

observation of December 3, the relative humidity of the air was 75 per cent., the wind calm, and the barometer, corrected to 32° and sea-level, 30.284 inches. On January 7, relative humidity was 76.5 per cent., wind faint; barometer 30.499 inches. The altitude of this station is 480 feet; lat. 54° N., long. 1°. 36 W. G. PAUL.

Corporation Observatory, Harrogate, March 24.

THE sun pillar described by your correspondents was very well seen from the railway between Netley (5.40) and Southampton (6 p.m.), and lasted, I think, more than half an hour. It was visible before and after sunset. The upper air at the time was remarkably calm; the morning had been foggy, and the morning of March 7 was also foggy on the ground. Observation of the upper clouds on the morning of the 6th, and at the time of the phenomenon, showed an extremely slow movement from the north-west, barely noticeable between telegraph wires overhead. At 9 a.m. on the 7th cirrus was moving very slowly from about north, and at noon from north-west.

R. RUSSELL.

Condercum, Alum Chine, Bournemouth, March 24.

THE accounts of this rather rare phenomenon (as it seems to be) come (so far) only from the south-west of England. It is, therefore, worth while adding the following as seen at Oxford by myself and friends:—

March 6, 6.18 p.m.—A vertical pillar of flame-coloured light, springing probably from the sun below the horizon, quite parallel-sided, about $\frac{3}{8}$ ° wide and 6° high, careful measurements, perfectly steady for the 10 minutes that we were able to look that way. We thought there was a condensation of light, as of a faint mock sun, about 4° above the horizon. It was fading off downwards appreciably at the last moment.

Littlemore, Oxford.

W. J. HERSCHEL.

If the phenomenon of so-called "sun pillars" can only obtain when the atmosphere is "quite free from convection currents . . . (which it seldom is)" [see NATURE, March 20], is it not reasonable to suspect that the thing seen on March 6 was *not* such an atmospherical phenomenon? since it was viewed east and west from Brighton to the Cornish coast and northwards to High Barnet and Carmarthen Bay, so far as has been already ascertained.

If the barometrical and thermometrical readings, wind velocities and directions over this wide area on the 5th, 6th and 7th inst. could be obtained, an examination of these would go far to settle the question. CATHERINE O. STEVENS.

Bradfield, Berks, March 31.

Sounds Associated with Low Temperatures.

THE whistling or squeaking of snow under foot at low temperatures is a familiar phenomenon to residents in such climates as that of Canada. The sound is in strong contrast to the crunching of snow at the freezing point.

I suspect that "walking about the sheds" in the letter quoted by Sir Wm. Preece (p. 487) means walking over snow-covered ground between the sheds. J. D. EVERETT.

11 Leopold Road, Ealing, March 29.

I HAVE, I think, frequently heard the sounds mentioned in the letter sent to you by Sir William Preece; but if the sounds I mean are the same as those there described they are not necessarily associated with low temperatures, though they would be more likely to be noticed when the ground is frozen. The sounds to which I refer are to be heard near palings or sheds made, as they frequently are, with overlapping boards. The explanation I have always supposed to be as follows:—If the ground is sharply struck, with the boot for instance, the sound thus made will be reflected back by the ends of the boards; as each of these ends is further from the listener than its neighbour, the echoes will come back at intervals depending on the distance of the observer from the paling and on the width of the boards; if the boards are of equal width, the echoes will come back with nearly equal intervals between them, thus producing a musical note. If the ground is frozen, the sharp sounds necessary will be produced when walking by one's boot

striking the ground; but the same sounds may be produced in dry weather and especially when walking on gravel. I have often observed the musical note, but never where such an explanation would not be possible. Wooden palings are not, however, necessary; I have heard the same thing when walking past iron palings, more particularly, as is to be expected, when the uprights have a square section. CHARLES J. P. CAVE.

Binsted, Cambridge, March 31.

