and experiments were made to determine suitable methods of staining.

M. X. Sullivan, Ph.D., instructor in chemical physiology, Brown University, investigated the physiology of digestion in the common dog-fish.

Francis Bertody Sumner, Ph.D., instructor in zoology, College of the City of New York, and director of the laboratory, was occupied with (1) work upon the biological survey of the marine fauna and flora of the vicinity of Woods Hole (*see above*), (2) the card catalogue record of local species (*see above*), (3) experimental and statistical studies of various fishes with reference to adaption and selection. In the experimental part of this work, Dr. Sumner was assisted by Mr. D. W. Davis, in the biometric part by Messrs. Davis, Metcalf, Morse and some other assistants.

E. E. Watson, student in Iowa University, was engaged in biometric studies of various local crabs.

Chas. B. Wilson, A.M., professor of biology, State Normal School, Westfield, Mass., carried on studies of parasitic copepods, both living and preserved material being used. Many interesting facts relating to the ecology of these parasites, some of possible economic value, were discovered. In a number of cases the life history was traced partially or completely. A considerable number of new species were found. Professor Wilson likewise prepared an extensive set of records of local parasitic copepods for incorporation into the faunal catalogue.

Commissioner G. M. Bowers, Dr. B. W. Evermann, chief of the Division of Scientific Inquiry, and Mr. E. L. Goldsborough, assistant in that division, likewise spent portions of the summer at the station; and the hospitality of the laboratory was extended to Mr. Chas. R. Knight, the well-known animal painter, and to Mr. S. F. Denton, the illustrator and taxidermist.

Francis B. Sumner.

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*ALBATROSS EXPEDITION TO THE EASTERN PACIFIC.**

II.

We left Callao for Easter Island Saturday afternoon, December 3; as far as 90° west longitude we remained in the Humboldt current, as we could readily see from the character of the temperature serials and from the amount of pelagic life we obtained from both the surface and the intermediate hauls. This current also affected the bottom fauna, which was fairly rich even as far as 800 miles from the shore while we remained within the limits of the northern current. As soon as we ran outside of this the character of the surface fauna changed; it became less and less abundant as we made our way to Easter Island, the western half of the line from Callao becoming gradually barren. This current also affected the deep-sea fauna to such an extent that towards Easter Island, at a distance of 1,200 to 1,400 miles from the South American continent, our trawl hauls were absolutely barren; the bottom for the greater part of the line was covered with manganese nodules on which were found attached a few insignificant siliceous sponges, an occasional ophiuran, and a few brachiopods or diminutive worm tubes, the same bottom continuing to Sala y Gomez and between there and Easter Island. Sala y Gomez and Easter Island are connected by a ridge, on which we found 1,142 fathoms near Sala y Gomez, and 1,696 fathoms between that point and Easter Island. The ridge rises rapidly from about 2,000 fathoms, the general oceanic depth within about

* Extract from a letter of Mr. Alexander Agassiz to Hon. George M. Bowers, U. S. Fish Commissioner, dated Chatham Island, Galapagos, January 6, 1905.

100 miles, to over 1,100 fathoms within a comparatively short distance from both Sala y Gomez and Easter Island.

The southern part of our line from Easter Island to the Galapagos shows all the features characteristic of the western part of the line from Callao to Easter Island; like the latter, as far as the twelfth degree of southern latitude, it proved comparatively barren, the bottom consisting of manganese nodules to within about 250 miles of the Galapagos. The pelagic and intermediate fauna from Easter Island to 12° south latitude was very poor, and the serial temperatures show that we were outside and to the westward of the great Humboldt current. But near the twelfth degree of southern latitude a sudden change took place; the pelagic and intermediate fauna became quite abundant again, and soon fully as rich as at any time in the Humboldt current. There was also a marked change in the temperature of the water as indicated by the serials, showing that from the twelfth degree of southern latitude to the Galapagos we were cutting across the western part of the Humboldt current. The great changes of temperature which took place in the layers of the water between 50 and 300 fathoms are most striking, and show what a disturbing element the great mass of cold water flowing north must be in the equatorial regions of the Panamic district to the south and to the north of the Galapagos. South of the Galapagos the western flow of the Humboldt current must be nearly 900 miles wide, and of about the same width when running parallel to the South American coast.

