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GENERAL ACCOUNT  
OF THE  
ATOLL OF FUNAFUTI

By C. HEDLEY,

*Conchologist to the Australian Museum.*

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## INTRODUCTORY NOTE.

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THE Local Committee of the "Funafuti Coral Reef Boring Expedition, of the Royal Society" (London), in charge of Prof. Sollas, LL.D., F.R.S., having suggested to the Trustees of the Australian Museum that one of their Officers should be deputed to accompany the Expedition, Mr. Charles Hedley was selected for the purpose.

Mr. Hedley left Sydney in H. M. S. "Penguin," under the command of Capt. Mervyn Field, R. N., on May 1st, arriving at Funafuti on May 21st. He remained on the island for two and a half months, leaving in the same vessel. On the return voyage to Fiji, the Island of Nukulailai was touched at, where scientific investigations were renewed for two days. Mr. Hedley finally reached Sydney on August 22nd.

During his stay on Funafuti, Mr. Hedley succeeded in amassing an interesting collection, particularly of Invertebrate and Ethnological objects, together with much valuable scientific information. The collections are now in process of description by the Scientific Staff of the Museum, and the results are being published in the order in which the study of the various groups is completed.

A brief account of the results of the boring operations at Funafuti, extracted from Prof. Sollas' letters, will be found in "Nature" of 24th Sept., 1896, p. 517.

R. ETHERIDGE, Junr.,  
Curator.

Sydney, 21st December, 1896.

[I.]  
GENERAL ACCOUNT  
OF THE  
ATOLL OF FUNAFUTI

BY C. HEDLEY, Conchologist to the Australian Museum.

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THE ARCHIPELAGO.

THE Ellice Group is an Archipelago of somewhat vague limits, which trends for about four hundred miles in a north-westerly and south-easterly direction, and lies between Lat.  $5^{\circ} 35'$  and  $11^{\circ} 20'$  South, and Long.  $176^{\circ}$  and  $180^{\circ}$  East. After a gap of a hundred and fifty miles, the same general trend is continued across the equator into the Northern Hemisphere by the Gilberts, otherwise known as the Kingsmill or Line Islands, whose physical features repeat those of the Ellice Group, though the character of their inhabitants is widely different.

This particular archipelago is indeed but a link in a huge chain of islands which extends for about 3,500 miles from the Austral Islands through the Herveys, Samoas, Ellices, and Gilberts, to the Marshalls, forming the S.W. edge of that axial trough described by Dana\* as the Central Depression of the Pacific, mapped by Whitmee† as the Great Atoll Valley, and mentioned by Lapworth as "the mightiest of all the submarine buckles of the earth crust;"‡ the opposite N.E. edge of which is indicated by the answering chain of islands stretching from Hawaii to Kure. West of this Marshall-Austral chain (the "zone pacifique australe" of Sacco§), and roughly parallel both to it and to the East Australian coast, is a second series of elevations whose contour, as shown by the "Challenger's" cross sections,|| is that of waves directed westward. These latter elevations have in common a fauna and flora characteristically continental, in contrast to the essentially drift fauna and flora of the outer chain, from which they are also distinguished by a system of volcanoes. The term Melanesian Plateau has been proposed¶ as a collective geographical name for these elevations,—whose summits, now projecting as dry land, are New Zealand, Lord Howe Island, New

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\* Dana—Corals and Coral Islands, 1872, p. 328.

† Encyc. Britt., (9) xix., 1885, Pl. iii.

‡ Rep. Brit. Assoc. for 1892 (1893), p. 705.

§ Sacco—Essai sur l'Orogenie de la Terre, Turin, 1895, p. 31.

|| Challenger Reports—Deep Sea Deposits, 1891, Diagrams, 11, 12, 13.

¶ Hedley—Proc. Linn. Soc. N.S.W. (2), vii., 1892 (1893), p. 335.

Caledonia, New Hebrides, Fiji and the Solomons,—which during the life of the existing fauna have been first deeply sunk and then slightly elevated. Viewing Australia as the massif around which have been concentrically heaped up\* this inner and outer chain, it is noteworthy that the only point in which the outer chain has swelled into large and lofty islands is where, in the Samoan Archipelago, it has swept on to the heel of the Melanesian Plateau.

Proceeding southwards the following are the inhabited islands of the Ellice:—Nanomea, Niutao, Nanomana, Nui, Vaitapu, Nukufetau, Funafuti, Nukulailai, and Nurakita. Every member of the group is essentially an atoll or lagoon island, but in the smallest, like Nurakita, the structure is masked by the filling in of the lagoon having reached completion, and converted the interior of the atoll from water to land.

