the forest proper. Other introductions, some of which are extremeiy abundant, may be briefly noticed. The beautiful *Orcus chalybeus*, from Australia, is now widely spread and very common, feeding on *Lecanium*, *Pulvinaria*, *Diaspis*, &c. *Rhizobius ventralis*, Muls., from China and Ceylon, attacks that most abundant scale *Lecanium longulum*, and other species. *Chilocorus circumdatus*, from China and Ceylon, breeds freely on scales in Honolulu. Trees literally covered with *Mytilaspis* were entirely cleaned. Even the old dry scales were turned over in the search for food. *Platyomus lividigaster* has bred freely on orange *Aphis* in the city. *Scymnus debilis*, which in California feeds on *Dactylopius*, has become entirely naturalised. Other introductions, which have bred in the Islands, are *Chilocorus bivulnerus*, *Leis conformis*, *Synonyche grandis*, and *Novius Koebelei* (Fig., Rep. on Import. of Par. and Pred. Ins., by State Board of Horticulture, Sacramento, 1892.) There is little doubt that[1] other introduced species will turn up, when the city gardens and suburbs are systematicallysearched. Before the introduction of the species above mentioned, the only known Hawaiian *Coccinellidæ* were a few species (probably endemic) of *Scymnus* and *Coccinella abdominalis*, the latter, no doubt, accidentally imported from America many years ago. Unfortunately this species is attacked by a hymenopterous parasite, a *Braconid*, *Centistes americana*, Riley, which may interfere with the splendid work of *C. repanda*. The presence of this parasite is the more to be deplored, as such care was taken to exclude parasitised specimens when the introductions were made. This was very necessary, as the ladybirds seem very liable to the attack of parasitic Hymenoptera, especially the Australian species.

It is very pleasing to be able to refer to such successful results in the Hawaiian Islands, as in the United States Mr. Koebele's work has met with a good deal of adverse criticism. But it is not only by the introduction of ladybirds that Mr. Koebele has done such signal service, for he has had many other insect pests to contend with, which it is beyond the power of these to affect, attacking, as they do, but a very small portion of the insect world. In many parts of the islands, the bananas and palm-trees have been severely attacked by the larva of a species of *Pyralidina*. There is little doubt that in course of time this plague will be entirely kept under by a fine Chalcid (*Chalcis obscurata*, Walk.), introduced from China and Japan, which has already multiplied enormously at the expense of these caterpillars—so much so, indeed, that in many localities the trees have now entirely recovered. Again, within the last few years a Lamellicorn beetle (*Adoretus umbrosus*) has been introduced from Japan. This insect speedily multiplied prodigiously, and soon destroyed nearly every rose-tree in Honolulu, and subsequently attacked the foliage of many other trees. The cultivation of roses—once a feature of the city—became impossible, while a remedy seemed hopeless. One day, however, Mr. Koebele discovered a parasitic fungus, and by cultivation of this, and infecting healthy beetles, soon spread it far and wide. Whether the fungus will prove entirely effective is not at present certain, but in any case it will be a most useful aid. The writer has seen the ground under trees which were attacked, literally strewn with dead beetles—all killed by the fungus—and beneath the surface of the soil the larvæ had likewise perished. It is at least certain, therefore, that myriads of the beetles were destroyed very shortly after the fungus was spread around by the individuals that had been infected.

It becomes natural to ask why the success of the imported beneficial insects has been so pronounced here, while in other countries it has been attained in a comparatively small measure. The reason, I think, is sufficiently obvious. The same causes which have led to the rapid spread and excessive multiplication of injurious introductions, have operated equally on the beneficial ones that prey upon them. The remote position of the islands, and the consequently limited fauna, giving free scope for increase to new arrivals, the general absence of creatures injurious to the introduced beneficial species, and the equability of the climate, allowing of almost continuous breeding, may well afford results which could hardly be attained elsewhere on the globe. The keen struggle for existence of continental lands is comparatively non-existent, and, so far as it exists, is rather brought about by the introduced fauna than by the native one.

In conclusion, I cannot help turning to the darker side of the picture. What will be the result of all these importations on the endemic fauna? The introduction of many other species—parasitic and predaceous—is contemplated, and will be performed. That success, from an economic point of view, will be attained there is little doubt, and while industries are threatened, or even the gratification of æsthetic tastes, it is certain that no consideration will be given to the native fauna. When even now the ladybirds are affecting the latter, what will be the result of the introduction of more widely predaceous species? The effect of the former is not imaginary, but proven. In June 1895, in a lovely forest in Hawaii—5000 feet above sea-level—I found the native trees much affected by a black *Aphis*. By beating these trees the blight came down in abundance, and amongst them various fine species of endemic *Chrysopa* and *Hemerobius*, predatory creatures. One or two introduced ladybirds were also noticed. By September the ladybirds were in thousands, the blight and native insects in small numbers. In August 1896 not an *Aphis* was to be found, and only one or two stray specimens of ladybirds, as one may find anywhere throughout the forests. They had done their work and disappeared. This is a high testimonial as to the capabilities of the beetles, and as the existence or non-existence of Hawaiian *Chrysopa* is not likely to be regarded by people at large, and seeing that sooner or later the greater part of this most interesting native fauna is, under any circumstances, in all probability doomed to extinction, it only remains to wish Mr. Koebele a success in the future equal to that which he has already attained.