CENTRAL AND SOUTH AMERICA.¹

CENTRAL AMERICA and the West Indies are attracting so much attention at present that a comprehensive description of them is of especial value to all who are watching the growth of political power in the New World. Hence we may welcome Mr. Keane's work, which, *inter alia*, treats of their history, physical geography, climate, flora, fauna, ethnology and industries, as well as of their financial and commercial statistics. The volume, although purporting to be a "new issue," might well claim to have no relation to the old one, edited, a quarter of a century ago, by the well-known naturalist H. W. Bates; for the knowledge of the region which has accumulated during the interval has been largely utilised, although not brought up to date in some important respects. Besides ten carefully executed maps, not overloaded and confused by unimportant names, the work contains numerous illustrations.

Mr. Keane opens his subject with a comprehensive chapter on the physical and biographical relations of the countries under consideration. "The present Central American mainland, like the Southern continent, formed, originally, a vast insular region, which was gradually consolidated in Tertiary and later times. It constituted a great archipelago, which stretched, for about 770 miles, in a south-easterly direction from Tehuantepec to Panama, and presented certain analogies to the West Indian insular world, with which it is in fact connected by at least two chains of islets, reefs, and partly or wholly submerged marine banks. . . . It is difficult to realise the fact that the 'American Mediterranean,' as the Gulf of Mexico and Caribbean Sea are often called, has a circuit from Cape Sable round to the Bahamas of no less than 12,000 miles. . . . The volume of water (the Gulf Stream) rejoining the equatorial current north of Florida strait, though relatively small, forms none the less a liquid mass about fifty-five miles wide and 450 fathoms deep moving at the rate of from two to six miles an hour, and is thus equivalent to as many as 300,000 rivers as copious as the Mississippi." It may be remarked that Maury is contented with giving the flow of the Gulf Stream through this strait as 1000 times the volume of the mighty river mentioned.

Mr. Keane discusses at length the ethno-geographical relations of the almost numberless tribes which have made the lands bordering the Gulf of Mexico and Caribbean Sea such an interesting study, and he concedes to the Toltec; Aztec and Maya peoples a high degree of civilisation. Most writers do the same, as they let their imagination revel in the romantic accounts of the conquest of Mexico and the descriptions of the ruins found from New Mexico to Panama; but it may be doubted if any of the tribes of Indians who occupied that region ever reached a higher grade than the "Upper Status of Barbarism" so admirably defined by Lewis H. Morgan in his "Ancient Society."

As to the Carib race, the cradle of which Mr. Keane rightly fixes in the heart of South America, they wandered north to the shores of the Caribbean Sea, to which they gave their name, and which recognised, throughout its

¹ Stanford's "Compendium of Geography and Travel" (new issue). "Central and South America." Vol. ii. Central America and West Indies. By A. H. Keane, F.R.G.S. Edited by Sir Clements Markham, K.C.B., F.R.S. Pp. xxiv+496. (London: E. Stanford.) Price 15s.

islands and coast lands, their all-conquering predominance. In fact the Carib, a born navigator, was the connecting link between North and South America, and freely navigated the Gulf of Mexico and the Caribbean Sea for purposes of war or trade.

Commenting on the "pre-Columbian cultered Toltecs of Mexico," the author shows how these were pushed aside or driven southward by the invasion of the Nahuas from the north, who extended their conquests, by the Pacific coast, into Guatemala and Yucatan, and "penetrated beyond this region into Nicaragua, everywhere founding settlements amid the surrounding aborigines." But the Nahuatlacá (Aztec) race really overran Central America as far south as the Isthmus of Panama.

Vasquez de Coronado, in 1564, met a cacique, Iztolin, on the southern shore of Almirante Bay, who conversed with him in the Nahua tongue; and Ferraz has shown that numerous existing geographical names in Costa Rica are of Nahua derivation. But Panama was probably a debatable ground between them and the Indians of Colombia, or between them and the Caribs who occupied and crossed the

isthmus and extended their raids to the Pacific coast of Colombia, which was populated by the Chocoamas. These, according to Codazzi, spoke Cueva, a mixture of Carib and Chocoama. That the Panama Indians were in communication with those of Nicaragua (which were, in turn, in contact with those of the Mexican tableland) is also proven by the first Spanish exploring expedition sent northward (1516) from the Pacific side of the isthmus, near which they found a large bay, where the Chinchiris Indians gave the information that there was a communication between the two oceans through a great interior lake (Nicaragua).