To elucidate the relation of Funafuti to the other members of the group, the following sketch of the archipelago is compiled from the notes of various travellers:—

NURAKITA.—“Six hundred miles from Samoa, sailing north-westerly, the first of the group, Sophia Island, is sighted. It is the south-easterly outlier of the group, and is the only one of sufficient height to be seen from the vessel’s deck at a distance of twenty miles. Until a few years ago it was uninhabited, although the people of the next island, Nukulaelae, say that ‘in the old, old time, many people lived there.’† It is about three miles and a half in circumference, has but few coconuts growing upon it, and would have remained untenanted in its loneliness to this day but for the discovery of a fairly valuable deposit of guano. Then it was taken possession of by an enterprising American store-keeper in Samoa, named Moors, who landed native labourers and worked, and is still working, the deposit. The old native name

\* In this connection Messrs. Haddon, Sollas and Cole (On the Geology of Torres Straits, Trans. R. Irish Acad., xxx., 1894, p. 473) have remarked that, “As our knowledge grows, we the more distinctly see in Australia and its islands the ruins of a great southern continent, fractured and submerged, possibly during the great Alpine Himalayan revolutions, and now in process of resurgence, as the vast folds of the earth’s crust roll slowly inwards upon the central continental mass.”

† Other instances of Pacific islands once inhabited but afterwards depopulated by war, famine, disease or storm, are: Caroline Island, where the American Scientific Expedition discovered maraes, &c. (Mem. Nat. Acad. Sci., ii., 1884); Gente Hermosa, of which Whitmee says, “The island was formerly inhabited by a large race of people whose skeletons are now found, all of them I am told exceeding six feet in length. No one knows by what means they became extinct, but the fact that their skeletons are lying unburied in various parts of the island, points to famine, or an epidemic which quickly proved fatal to all the people, as the probable cause” (Missionary Cruise in the S. Pacific, 1871, p. 6); and Palmerston Island, described by Gill (Jottings from the Pacific, 1885, p. 37).

of this spot is Ulakita—a name, by the way, that is almost unknown, even to the local traders in the Ellice Group.”\*

NUKULAILAI.—“Eighty or ninety miles away is Nukulaelae,† a cluster of thirteen low-lying islets, forming a perfect atoll, and enclosing with a passageless and continuous reef a lagoon five miles in length by three in width. This narrow belt of land—in no case are any of the islets over a mile in width—is densely covered with cocoanuts, and, seen from the ship, presents an enchanting appearance of the highest green, accentuated on the westerly or lee shore by beaches of the most dazzling white. Thirty years ago Nukulaelae had a population of four hundred natives. Then one day there came along two strange vessels—a barque and a brig—and hove-to close to the reef; and in a few hours nearly three hundred of the unfortunate, unsuspecting, and amiable natives were seized and taken on board by the Peruvian throat-cutters and kidnappers that had swept down upon them, and, with other companions in misery, torn from their island homes, were taken away to slavery in the guano fields of the Chinch Islands. Of the Nukulaelae people none ever returned, and all but two perished miserably under their cruel taskmasters on the gloomy Chinchas.”‡ “Fangafana is the name of the islet on which the settlement stands. Nukulaelae is the name of another islet and is used to designate the group. Near tradition traces the people to the island of Funafuti; remote mythology says that Mauke, the first man, had his origin in a stone.”§

The next atoll, FUNAFUTI or Ellice Island, is reserved for a more extended description, and passing over it we come to NUKUFETAU, or DePeyster’s Group, lying sixty miles to the leeward and consisting of “A very beautiful group of thirty-seven islets almost surrounding a lagoon. The name signifies the land of the fetau (*Calophyllum inophyllum*), the only indigenous tree of large size found there. The settlement is located on the island of Te anamu, and there are houses also on Sakuru.|| Fairly good water can be obtained at Te anamu. Other islets in this group are Te afuavea, Te afuana, Te afatule, Paifa, Funata, Mata Nukulaelae (like Nukulaelae), Teafualoi, Nualei, Niuatangi, Teafuanono, Motu tu lua, Teafuniua, Niuatui, Niuatibu (a Gilbert Island name), Oua, Lafaga (where there is said to be fresh water), Niuaruko, Faiava, Potiki, Moturaro (here also water is to be found), Motufetau, Motuloa, Te afua, Te motumua (here

\* Becke—*Evening News*, Sydney, 25 April, 1896.

† Officially spelt Nukulailai, otherwise the Mitchell Group.