Honolulu, H.I., November 1896. R. C. L. PERKINS.

[1] Since writing the above several other species have been found, which have evidently bred in the country.

MARINE ORGANISMS AND THE CONDITIONS OF THEIR ENVIRONMENT.[1]

THE ocean may be divided into two great biological regions, viz. the superficial region, including the waters between the surface and a depth of about 100 fathoms, and the deep-sea region extending from the 100 fathoms line down to the greatest depths. The superficial region may be subdivided into two provinces, viz. the shallow-water or neritic province around the land masses where the depth is less than 100 fathoms, and the pelagic province, embracing the superficial waters of the ocean basins outside the 100 fathoms line; these two provinces contrast sharply as regards physical conditions, which are of great variety in the neritic province, and very uniform over wide areas in the pelagic province.

Temperature is a more important factor in determining the distribution of marine organisms, mostly cold-blooded, than in the case of terrestrial species, mostly warm-blooded and air-breathing animals, the distribution of which depends rather upon topographical features than upon climatic conditions.

A map was exhibited showing the range of temperature in the surface waters of the ocean all over the world, and indicated northern and southern circumpolar areas with a low temperature and small range (under 10° F.), and an almost circumtropical area with a similar small range but high temperature; in temperate regions the range is greater, the areas of greatest range (over 40° F.) being found off the eastern coasts of North America and of Asia and south of the Cape, due to the mixture of currents from different sources, which sometimes causes the destruction of enormous numbers of marine invertebrates and fishes.

The pelagic tropical waters of the ocean teem with various forms of life, of which probably 70 to 80 per cent. function as plants, converting, under the influence of sunlight, the inorganic constituents of sea-water into organic compounds, thus forming the original source of food of marine animals both at the surface and at the bottom of the sea.

The number of species living in the pelagic waters of the tropics may greatly exceed the number in polar waters, where, on the other hand, there is often a great development of individuals, so that there is probably a greater bulk of organic matter in the cold polar waters than in the warm tropical waters. The rate of animal metabolism is slower at a low than at a high temperature, and organisms inhabiting tropical waters probably pass through their life-history much more rapidly than similar organisms living in polar regions. Carbonate-of-lime-secreting organisms are most abundant in the warm tropical waters, decreasing in numbers towards the polar regions, and it has been shown that the precipitation of carbonate of lime from solution in sea-water takes place much more rapidly at a high

[1] An address delivered at the Royal Institution by Dr. John Murray, F.R.S.

temperature. The pelagic larvæ of bottom-living species are always present in the warm surface waters of the tropics, sometimes growing to an enormous size; but they are absent from the cold polar waters and in the deep sea, where the majority of the bottom-living species have a direct development.

The Arctic fauna and flora, both at the surface and at the bottom, resemble the Antarctic fauna and flora, and a large number of identical and closely-related species are recorded from the two polar areas, though quite unknown in the intervening tropical zone.

The boundary line between the deep-sea region and the neritic province is marked out by what has been called the "mud-line," where the minute organic and inorganic particles derived from the land and surface waters find a resting place upon the bottom, or serve as food for enormous numbers of crustacea, which in their turn are the prey of fishes and the higher animals; this mud-line, in fact, appears to be the great feeding-ground in the ocean, and its average depth is about 100 fathoms along the borders of the great ocean basins.

The majority of deep-sea species are mud eaters; some are of gigantic size; some are armed with peculiar tactile, prehensile, and alluring organs; some are totally blind, whilst others have large eyes and are provided with a kind of dark lantern for the emission of phosphorescent light. The deep-sea fauna does not represent the remnants of very ancient faunas, but has rather been the result of migrations from the region of the mud-line in relatively recent geological times.

The *Challenger* investigations show that species are most abundant in the shallow waters near land, decreasing in numbers with increasing depth, and especially with increasing distance from continental land.[1] This is true as a general rule, especially of tropical waters, but in polar regions there are indications of a more abundant fauna in depths of 50 to 150 fathoms than in shallower water under 50 fathoms.[2]

The various points touched upon regarding the distribution of marine organisms, might be explained on the hypothesis that in early geological times there was a nearly uniform high temperature over the whole surface of the globe, and a nearly uniformly distributed fauna and flora; and that with the gradual cooling at the poles, species with pelagic larvæ were killed out or forced to migrate towards the tropics, while the great majority of the species which were able to survive in the polar areas were those inhabiting the mud-line. The uniform physical conditions here referred to might be explained by adopting the views of Blandet[3] as to the greater size and nebulous character of the sun in the earlier ages of the earth's history.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. J. N. Langley, F.R.S., and Mr. A. C. Seward, Lecturer in Botany, have been appointed additional members of the Degree Committee of the Board for Biology.