Mexico and the Central American states are passed in review by Mr.

Keane, and their history, geography, physical features, &c., receive such attention as is possible within the limits of the volume.

Regarding the history of the first, he says, "the endless revolutions and political disorders of all sorts which followed the War of Independence produce a sense of weariness accompanied by a feeling of surprise that the Mexican people could have ever recovered from such a succession of overwhelming calamities." This is true; but it would have been useful to state that almost all of these revolutions represented the struggle of the Liberal party to shake off the baneful grip of the Church, which, in 1827, had 150 convents scattered over Mexico, and, in 1833, held more than one-third of the country in mortmain. Moreover, Europe was responsible for aiding the clergy in the last grand struggle of the latter to retain their power, through the

establishment of an Imperial Government under Maximilian, backed by a French army. It was the most terrible and desolating war that Mexico ever saw; but the effort of the Church was a disastrous failure—the greatest of Mexicans, the Indian Juarez, was the victor, and the Constitution of 1857 and the Laws of Reform of 1859 remained triumphant, and became the basis of the subsequent remarkable progress of the country.

Quoting a careless writer, Matias Romero, Mr. Keane gives Mexico 15,000,000 inhabitants and estimates the whites at 19, the aborigines at 38 and the mixed at 43 per cent. of the population; but such statements are only based on personal judgment. I should be inclined to estimate the aborigines at at least one-half of the entire population. It is a question if the aboriginal blood is not stronger than the Spanish, and if it will not, in the long run, aided by climate and environment, *indianise* the latter, unless arrested from the north.

Remarking on the mineral wealth, Mr. Keane gives the total mintage of Mexico since 1537 at 706,000,000*l.* This is probably understated; the eminent statistician Miguel Lerdo Tejada, in 1853, in an elaborate statement, gave the total amount coined, from the conquest up to 1852, at 3,562,204,897 dollars (pesos), of which 110,000,000 dollars remained in the country. The amount exported did not include contraband shipments of uncoined silver, which were enormous.

It is impossible within the reasonable limits of a review to comment upon all the interesting and varied data contained in Mr. Keane's valuable book. Some of the countries, however, of which it treats have already outgrown it; Spanish America, with all its turmoil, moves faster than Europe. In speaking of the two principal Atlantic ports of Mexico, Mr. Keane says that below Tampico, "six miles above the mouth of the Panuco river, this is so shallow that vessels drawing over nine feet have to ride at anchor outside the bar"; and as to Vera Cruz, "there is no harbour at all. . . . Vera Cruz should certainly have been founded at Anton Lizardo, fifteen miles further south, which has the only good harbour in the Gulf." These statements should be modified somewhat; the bar of Tampico has been deepened, and admits ships drawing twenty feet of water. The total net register tonnage of vessels entering the port now exceeds that of Vera Cruz. The fine port works of the latter (enclosing an area of nearly a square mile) give safety for ships of heavy draught. As to Anton Lizardo, as a harbour, its safety against "northers" could only be assured by building a very long break-water on the reef which partially protects it and which is only visible at low water.