‡ Becke—*loc. cit.*

§ Turner—*Samoa*, 1884, p. 280.

|| “Sakuru seems to have been uplifted ten or twelve feet.”—Turner, *loc. cit.*, p. 284.

also there is water), Te afualoto, Motuloto, Te afua fale niu, Te afuatakalau, Te fale (here also there is said to be water). The names here given will, to those acquainted with Gilbert Island, Tongan, Samoan, and Rarotongan dialects, furnish instances of the influence of all these dialects in the nomenclature of the group.\* In 1884 Mr. C. M. Woodford estimated the population at 240.†

VAITUPU.—“Oaitupu‡ (literally ‘the fountain of water’) is although nearly the smallest, the most thickly populated of all. It has no lagoon accessible from the sea, and landing even is not always easy. Here, although the soil is better than that of the other islands, and the natives have taro, bananas, and pumpkins to vary the monotonous diet of cocoanut and fish obtaining elsewhere in the Ellices, they are very subject to that species of eczema known as *timea dequamans* (locally it is called ‘lafa’).”§ The Rev. S. J. Whitmee says||:—“It is nearly round, about four miles across, and has a salt water lagoon in the centre, completely shut off from the sea by a ring-like strip of land about half a mile across. The population amounting to three hundred and seventy-six are very advanced.”

The next island, NUI, Egg or Netherland Island, is remarkable for being in the possession of an outlying colony of Gilbert Islanders or “Tafitos,” differing from the Ellice Islanders in language, customs, appearance and demeanor.¶ Moresby says:—“We communicated with Egg or Netherland Island, a crescent-shaped reef, with the horns of the crescent lying about two and a half miles north and south of each other. The two hundred inhabitants were all Christians, and had escaped the kidnapper; their village stands on an islet on the southern horn.”\*\*

NANOMANA.—“Nanomaga, the Hudson Island†† of Commodore Wilkes, is the smallest of the group. It is barely a mile and a half long, and not one in width, yet supports a population of six hundred people. The writer (who was the second white trader there since the people accepted Christianity in 1870) spent a year on the island, and can bear testimony to the kindly nature and honesty of its people. During all the time he lived there as

\* Rev. J. E. Newell—Proc. Austr. Assoc. Adv. Sci. for 1895 (1896), p. 609.

† Geogr. Journ. 1895, vi, p. 344.

‡ Officially Vaitupu, otherwise Tracey Island.

§ Becke—*loc. cit.*

|| In Findlay—Directory of the South Pacific Ocean, 1877, p. 753.

¶ Turner, Becke, Newell and Findlay—*loc. cit.* Whitmee—Journ. Anthropol. Inst., viii., 1879, p. 274.

\*\* Moresby—New Guinea, 1876, p. 77.

†† After the Commander of the “Peacock.”

agent for Messrs. John S. De Wolf and Company, of Liverpool, he never had as much as a scrap of tobacco stolen from him, although his trade goods were piled up indiscriminately on the floor of his house, which had neither doors, locks, nor a bolt of any kind. In this, however, the Nanomagans are peculiar—the other islanders are not so particular.\* “There is a lagoon here, centre very deep, sides very muddy,” writes Dr. Gill in a MS. account of a visit to this island in 1872, which he has kindly allowed me to peruse. Wilkes, however, denied it a lagoon, and none is shown upon the Admiralty Chart (South Pacific, No. 766, Ed. 1893).

“NIUTAO, Lynx or Speiden† Island is an atoll about three and a half miles in circumference, and has two small lagoons. It is said to have had its origin with other islands in two ladies, the one called Pai and the other Vau. They came from the Gilbert Islands with a basket of earth, and wherever they threw it about the islands sprang up. Other traditions say that the people came from Samoa in two canoes which drifted thither. The one went to Vaitupu and the other to Niutao.”‡ “This island,” Moresby informs us, “differs from the others of the group in having no guarding reef, and no companion islands near it. It stands alone in the ocean, scarcely raised above its level, and is simply a huge flat-topped coral rock, two and a half miles by one and a half in extent, which rises perpendicularly from fathomless depths, and is only saved from being washed over by the sea by a narrow shore reef, on which the great surf expends itself. We pulled to the edge of the boiling surf and met canoes, which landed us without a wetting, and were received on the beach with the most intense curiosity by the natives, who had never seen a man-of-war before. They are a well-looking, dark, straight-haired race, and number four hundred and seventeen souls, a large population for so small an island, but their food is abundant, an unlimited supply of cocoanuts, fowls, pigs, flying-fish, skipjack and sharks. . . . Their mode of procuring water is curious. They cut the coral rock to a depth of twenty feet, and make an opening wide at the top and narrowing into three small holes below, which fill with a brackish water as the tide rises. They have not any other supply, but do not need it as they have an unlimited supply of coconut milk.”§

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\* Becke—*loc. cit.*

† So named by Wilkes, who sighted the island in 1841, after the purser of the “Peacock.” “Niutao,” says Gill (Jottings, p. 1), signifies “baked coconut.”

‡ Turner—*loc. cit.* p. 287.

§ *Loc. cit.*, p. 79.

