

plan with the stern in the direction in which west is on the map. I constructed the orientation of the passageway and of the state-room accordingly. It happened, that, when I joined the ship, her stern was towards the east; but, on descending into the cabin for the first time, I fixed the orientation to correspond to the one previously formed from the plan, forgetting at the moment that I was thus making a change of 180° .

VII. A universal law of the four cardinal directions is, that they always arrange themselves along visible lines, such as roads, boundaries of a room, etc.: in other words, the directions never subdivide themselves. In going along a new road which I know ought to bisect the angle between two directions, I can, by an effort of the will, imagine it to do so; but, the moment attention is relaxed, one cardinal direction is sure to take possession of the road, and of course, once in possession, keeps it: so, no matter how well I may know that the walls of a room are at an angle of 90° with the other walls of a building, the directions are sure to arrange themselves parallel to the walls.

It may be asked, How does this system work, in case of a number of rooms radiating like a fan from a central space? I answer, that in such a case my ideas of direction simply get unutterably confused, and only by long habit can I get the relations of the different rooms to each other.

SIMON NEWCOMB.

THE ARAGO LABORATORY AT BANYULS.

AMONG the zoological stations or laboratories along the coast of France, none is more widely known or more firmly established than the laboratory at Roscoff,¹ in Finisterre, organized in 1872 by Professor Lacaze-Duthiers as an adjunct of his zoological laboratory of the Sorbonne at Paris. Encouraged by the success of his laboratory at Roscoff, which during August, 1881, had twenty-five workers, but which, owing to its exposed position at the north-west extremity of France, was only available for work from March until October, at the most, Professor Lacaze-Duthiers sought to establish a winter laboratory on the Mediterranean, to furnish seaside work the remaining months of the year. After careful examination of the French coast of the Mediterranean, a location was chosen for the laboratory at the base of the rocky promontory of Fontaulé, at the entrance of the little harbor

of Banyuls-sur-mer, within a few miles of the Spanish frontier in the department of Pyrénées-Orientales.

The municipal council of Banyuls, through the mayor, M. Pascal, who took much interest in the establishment of the laboratory, offered a site for building, twelve hundred francs for immediate use, and an income of five hundred francs annually for twenty years; M. Thomas, a wealthy gentleman of Banyuls, offered two hundred and fifty francs annually for ten years, and a boat; the council of the department of Pyrénées-Orientales voted twenty thousand francs toward the construction of the laboratory; and subscriptions were received from the citizens of this rich wine-producing neighborhood. These were some of the means employed to induce Professor Lacaze-Duthiers to locate at Banyuls. Port Vendrès, a neighboring village, offered inducements to locate there; but the great number of fishermen in Banyuls, its nearness to the open Mediterranean, and its freedom from the distractions due to commercial and other activities, together with the earnest interest taken by its inhabitants in the laboratory, won the choice of that village. What a novel sight it would be, here in America, to see villages contesting for the honor of possessing a scientific laboratory! The Academy of sciences at Paris took the laboratory under its protection; and the establishment was called 'Laboratoire Arago,' to honor the name of the most distinguished *savant* of the Pyrénées-Orientales, a former member of the academy.

It is, of course, impossible to speak of much work already accomplished at the Arago laboratory, as one might describe studies completed at Roscoff; for the laboratory at Banyuls was scarcely finished in the winter of 1881-82, when, with another American and a French student, I had the pleasure of being one of the first to work within its walls: so I will write only of the region and of the laboratory.

The eastern end of the Pyrenees descends suddenly upon a north and south coast by a series of radiating ridges, between which are small indentations of the sea, forming harbors, with rocky promontories at each side of their entrances, and a sandy beach within. This kind of coast offers numerous advantages to those searching for marine animals. On each of the larger of the beaches are villages, most of which date back to Roman times. These villages were recently connected by a railroad which follows the coast, passing through tunnels between them.

Banyuls is situated upon one of these beaches, at the head of a small harbor, which is partly

¹ For a detailed account of the laboratory at Roscoff, with maps and plans, see *Revue scientifique*, Nov. 26, 1881, xxviii. 673-680.

protected from the open sea by a breakwater (seen in the middle of the first picture at the left of the laboratory), which extends from the promontory, at the base of which the laboratory is built, to a rocky island in the middle the entrance to the harbor. The village of Banyuls itself (seen in the other illustration, looking from the laboratory into the harbor) has about four thousand inhabitants. Behind the village the hills are clothed with vineyards, olive-groves, and cork-oak trees, nearly to their tops. To crown the view is the middle-age tower of Madeloth, or *Tour du Diable*, on a mountain six hundred and sixty-eight metres high. The village has two hotels, which are crowded with bathers during midsummer. In winter there are few amusements, and the hotels are then nearly empty. For a good concise description and history of this region, in which the Catalan dialect still prevails to a considerable extent, and the history of which is extremely interesting, I refer to Pierre Vidal's *Guide historique et pittoresque dans le département des Pyrénées-Orientales*, Perpignan, 1879. M. Vidal is the assistant librarian of the town of Perpignan, capital of the department.