Mr. F. F. Blackman, of St. John's College, has been appointed University Lecturer in Botany.

The special numbers of the *University Reporter* containing the Report of the Syndicate on Degrees for Women, and the speeches made in the three days' discussion thereupon in the Senate House, can be obtained (price 7*d*.) by application to the University Press, Cambridge.

DR. ALEXANDER J. C. SKENE, president of the Medical College of the Long Island College Hospital of Brooklyn, has received the degree of LL.D. from the University of Aberdeen, his native city.

MR. JOHN D. ROCKEFELLER has given 40,000 dollars to Mount Holyoke College, in Massachusetts. This is a college for women, which a few months ago met with heavy loss by the burning of its buildings.

MRS. E. A. STEVENS, widow of the founder of the Stevens Polytechnic Institute, has given to that Institute property valued at 30,000 dollars, since the quarter-century celebration held a few days ago.

[1] See "*Challenger* Reports," "A Summary of the Scientific Results," by John Murray, pp. 1430–1436, 1895.

[2] See Murray, "On the Deep and Shallow-Water Marine Fauna of the Kerguelen Region of the Great Southern Ocean," *Trans. Roy. Soc. Edin.*, vol. xxxviii. p. 343, 1896.

[3] *Bull. Soc. géol. de France*, sér. 2, t. xxv. p. 777, 1868.

IT is stated that M. Solvay, who owns large industrial establishments in the neighbourhood of Nancy, has given 100,000 francs to the university of that city, for the purpose of erecting a chemical and electrical laboratory.

THE Senate of the University of Glasgow have resolved to confer the honorary degree of LL.D. upon Mr. J. Wolfe Barry, C.B., F.R.S., President of the Institution of Civil Engineers, London; Prof. John M'Cunn, Professor of Philosophy in University College, Liverpool; and Prof. W. Ramsay, F.R.S., Professor of Chemistry in University College, London.

A BLUE-BOOK just published shows that the total amount expended by local authorities on technical education during the year 1894–5 was 737,809*l*. 5*s*. 4*d*.; and that the estimated total expenditure on technical education during the year 1895–6 was 793,507*l*. 17*s*. 7*d*. These amounts are exclusive of the sums allocated to intermediate and technical education under the Welsh Intermediate Education Act, and amounting to 42,861*l*.

THE following are among recent announcements:—Dr. Hans Lemke to be assistant at the meteorological and magnetic observatory at Potsdam; Prof. Simmara to be professor of physiological psychology in the Government School of Science at Madrid; Dr. E. Vischer, associate professor of botany at Bern, to be professor and director of the Botanic Gardens there; Dr. Ross to be curator of the Botanical Museum at Munich; Dr. J. Y. Mackay, professor of anatomy, to be principal of the University College, Dundee; Prof. P. Baccarini to be professor of botany in the University of Catania; Dr. O. Kruch to be professor at the agricultural experiment station in Perugia; Dr. W. Felix to be associate professor of anatomy in the University of Zürich.

A COMPARISON of the number of hours devoted to different departments in four Universities in the United States is made in *Science*. The following table shows the relative attention given to different branches of knowledge.

	Harvard.	Cornell.	Yale.	Princeton.
Classics	8·7	8·0	24·2	22·6
European languages	22·8	18·8	14·5	12·4
English	16·8	16·3	10·9	11·3
Political science	9·9	6·5	11·2	9·6
History	14·3	8·2	10·4	
Mathematics	4·4	6·6	9·6	19·4
Philosophy	6·1	7·7	8·9	8·6
Natural science	10·2	23·5	8·1	8·8

It is pointed out by *Science* that Yale and Princeton agree somewhat closely in the distribution of studies, except for the excess in mathematics at Princeton. Harvard and Cornell also agree to a considerable extent, but Cornell devotes one-fourth of the entire time (the figures refer to the academic department) to science. It is noteworthy that in the Senior year at Princeton, when the studies become elective, only 3·8 per cent. of the time is given to the classical languages, and 15·1 per cent. to natural and physical sciences. The classical languages evidently only hold their position at Yale and Princeton through compulsion. European languages tend to take their place in large measure with some gains by English and the sciences.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 4.—"The Palæolithic Deposits at Hitchin and their Relation to the Glacial Epoch." By Clement Reid, F.L.S., F.G.S., of the Geological Survey of the United Kingdom. Received February 15.

In continuation of the researches at Hoxne, communicated last autumn to the British Association, excavations and borings have been made at Hitchin, with the object of ascertaining whether the conclusions arrived at are supported by the study of a fresh locality. The results obtained at Hitchin are thoroughly in accord with those obtained at Hoxne. At each place brick-earth with Palæolithic implements can be proved to overlie the latest boulder clay of the district. At Hoxne the Palæolithic deposits were shown to be separated from the boulder clay by two distinct alluvial deposits, the newer of which yields an arctic flora, the older a temperate one. The arctic plants have not yet been discovered at Hitchin, but abundance of temperate species occur in the older alluvium.

At each locality the same story is told. Some time after the passing away of the ice the land stood higher than now, so that