NANOMEA.—This is the northernmost of the Ellice Group, it is probably the San Augustin Island of Murelle (1781), and Taswell and Sherson Islands of the brig "Elizabeth."\* (1809). The Rev. S. J. Whitmee† says (1870), "There are two islands within three or four miles of each other connected by a reef, dry at low water. The westerly island is named Lakena; it is nearly round, two miles or more across, well stocked with cocoa-nut and other trees, and has a deep *fresh water* lagoon in its centre. It is not inhabited, but is used by the people of the other island for the cultivation of food. Nanomea, the second island, is about four miles long by one to two wide; it has a shallow water lagoon towards the east end, partially open to the sea. The inhabitants are taken together the finest race of men, so far as muscular development goes, I have ever seen. They are almost a race of giants. I believe nine out of every ten would measure six feet or more high, and their breadth is proportionate to their height. The Englishman resident on the island estimates the population at about one thousand." Becke writes‡ "There were last year eight hundred and thirty people on the two islands, Nanomea and Lakena." Here "the men are heavily bearded, and not a little proud thereof."§

The Ellice Islanders seem ethnologically to have segregated themselves in three groups. Nukulailai and Nukufetau were anciently more or less dependents of Funafuti, with which Vaitupu was allied; all four for instance united in the worship of Fofilape or Firafo. In 1841, the Nukufetau people described their world to Wilkes as consisting of Funafuti, Vaitupu, and the Tokelaus. Nanomana and Nanomea were closely linked by their extraordinary quarantine rites, Niutao by its position and skull worship was associated with these; the north and south group also differed in their method of making the titi (see *Vegetation post*). As we have already remarked Nui stood apart.

The atoll of Funafuti was discovered by Captain Peyster|| in the "Rebecca," on March 18th, 1819. According to the observations¶ of Captain Wilkes, it lies in Lat. 8° 30' 45" South, Long. 179° 13' 30" East. A position which may otherwise be described as due north of Fiji, and precisely half way between that and the Equator. It is about a thousand miles south-south-west of what Dana considered\*\* as the centre of the great Pacific subsidence.

\* Mercantile Magazine, Sept., 1873, p. 257.

† In Findlay—*loc. cit.* p. 755.

‡ *Loc. cit.*

§ J. B. Davis—*Anthrop. Rev.*, vii., 1870, p. 191.

|| Findlay—*loc. cit.*, p. 751.

¶ Wilkes—*Narrative U.S. Exploring Expedition*, 1845, p. 295.

\*\* Dana—*Corals and Coral Islands*, 1872, p. 324.

The nearest high land is the small island of Rotumah, two hundred and sixty miles to the south-west ; but the nearest land of any considerable size is Vanua Levu, four hundred and fifty miles south.

On nearing Funafuti, as with any South Sea atoll, a long low line of vegetation on the horizon gives the first intimation of the approach to land. Looming larger, the tallest palm trees show their plumed heads sharp against the sky. Nearer, if to windward, the dense vegetation is framed by a long white line of ever breaking surf ; to leeward, a beach of sand, dazzling white in the sunshine, limits the forest. Not till the observer has entered the lagoon by one of the navigable channels does the atoll as a whole extend before him. In this instance Dana's poetic comparison\* of an atoll to "a garland thrown upon the waters" is scarcely applicable, so many and so wide are the rents in the wreath of foliage.

#### PHYSICAL STRUCTURE AND GEOLOGY.

The outline of Funafuti is that of a pear, the curved stem of which is directed southwards. On the east or windward side the outline is sketched in most firmly, the thread of reef and palm being here almost continuous ; but on the leeward side so many and so wide are the gaps that the interspaces of surf far exceed those dots where the atoll rim emerges as dry land. The lagoon, a noble sheet of water about ten miles long and eight broad, thus bounded, is plentifully besprinkled with shoals, many of which rise to the surface and "break." Its maximum depth is thirty fathoms, the general level of the floor being about twenty, whence it steeply rises to the beach.

Beyond the atoll rim, I am informed by Captain Mervyn Field, R.N., of H.M.S. "Penguin," that his exhaustive series of soundings developed the interesting fact that Funafuti is not seated on any common ridge, or connected with the other members of the Ellice Group by any bank, but that it rises independently from the abyssal floor of the Pacific. The same was demonstrated to be the case with Nukulailai, and therefore the remainder of the Archipelago will probably prove "a range of deep sea cones," which Dana said† would be so "interesting a discovery." From the reef the atoll sloped steeply outwards to forty fathoms, whence to a hundred and fifty fathoms an almost precipitous cliff surrounded the island. Below this its lower slope, as was suggested to me by Prof. Sollas, compared with the contour of Mount Etna. The outlines of the atoll, as it appears on the surface, are repeated with astonishing fidelity by the five hundred, thousand, and fifteen hundred fathom levels.