The climate of Banyuls is sufficiently moderate to make a winter's stay very agreeable. Oranges, figs, cactuses, almonds, and even the date-palm with poorly developed fruit, are cultivated in the valleys. In the latter part of February, 1882, I waded along the beaches in search of mollusks, without finding the cold inconvenient. Snow rarely falls. The climate can be shown best by quoting a table for 1882, from Martinet,¹ as follows (*degrees in Centigrade*):—

| MONTH. | TEMPERATURE. | | | | | NUMBER OF DAYS OF | |
|---------------------|---------------|---------------|---------------|---------------|--------|-------------------------|-------|
| | EXTREMES. | | MEANS. | | | Rain. | Wind. |
| | Mini- mum. | Maxi- mum. | Mini- mum. | Maxi- mum. | Total. | | |
| January | 2.0 | 15.0 | 5.0 | 11.7 | 8.4 | 3 | 1 |
| February | 1.5 | 19.5 | 6.4 | 13.1 | 9.7 | 3 | 7 |
| March | 4.0 | 23.0 | 9.3 | 16.9 | 13.1 | 5 | 9 |
| April | 7.5 | 26.0 | 10.6 | 18.6 | 14.6 | 8 | 7 |
| May | 10.0 | 27.5 | 14.7 | 22.7 | 18.7 | 3 | 3 |
| June | 13.5 | 34.5 | 17.6 | 26.5 | 22.1 | 4 | 9 |
| July | 16.0 | 38.5 | 19.3 | 28.3 | 23.8 | 3 | 11 |
| August | 13.0 | 35.0 | 19.9 | 28.1 | 24.0 | 7 | 6 |
| September | 10.5 | 28.0 | 12.9 | 20.4 | 17.1 | 13 | 2 |
| October | 9.5 | 27.0 | 13.3 | 19.8 | 16.5 | 6 | 8 |
| November | 5.0 | 19.0 | 8.7 | 15.5 | 12.1 | 4 | 8 |
| December | 1.0 | 16.0 | 6.7 | 11.6 | 9.2 | 8 | 3 |
| Means of the year, | — | — | 12.1 | 19.4 | 15.8 | 67 | 74 |

¹ L. Martinet, Banyuls sur mer (*Rev. géogr. internat.*, April, 1883, 8e ann., 67).

The lowest temperature of which I find data was — 6° C., in January, 1871. The cold winds which sometimes descend from the mountains, blowing with considerable severity for one or two days at a time, are the only unpleasant climatological feature of the region.

I have been unable to find sufficient data in regard to the temperature of the sea-water at Banyuls. Martinet writes (*l. c.*, May, 1883, p. 85), "From the month of May the temperature of the sea is 18°; that of the air, in the shade, from 30° to 35°. In July and August the temperature of the water reaches 24° to 26°; then in September and October it descends from 22° to 18°."

