony is hard and often dilated, the polyps are retractile, appearing only, when fully withdrawn, as slight elevations above the mass of the branches. *Sarakka crassa* (n. g. et sp.) is a species with a very peculiar structure in its œsophagus, which seems to be constricted laterally into two independent portions; while *Crystallofanes polaris* is a form with few polyps on the stem but with a summit rich in polyps, borne on short branches which are placed in whorls round the stem; the polyps are retractile.

A new sub-family is made for a new genus and species *Organidus nordenskjoldi*; in this species the polyp cells are long, connected together so as to form an axis; these polyp cells are long, cylindrical, calcareous, with both the polyp body and its tentacles well provided with spicules. The author thinks that this sub-family shows some affinity to the Tubiporinæ, but it would appear to us to show more relationship to such forms as Gersemia and Eunephthya. *Clavularia frigida* and *Sympodium abyssorum* are described as new species.

This memoir is published in both Swedish and English, in parallel columns, for which the student cannot be too thankful; true, the English may strike the reader as a little quaint, and in the nomenclature of the spicules it is somewhat novel, but criticism would be out of place in the presence of so great a boon. The day is coming when a new classification of the spicules of the Alcyonaria must be made; at present, while new types are constantly being discovered, any such would be but premature, and we must be content with that laid down for us by Kölliker. Had the value of the labours of Valenciennes been properly appreciated, this might not now be the case. The almost overcrowded plates have been drawn by H. Bucher, Jun., with all that skill which we have before admired, though perhaps the drawings of the spicules convey too much the notion of their being perfectly solid.

We shall wait with great expectancy the publication of future memoirs of the other families of the Alcyonaria.

THE COLOURS OF THIN PLATES.[1]

THE physical theory, as founded by Young and perfected by his successors, shows how to ascertain the composition of the light reflected from a plate of given material and thickness when the incident light is white; but it does not and cannot tell us, except very roughly, what the *colour* of the light of such composition will be. For this purpose we must call to our aid the theory of compound colours, and such investigations as were made by Maxwell upon the chromatic relations of the spectrum colours themselves. Maxwell found that on Newton's chromatic diagram the curve representative of the spectrum takes approximately the simple form of two sides of a triangle, of which the angular points represent a definite red, a definite green, and a definite violet. The statement implies that yellow is a compound colour, a mixture of red and green.

In illustration of this fact, an experiment was shown in which a compound yellow was produced by absorbing-agents. An infusion of litmus absorbs the yellow and orange rays; a thin layer of bichromate of potash removes the blue. Under the joint operation of these colouring-matters the spectrum is reduced to its red and green elements, as may be proved by prismatic analysis; but, if the proportions are suitably chosen, the colour of the mixed light is yellow or orange. When the slit of the usual arrangement is replaced by a moderately large circular aperture, the prism throws upon the screen two circles of red and green light, which partially overlap. Where the lights are separated, the red and green appear; where they are combined, the resultant colour is yellow.

On the basis of Maxwell's data it is possible to calculate the colours of thin plates and to exhibit the results in the form of a curve upon Newton's diagram. The curve starts at a definite point, corresponding to an infinitely small thickness of the plate. This point is somewhat upon the blue side of white. As the thickness increases, the curve passes very close to white, a little upon the green side. It then approaches the side of the triangle, indicating a full orange; and so on. In this way the colours of the various orders of Newton's scale are exhibited and explained. The principal discrepancy between the curve and the descriptions of previous observers relates to the precedence of the reds of the first and second orders. The latter has usually been considered to be the superior, while the diagram supports the claim of the former. The explanation is to be found in the inferior brightness (as distinguished from purity) of the red of the first order, and its consequent greater liability to suffer by contamination with white light. Such white light, foreign to the true phenomenon, is always present when the thin plate is a plate of air inclosed between glass lenses. To make the comparison fairly, a soap film must be used, or recourse may be had to the almost identical series of colours presented by moderately thin plates of doubly-refracting crystals when traversed by polarized light. Under these circumstances the red of the first order is seen to be equal or superior to that of the second order.

[1] Abstract of Lecture delivered by Lord Rayleigh at the Royal Institution on March 25, 1887.