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\* *Loc. cit.*, p. 167.

† *Loc. cit.*, p. 372.

The largest islet of the atoll extends for seven miles, occupying about half the windward side. In shape it resembles a reversed capital L, or more nearly the Australian aboriginal club called "Liangle." The concave side is presented to the lagoon; against the centre of concavity sand has been banked up, so as to greatly increase the diameter of the islet, which here attains its maximum breadth of seven hundred yards. Here is situated the principal or permanent village, Fungafari; here also is the only supply of fresh water and the gardens. North and south of this area the islet rapidly narrows to a width of about a hundred yards, which is maintained for the greater part of its length. About a mile south of the village, at a spot called Luamanif, is a well beaten track, the portage, where, to avoid the long pull by the passage, the natives haul their canoes overland across the islet, a distance of about seventy yards, and launch them on the other side. A considerable area of perhaps a dozen acres in the centre of the islet is occupied by a swamp, which from the fact of being ringed round with *Rhizophora* will be called the Mangrove Swamp. The native name of this locality is, I believe, Tisala. This swamp is somewhat the shape of a sagittate leaf of an aroid like the taro; the tip of the leaf answering to the south-east corner, while the lobes represent two branches, a broad western one stretching nearly across the island and penetrating almost to the village, and a narrow northern branch. Along its whole eastern border the swamp is walled in by a bank of shingle and rolled coral blocks, which rise twelve or fifteen feet above the flat, and on the further side of which the waves break at high tide. This shingle bank is narrowest and lowest in the centre, and carries a few scattered palms and pandanus. On its inland face a strip of *Rhizophora* luxuriates in soft, dark brown, rather deep mud. The chief expanse of the Mangrove Swamp is bare of vegetation, extremely level, of soft decomposing coral rock, whose interstices are filled with mud. At high tide it is covered ankle deep with water which drains away at half ebb. Following the retreating water northward, several large deep pools are encountered in the northern arm. On closer approach these are seen to be in such free communication with the ocean, that not the tides alone but every individual wave pulsates therein. Some have an easterly and westerly disposition, which suggests that they are breaks in the roofs of tunnels which extend under the shingle rampart, and open outside the reef a hundred yards away. A child, I was told, once disappeared into one of these pools, the dead body of which was afterwards recovered on the ocean beach. Striking as may be this natural siphon of the northern arm, by which the rising tide floods the swamp, yet the western limb surpasses it in interest. Here, at a spot a quarter of a mile east of the Mission Church, round flat-topped table-like bosses three to

four feet across rise a few inches above the general level. Just such masses occur as living coral in the reefs in the lagoon, and on flaking off a chip these prove to be a small-pored *Porites*. From these bosses of *Porites* extend in rays for several yards in every direction, thin flat stones on edge like tiles along a garden walk. A glance at a fragment serves to identify the latter as slabs of blue coral, *Heliopora cœrulea*. On drawing Prof. Sollas' attention to this formation, he suggested that the *Porites* and its surrounding star of *Heliopora* evidently both lived *in situ*, and that they could not have existed at their present level where high tide alone bathes them. I am of opinion that the action of the tides is impeded in the Mangrove Swamp, but that the high tide, not the low one, must be the affected level; the height of coral growth is determined by the low tide not the high.

We are therefore here facing unequivocal evidence of elevation in Funafuti to the extent at least of the range of the tide, since low water springs is the highest level to which the *Porites* and *Heliopora* could have reached. They probably also grew in smooth and sheltered water. The cone in which the island rises from the abyss suggests the proximity of volcanic force to give an upward thrust. In Honden Island and Osnaburgh Island Dana\* has given striking instances of slightly upheaved atolls.

Around the western edge of the Mangrove Swamp, and most noticeable in the north arm, is an old beach where a breccia of coral fragments in a platform two or three feet above the swamp has been eaten back by wave action. That this breccia formerly extended as a sheet over what is now the surface of the swamp, is indicated by a few isolated and worn cakes of it, outliers in other words, near the centre of the flat; but whether or not it overlaid the *Heliopora* I possess no evidence to show, although I incline to the opinion that it did.†

The beach outside the Mangrove Swamp is furthest to windward of any land in the atoll; reverting to my comparison of the islet to a Liangle, this spot corresponds to the blade of the weapon. In other words it is the most exposed corner of Funafuti.

The history of the Mangrove Swamp as indicated by these features seems to me to be, that a hurricane breaking on the eastern face of Funafuti, tore down the shingle rampart and

\* *Loc. cit.*, pp. 333 and 335. Darwin declined (*Structure and Distribution of Coral Reefs*, 1874, p. 169) to accept these evidences of slight elevation, and endeavoured to otherwise explain an apparent instance of it which he observed (*op. cit.*, p. 21) at Keeling Island.