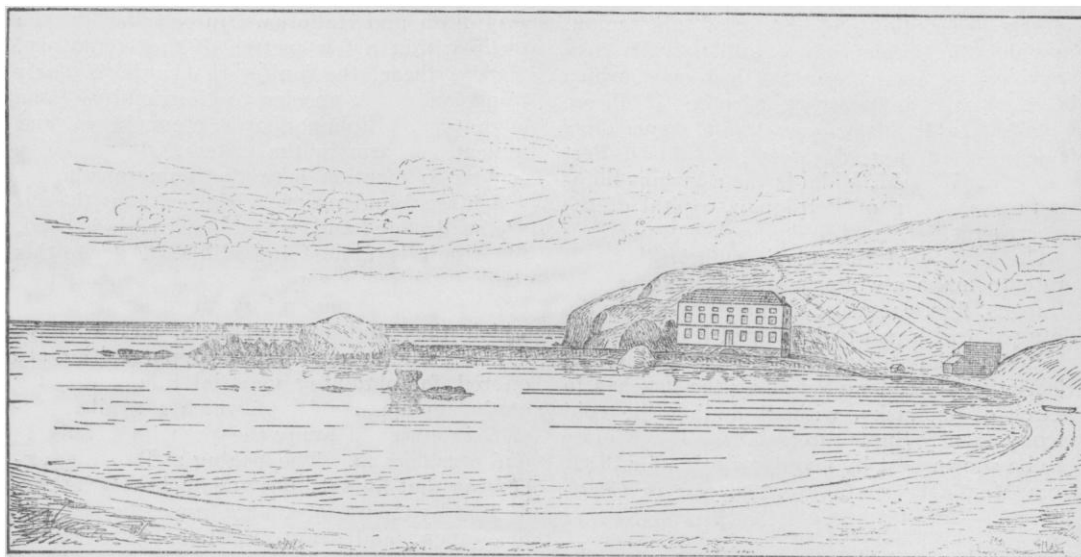
The marine fauna at Banyuls is very rich. Several species of corals and of actinias, and numerous species of interesting mollusca, such as Chiton and Haliotis, can be taken on the rocks within a few metres of the laboratory. Besides these, the janitor in charge regularly transplants new species to the vicinity of the laboratory. Siphonophores, ctenophores, and tunicates swarm in the waters. It would be useless to mention here the numerous forms which are found on every side without the aid of the dredge; and, when the dredge is used, the result is almost incredible. Add to this the habit already acquired by the fishermen of bringing to the laboratory all curious animals which they find in their nets, and we have a place where unsurpassed opportunities are offered for obtaining material in quantity for study, an opportunity of which I availed myself, in order to study the parasites of fishes and crustaceans. The fishing at Banyuls, excepting that for sardines and anchovies, is carried on by the use of a large funnel-shaped net, held open, and drawn through the water by two boats, which stand a distance apart. Numerous sharks and cephalopods, — both eaten by the people at Banyuls, — and sometimes sunfishes (*Orthogoriscus*) and other large fishes, are taken in these nets, besides smaller fishes by thousands.

About fifty fishing-boats, like those seen in the second illustration, leave Banyuls early every pleasant morning, returning about five o'clock in the afternoon, when the fish are spread out for sale along the beach. This mode of sale is a convenience for the naturalists as well as for the townspeople: on the contrary, in fishing-places near large cities, the fish are hurried aboard the trains, leaving no opportunity for their examination. The fresh entrails of fishes can be examined by thousands on the beach at Banyuls, for parasites or for anatomical purposes.

The terrestrial and aerial fauna offers abundance of water-birds, lizards, geckoes and insects, scolopendra and scorpions.

The Arago laboratory is a brick and stone building, about forty metres long and ten metres wide, facing nearly northward. The illustration is a view of the laboratory looking nearly southward from the village. The ground-floor of the laboratory is devoted to a small room for the janitor, another for apparatus, and to a large room for aquaria. In the centre of the last room is a large oval aquarium, and about the room are smaller aquaria to be devoted to special purposes. The water from these aquaria passes out of the front of the building, and supplies other aquaria in the open air. It is,

his room, the worker has upon his right a table for drawing; in front, toward the large window, — which, with the climate of Banyuls, can be open much of the time, — is a table for his microscope and apparatus; at his left, a table for specimens. Turning to his right, the investigator can write his notes and draw, free from the danger of water from his larger specimens. This arrangement of tables in three sides of a square, with a revolving-chair at the centre, is an idea original, as far as zoölogical laboratories are concerned, with Professor Lacaze-Duthiers; and, after having used for a time tables thus arranged, one never is exactly at ease when they are placed otherwise. As if these were too meagre furnishings for each



ARAGO LABORATORY, SEEN FROM BANYULS.

however, upon the first floor that the arrangements made by Professor Lacaze-Duthiers attain the maximum of convenience. A hall runs lengthwise through the middle of the laboratory; and from this hall open out at each side the separate rooms, consisting of a store-room for glassware, a lecture-room, a library, a room for the director, and nine rooms for work. Instead of having a table, as is the usual mode in laboratories, each worker has a room (four metres square) to himself, wherein he can carry on researches undisturbed by his neighbors. As the laboratory is intended for advanced students pursuing original investigations, this provision is of special importance. Sitting on a revolving-chair in the middle of

room, another table, a bookcase with drawers, and shelves, are added. A flowing supply of salt water will be, or probably is already, available for small aquaria in each of these work-rooms. Three of the rooms have chimneys, and are more especially desirable for physiological researches. The second floor is not yet used, but probably will be ultimately partitioned into sleeping-rooms for those who work in the laboratory.¹

The laboratory possesses already, besides two rowboats for collecting along the indentations of the coast, a new boat of the same general construction as are the fishing-boats of

¹ For a detailed description and plans of the Arago laboratory, see the *Revue scientifique*, Dec. 3, 1881, xxviii. 705-715.

the region, with a lateen-sail, but considerably larger for long voyages. This boat is commanded by an experienced fisherman of Banyuls, who is conversant with the whole neighboring coast.