Reaching the Central American States, the author properly describes Guatemala as "almost an Indian republic." Here the population double their chances for the efficacy of prayer by worshipping at a Christian altar with images of their heathen deities hidden behind it. The physical features of the country, its products, character of its people and their Government are similar to those of the densely populated contiguous state of Salvador. Honduras, which has been the victim of financial deprivations from abroad rivalling in magnitude its almost unequalled natural resources, is well and vividly outlined. It is the richest in mineral wealth of all the Central American States. Nicaragua and Costa Rica are treated at some length. The former is distinguished by three physical zones:—(1) the Mosquito seaboard, partly of coralline (marine), partly of alluvial formation; (2) the uplands of the interior, with the Cordillera de los Andes forming part of the original continental framework, and extending from Mosquitia to the great depression which is now flooded by lakes Nicaragua and Managua; (3) the coastlands between the lakes and the Pacific, which are mainly of igneous origin and form a southern continuation of the Salvador volcanic system. . . . Thanks to a

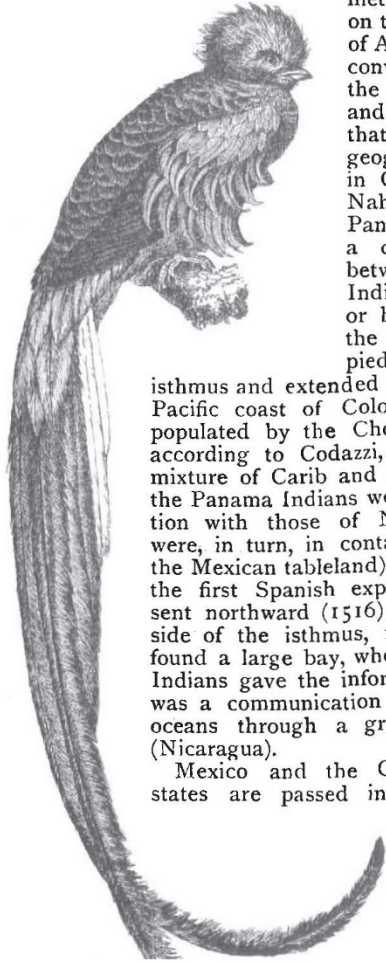


FIG. 1.—Quetzal.

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mean altitude of from 2000 to 3000 feet above the sea, the central uplands, including the Atlantic slopes of the Nicaraguan backbone, enjoy a relatively mild climate, generally healthy and suited for European settlement." Of Costa Rica, "probably 275,000, out of a total population of 294,000, have already been fused in a somewhat homogeneous Ladino element of Spanish speech and culture. As in Salvador and Nicaragua, the people are concentrated in the fertile and salubrious volcanic districts on the Pacific slope." Mr. Keane's description of the principal West Indian islands is admirable and varied, and enables the reader to understand their importance in the general movement of the world; but the voluminous publications of the United States Government, in 1900, relative to Cuba and Puertorico, might have been consulted with advantage. Saving the defect that much of the industrial, financial and commercial data are not brought up to date, the volume is an extremely useful and instructive compendium of the subjects of which it treats, and does great credit both to the publisher and the author. One of the illustrations is reproduced on the preceding page.

GEORGE EARL CHURCH.

THE MALDIVE AND LACCADIVE ARCHIPELAGOES.¹

FEW oceanic island groups are of greater interest to the students of the science of "distribution" than the Laccadives, Maldives, Chagos and Seychelles, since they appear to be the last remnants of a land connection between India and Madagascar. For instance, Dr. W. T. Blandford, in his presidential address to the Geological Society for 1890, after mentioning that there appeared to be evidence of deep water between the banks on which the above-mentioned islands are situated, proceeded to say that he believed a fuller knowledge of the contours would reveal the existence of a bank connecting the whole series from India to Madagascar. "Even should this not be case, the evidence of a land-connection appears so strong that it may be a question whether the whole of the ocean-bottom between Africa and India may not have sunk to its present depth since Cretaceous times."

In addition to this special point of interest, the coral-reefs of the Maldives, Laccadives and Ceylon have an interest of their own in regard to their mode of formation and growth, the fauna by which they are inhabited, and the evidence they afford either of upheaval or of subsidence in this part of the Indian Ocean. The managers of the Balfour studentship, with the assistance of donations from the Government Grant Committee of the Royal Society and the British Association, were therefore well advised in selecting this area as one where a careful and detailed geographical and zoological survey would be likely to yield results of the highest scientific importance. So far as can be judged from the small section of the work now before us, Mr. Gardiner, ably seconded by Messrs. Borradaile and Cooper, appears to have carried out his task with great thoroughness and success. A part of the time, it is true, he was incapacitated from work by illness, but during his absence the researches were carried on with vigour by Mr. Cooper, who took no less than eighty-eight dredgings in five different atolls.