† A too brief note (*Qt. Journ. Geol. Soc.*, 1872, xxviii., p. 381) by S. J. Whitnell (? Rev. S. J. Whitmee) upon raised coral rock *in situ* at Funafuti, may refer to the place I have here described, but I rather suppose that the subfossil coral exposed by the beach section of breccia was mistaken for coral in the position of growth.

eroded the loose coral blocks with the breccia sheet that lay behind it, until the storm had made a breach half across the islet. Afterwards the waves in the usual course of their work rebuilt the shingle bank as it now stands. Before the re-erection of the latter, drifting seeds of mangrove reached the swamp and originated the present thicket.

The shingle embankment referred to continues along the whole windward face of the atoll, being highest at the eastern angle and diminishing north and south where the trade winds strike the beach obliquely. On the leeward side it is entirely absent. Six feet above the usual level of the ocean waves it represents the greatest altitude, the culminating peak, of the atoll. Great blocks of coral packed high and toppled over by gales of past years, all weathered and discoloured, compose the inland face of the bank, their appearance recalling a heap of blackened lava and scorïæ from some volcanic hill side. A similar scene reminded Dana of "a vast field of ruins. Angular masses of coral rock, varying in dimensions from one to a hundred cubic feet, lie piled together in the utmost confusion; and they are so blackened by exposure, or from incrusting lichens, as to resemble the clinkers of Mauna Loa; moreover, they ring like metal under the hammer. Such regions may be traversed by leaping from block to block, with the risk of falling into the many recesses among the huge masses. On breaking an edge from the black masses, the usual white colour of coral is at once apparent."\* On the seaward face the blocks of coral are smoothed, rounded, and beach worn, till all semblance of their Actinozoan origin has been ground away.

On examining the beach at low water, the shingle bank was seen to be underlaid throughout, like that of the north arm of the swamp, by a breccia of angular coral fragments, in size usually of a man's head or fist. The corals appeared to belong to the same species as those now thrown up on the beach, some of which, presumably deep water species, only occurred too ground and battered to be worth collecting. A species, apparently a large *Mussa*, I knew well by sight, but was never fortunate enough to find in even tolerable preservation. Here and there this breccia was carved by the waves into fantastic turrets and pinnacles or extended seaward in shelves. The highest point it reached was a little above high tide mark. I thought sometimes that the mode of weathering and the composition of the rock indicated an upper and a lower bed, but of this I could not satisfy myself. The history of this stratum appears to be that fragments of coral torn from the growing edge have been packed in a bank like that now facing the surf, that sea or rain water cemented these into a sheet of breccia, and that a shift of winds set the waves to tear down what

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\* *Loc. cit.*, p. 178.

they had formerly built.\* In general wherever rock appeared on the atoll it was definitely related to the situation. Thus the breccia above described was peculiar to the ocean beach, and was always overlaid by coarse shingle and rough freshly broken coral fragments; on the leeward shore of the atoll the coral-sand-rock always accompanied stretches of clean sand composed of foraminifera, coral and molluscan fragments; again on the lagoon beach of the Funafuti islet there occur low scarps of shingle conglomerate overspread by shingle beaches.

It would appear, therefore, that these rocks were here consolidated under the conditions which still prevail. A little excavation with a crowbar shows the surface to be usually harder than the underlying strata. Often an apparently solid crust when overturned exhibited a lower surface bristling with pebbles that adhered to the mass by one end only. The process of consolidation, whether solution by sea water and deposition or not, having operated apparently on the upper surface and to a slight depth only.

On the outer edge of the reef the surf does not permit much close examination. From the base of the shingle bank or low scarp of breccia, the beach usually stretches seawards for forty or fifty yards in a bare and level expanse, which dries at very low tides in calm weather. It then appears from its Nullipore carpet as a sheet of dull crimson. Moresby noticed this colour on Nanomana Island but erroneously ascribed it to coral.† Deep fissures appear which rapidly widen into crevasses, between which the ground rises into knobs or hillocks, pitted and honeycombed throughout. These breast the surf, beyond them the reef plunges at once into deep water. The coral appears to grow seaward in piers, as these broaden their interstices first form wide trenches, then narrow crevasses that may be stepped across, which clefts tend to be roofed in by growth of Nullipores and are narrowest at the surface, ultimately (proceeding inshore) they become mere fissures and then disappear. This disappearance only refers to the surface, for they probably form tunnels far into the centre of the islet, as shown by the openings through which the sea floods the mangrove swamp. At Nui, the Rev. S. J. Whitmee observed that "the seawater gains access to the central lagoon through the reef underneath the islands. In some it bubbles up at the rise of the tide in the midst of the lagoons, forming immense natural fountains."‡ Further inshore the roof may be broken, and a

\* A formation apparently similar to this breccia is described by Darwin from Keeling Island, and by Chamisso from the Marshall Group.—Structure and Distribution of Coral Reefs, 1874, pp. 16 & 34.