The range of temperatures between 30 fathoms and 150 fathoms is at some points as great as 21°. Such extremes can not fail to affect the distribution of the pelagic fauna, and may account for the mass of dead material often collected in the intermediate tows at depths of less than 300 fathoms, when the range becomes as great as 28°. Such a range of temperature is far greater than that of the isocrymic lines which separate coast faunal divisions. The bottom fauna, as we entered the Humboldt current going north, gradually became richer in spite of its being covered with manganese nodules.

The two lines centering at Easter Island developed the Albatross Plateau indicated on the *Challenger* bathymetrical charts, on the strength of a few soundings reaching from Callao in a northwesterly direction and of a couple of soundings on the twentieth degree of latitude. The Albatross Plateau is marked as a broad ridge separating the Buchan Basin from the deep basin to the westward, of which Grey Deep and Moser Basin are the most noted areas.

Our line from Easter Island to the Galapagos showed a wonderfully level ridge, varying in depth only from 2,020 to 2,265 fathoms in a distance of nearly 2,000 miles. The soundings we made to the eastward from the Galapagos to the South American coast, and to the westward of Callao, as well as on the line from Callao to Easter Island, all indicate a gradual deepening to the eastward to form what the *Challenger* has called the Buchan Basin, with greatest depths of 2,400 to over 2,700 fathoms, and passing at several points near the coast to Milne-Edwards Deep, Haeckel Deep, Krümmel Deep and Richards Deep, some of them with a depth of over 4,000 fathoms. According to the *Challenger* soundings the Juan Fernandez Plateau connects with the Albatross Plateau and forms the southern limit separating Buchan Basin from the Barker Basin to the south of the Juan Fernandez Plateau.

At Easter Island we found our collier awaiting our arrival. We moved from Cook Bay to La Pérouse Bay to coal, as there was less swell there than in Cook Bay,

where we could scarcely have gone alongside for this purpose.

Considerable shore collecting was done at Easter Island. We must have brought together at least thirty species of plants. The flora of Easter Island is very poor. There are no trees nor native bushes—not even the bushes which characterize the shore tracts of the most isolated coral reefs of the Pacific are found there; and yet some of the equatorial counter-currents must occasionally bring some flotsam to its shores. We collected a number of shore fishes and made a small collection of the littoral fauna. The fishes have a decided Pacific look, and the few species of sea-urchins we came across are species having a wide distribution in the Pacific.

While coaling, we spent some time examining the prehistoric monuments which line the shores of Easter Island. During our stay at La Pérouse Bay we visited the platforms studding the coast of the bay, and made an excursion to the crater of Rana Roraka, where are situated the great quarries from which were cut the colossal images now scattered all over the island, many of which have fallen near the platforms upon which they were erected. Near Rana Roraka, at Tongariki, is the largest platform on the island, about 450 feet in length, to the rear of which are fifteen huge images which have fallen from the pedestals upon which they once stood. The plain in the rear of the platform is crowded with stone houses, most of which are in ruins.

On our return to our anchorage at Cook Bay, we examined the platforms within easy reach of the settlement, and also the crater of Rana Kao, on the north rim of which, at Orongo, are a number of the stone houses built by the people who quarried the great stone images. At Orongo are also found sculptured rocks, but neither the sculptures nor the images show any artistic qualities, though the fitting of some of the cyclopean stones used in building the faces of the platforms indicate excellent and careful workmanship. To Mr. C. Cooper, manager of the Easter Island Company, we are indebted for assistance while visiting the points of interest of the island. He was indefatigable in his exertions in our behalf.

We took a number of photographs during our stay, illustrating not only the prehistoric remains, but giving also an idea of the desolate aspect of Easter Island during the dry season.

We arrived at Wreck Bay, Chatham Island, Galapagos, on the third of January, where we found a schooner with a supply of coal. As soon as the ship has been overhauled and coaled we shall start for Manga Reva, where we ought to arrive the last days of January. We reached Chatham Island towards the end of the dry season. Everything is dried up, the vegetation seems dead with the exception of a few small wild cotton plants, weeds, cactus and an occasional mimosa; and the great barren slopes present fully as uninviting an aspect as when Darwin described them. When the *Albatross* visited the Galapagos in March, 1891, everything was green, presenting a very marked contrast to its present desolate appearance.

Alexander Agassiz.

SCIENTIFIC BOOKS.

Problems in Astrophysics. By Agnes M. Clerke. London, Adam and Charles Black; Agents in America, The Macmillan Co. 1903. Pp. xvi + 567, with 81 illustrations. $6.00 net.

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