¹ "The Fauna and Geography of the Maldiv and Laccadive Archipelagoes, being the account of the work carried on and of the collections made by an expedition during the years 1899 and 1900." Edited by J. S. Gardiner. Vol. i., part 1. (Cambridge: University Press, 1901.)

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Until the appearance of the complete work, which we gather will run to at least two volumes, we cannot, of course, lay before our readers the editor's conclusions with regard to the important problem mentioned at the commencement of this article. Neither can we refer to the general *faunes* of the fauna of these islands. Our notice must accordingly be restricted to the general introduction to the work and the four chapters which (together with a description of certain sections of the fauna) constitute the part before us.

For reasons connected with the meteorological conditions prevailing in the Indian Ocean, it was decided to devote the summer of 1899 to a thorough survey of Minikoi, the most southern atoll of the Laccadives. This island forms the subject of two out of the four chapters already published, and its history is to be continued in those which follow.

In the introduction, Mr. Gardiner refers to the enormous numbers of the delicate shells of the cephalopod *Spirula* met with on the northern end of one island. On inquiry from the natives he found that they were quite familiar with the complete mollusc, which appeared in numbers during the winter of 1897. Strangely enough, however, the creature seems to be extremely local, since it is quite unknown to any of the other islanders.

In the chapter on its coral islands, the author remarks that the Indian Ocean gives little clue from its topography to the character of the foundations of the various groups; and in this respect is unlike the Pacific, where the groups run more or less nearly parallel to one another and to

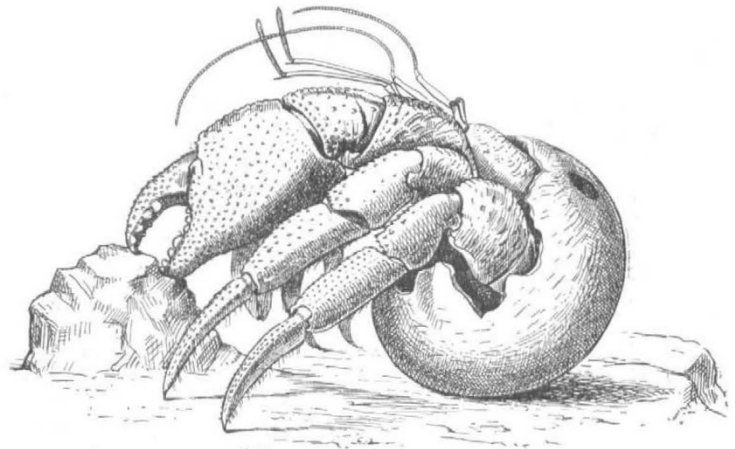


FIG. 1.—*Coenobita clypeatus* using a broken coconut as shell.

the adjacent continent. In one respect the two oceans present a striking similarity, namely, in the absence or paucity of coral-islands on their eastern¹ sides. In the Pacific this absence is complete; in the Indian Ocean it is broken only by Cocos-Keeling and Christmas Islands. In the Indian Ocean this scarcity of islands on the eastern border is, so far as it goes, in favour of the view that the numerous islands on the western side formed part of a land-connection. This belt between Madagascar and India is cut, says the author, to a depth of more than 2000 fathoms in three places, to wit, between the Maldives and Chagos, between the latter and Saya de Malha Bank, and again between Farquhar Atoll and Madagascar. "These channels divide the coral-reef areas into four sections, which may be respectively termed the Malagasy, Seychelles, Chagos and Maldive." These four sections are then discussed in detail.

Chapters iii. and iv. are devoted to part of the descrip-

¹ The author writes "western," but he obviously means "eastern."