† Moresby—New Guinea, 1876, p. 79.

‡ In article "Polynesia," Encyc. Britt., (9), xix., 1885, p. 420.

sea fountain be forced through the blow-hole by every wave. Peering down into these coral crevasses, for a moment there is shown an abyss as narrow, as green, and as deep as a cleft in some vast alpine glacier, in perspective beyond perspective swim a shoal of brilliant hued fishes, another instant and a rising wave blots out the scene in a volume of spray and foam. Dana remarks that "Among the scattered coral islands north of the Samoan Group, the shore platform is seldom as extensive as at the Paumotus. It rarely exceeds fifty yards in width, and is cut up by passages often reaching almost to the beach. Enderby's Island is one of the number to which this description applies. . . As a key to the explanation of the peculiarities here observed, it may be remarked that the tides in the Paumotus are two to three feet, and about Enderby's Island five to six feet in height."\*

Passing inland from the coast anywhere on the windward islets a descent is gradually made on a surface of loose blocks, from a yard in diameter downwards, of broken and decaying coral. The weather has etched the upper faces deeply, and exhibits beautifully the structure particularly of the astrean species. The hardest kinds, as *Montipora*, *Heliopora*, and *Millepora*, had suffered little, but softer species crumbled readily under the blows of a hammer. Most of the surface of the eastern islets was of this inhospitable description, and very cruel to a traveller's limbs and raiment was it. Now and then among the loose, broken blocks, a ridge of breccia running parallel to the islet's length could be detected. Though of so barren an aspect, this country supports a vegetation of Ngia, Ngashu, Fau, Fala, Boua, and palms, sufficiently dense to everywhere shade the ground. Nowhere is this description of country more than a foot or two above highwater mark, and little depressions commonly occur even in places remotest from the sea, where, when high, the tide leaks in and spreads in shallow pools, such are always densely enclosed by a thicket of Ngia and Ngashu.

Traverses across such places suggested to me that the low area of decaying coral blocks represents a final stage of the high shingle bank which faces the ocean; the loss in height resulting from decay and collapse natural to a loosely piled mass, such loss being gradual on retreating from the beach as this hypothesis demands. An accompanying transition in the state of decay may be noted likewise, the blocks furthest from the sea being most rotten. This explanation implies that the islet is growing peripherally, and that seaward from the present embankment another will in the future form. I am prepared to accept this implication, and fortify the position by quoting an opinion in support from that experienced and acute observer, the Rev. S. J.

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\* *Loc. cit.*, p. 186.

Whitmee,\* who writes of Peru in the Gilberts: "The island itself is formed of successive ridges of sand, broken coral, and shells. These ridges are most of them from thirty to fifty feet across, and the hollows formed between them are generally from four to six feet in depth. For some distance, at that end of the island which I examined, they run across, and in the middle they run parallel with the sides of the island. The whole extent examined presented the same appearance, and the ridges were so regular that they gave one the idea of being artificially formed. The waves must exert a mighty force during heavy weather to form these extensive ridges. There is little doubt but each ridge is the result of a single storm. I have already referred, in the notice of Atafu in the Tokelau group, to a similar ridge of smaller dimensions which was thrown up during the present year; and I have seen several small islands of broken coral and shells, which were formed on the reefs in Samoa during a hurricane of a few hours duration."

North and south of the Mangrove Swamp the region of decayed coral blocks does not immediately occur, but a considerable area of sandy soil intervenes. To the south a large tract of this is under cultivation, and more was so used when the atoll carried a larger population. Here also are the wells and bathing pools. To this area Dana's remarks† are quite applicable: "There is but little depth of coral soil, although the land may appear buried in the richest foliage. In fact, the soil is scarcely anything but coral sand. It is seldom discoloured beyond four or five inches, and but little of it to this extent; there is no proper vegetable mould, but only a mixture of darker particles with the white grains of coral sand. It is often rather a coral gravel, and below a foot or two it is usually cemented together into a more or less compact coral sand-rock."

The northernmost islet of the Funafuti atoll stands out of water higher by several feet than does any other. It occurred to me that the whole atoll had indeed a slight tilt from north to south, but I had no opportunity to decide whether it were so. On this particular islet there was richer red soil, plants grow here unseen elsewhere, there is also the best garden with flourishing bananas, not cultivated in a swamp in the usual Ellice Island fashion but on dry ground.