The almost entire absence of rise and fall of the water at Banyuls at first puzzles a collector of marine animals accustomed to searching the rocks bared by the receding tide: but one soon finds other and equally productive modes of shore-collecting; while the very absence of great variation in the level of the water enables one to moor boxes of embryos along the inside of the breakwater, and watch their development at leisure.

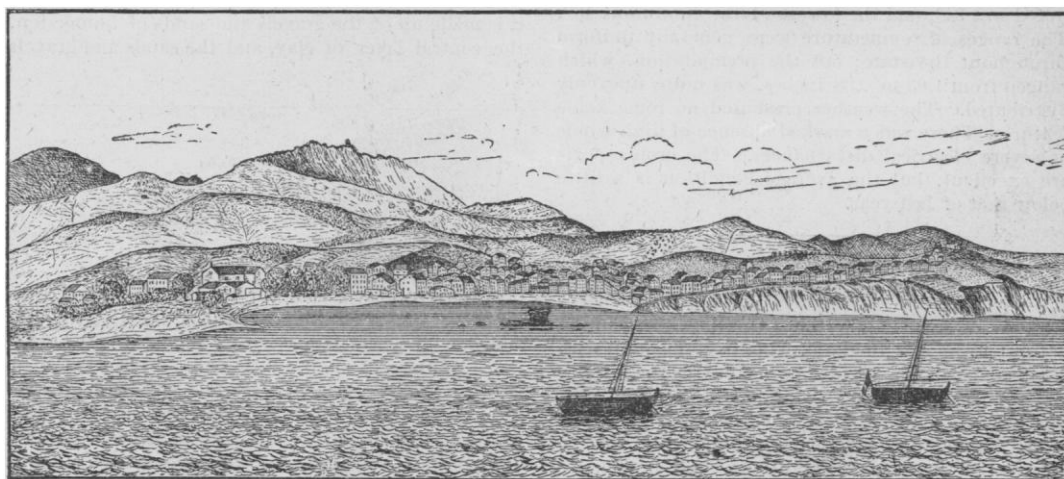
The expenses of living in Banyuls are about what they would be in a village of the same

AUGUST REPORTS OF STATE WEATHER-SERVICES.

THE states in which organized weather-services exist have issued reports for August which give in some detail the results of the observations. The special feature of the month in the majority of states seems to have been the lack of rain, and the consequent drought.

Georgia. — The temperatures ranged from 47° to 98°: the mean was 79°.3. The rainfall ranged from 1.01 inches in the south-west to 9.15 inches in the south-east. The general drought of the summer was unbroken. The cotton and corn crops do not average 75 % of the usual yield.

Indiana. — Thunder and lightning were unusually prevalent, but the rainfall was at least one inch less than the average. The temperatures were lower than usual, and light frosts were reported on the



BANYULS AS SEEN FROM THE LABORATORY.

size on the New-England coast; but the laboratory, like that at Roscoff, is free, requiring for its use only the permission of Professor Lacaze-Duthiers. Reagents, microscopes, mounted dissecting-lenses, glassware, and all other necessary apparatus, are furnished free, the only cost being a small fee paid to the janitor for the care of rooms. While, in all probability, preference would be rightly given to Frenchmen, in case there were more applicants for places than there were rooms, yet foreign investigators will undoubtedly play an important part in the laboratory at Banyuls, as they have already done in that at Roscoff, and will return to their native countries vividly impressed with the liberality and devotion to science shown by Professor Lacaze-Duthiers.

GEO. DIMMOCK.

24th and 25th. The pressure was nearly normal, with a small range.

Iowa. — "The month was cold, clear, dry, with north-westerly and south-easterly winds equally frequent, and calms numerous." The low mean temperature, 2°.5 below the normal, is mainly due to the first decade; but in this period the sunshine was especially intense. The number of fine days, and the dry, sunny weather, have been favorable to the crops. Frosts were recorded on the 22d, 23d, and 24th. There was a very severe hail-storm on the 7th, extending from Sac to Cass counties.

Missouri. — The mean temperature was below the normal, at St. Louis 2°.3 lower. The rainfall was less than the average, the amount at the central station in St. Louis being not much more than half the usual quantity. The heaviest rainfall was on the southern border of the state. In consequence of the continued drought, the crops have suffered much. A few wind and hail storms were reported.