A traverse of a leeward islet crosses formation quite different to that of the windward islets. The dry land is a tolerably level expanse of sandy soil, the islets are not arranged so strictly along the margin of the reef as they are to windward, but may be seated far within its border. The major axis of one islet is even

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\* Whitmee—A Missionary Cruise in the South Pacific, 1871, p. 35.

† *Loc. cit.* p. 179.

at right angles to the general trend of the reef. From the base of the vegetation a broad sandy beach extends around the islet, it is largely composed of two species of Foraminifera, which Mr. Whitelegge informs me are *Tinoporus baculatus*, Mont., and *Orbitolites complanata*, Lamarck. High water mark indicated by lines of drifted leaves and shells implies a quiet sea. At about half tide mark, especially upon the ocean side, sheets of regularly bedded coral-sand-rock appear, answering in position to the breccia of the windward beaches. At a lower level the shore extends in rough ledges and deep pools for perhaps a hundred yards, beyond this it becomes more level and carries numerous loose boulders of coral rock, as large as an ordinary chair or table; such boulders are known as "niggerheads" on the Great Barrier Reef of Queensland, and have been described by Dana,\* Jukes,† and Kent.‡

Everywhere small pebbles§ of pumice the size of a walnut might be collected on the beaches. The natives say that a few years ago much pumice came ashore, coincident with which the fish from without the lagoon became unfit for food. A further account of this pumice will be found in the accompanying Report by my colleague, Dr. T. Cooksey.

"Funafuti," writes Newell,|| is a group of some thirty islets surrounding a lagoon twelve miles in length. . . . The names of many of the islets in this group were given me. Not only here but all through the Ellice Group I found that not merely did every little atoll bear a name, but that the names of atolls and of known spots on these atolls were significant of some fact in its history, either original ownership or some physical feature of the islet, or some historical fact connected with the place. The following names of islets in the Funafuti Group are interesting:—Te Pava (the name of a Samoan, Upolu, war god); Te fua te fe'e, the offspring of the Fe'e (either the ancestor or the god incarnate in the cuttlefish); Aumatupu; Te muri te fala, the end of the Pandanus; Te afu alii, the sweat of the chief; Te puka, the name of a tree;¶ Te puka savilivili; Te fua lopa; Te fua fatu; Fuage'a; Te fala, the pandanus; Te fala o Ingo; Tutanga;

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\* *Loc. cit.*, p. 179, figs. 1 and 2.

† Jukes—Voyage of the "Fly," 1847, i., p. 16.

‡ Kent—Great Barrier Reef of Queensland, 1893, pp. 49, 104, Pl. xxx.

§ These pebbles of pumice are of very frequent occurrence on the shores of the inlets of the east coast of Australia. This subject has been discussed at length by Messrs. David and Etheridge in *Rec. Geol. Surv. N.S.W.*, 1890, ii., 2, p. 27. And for Polynesia see Guppy—The Solomon Islands, their Geology, &c., 1887, Chap. x.

|| *Loc. cit.* p. 608.

¶ *Hernandia peltata*, Meissn.—See *Vegetation post*.

Te ngasu ;\* Te afua fou, the new beginning (the name refers to an unfortunate incident in connection with their first contact with the white man, and their first knowledge of the deadly firearms of the foreigner. A vessel called at the mouth of the lagoon, and the natives were allowed on board. On leaving one of them stole a bucket.† The canoe containing the thief was pursued, and, to the astonishment and dismay of the company, the man in pursuit was able to produce lightning and thunder and to inflict death); Avalau (this islet is said to possess a spring of fresh water); Motu ninie, ironwood islands; Nuku savalivali, the place where people can walk about; Motu loa, long island; Motu sa Nafa, the island of the Nafa clan; Te rere; Te fata, the platform; Funafala, the pandanus of Funa, the name of a chief, after whom also the group has been named Funafuti."

An exact survey of the islets of the atoll was executed by Captain Mervyn Field and his officers during the visit of H.M.S. "Penguin," and for further details their work in the forthcoming Admiralty chart may be consulted.

The lagoon at Funafuti appears to be in course of filling up, though the agencies at work must take long to make a perceptible advance in so huge a task. In Vaitupu this has been partly, and in Nurakita wholly accomplished. The land gains upon the water at many points. A small cay in the heart of the lake presents a permanently dry surface, while low tide shows many patches of sand and gravel above water. Scattered over the whole lagoon are numerous small reefs of upwards of an acre in extent, for all of which (being good fishing grounds) the natives have distinguishing names as Fasua Takau, the Clam Shell Reef. These reefs are in a thriving condition and evidently growing vigorously. Those near enough to the surface to permit wading at low water, offered to the naturalists of the Expedition their best collecting grounds. Other reefs lying deeper seen through a water telescope, called to fancy a "rockery" in some botanical garden, if for boulders be taken round masses of *Porites* or *Goniastrea*, tufts of soft *Alcyonaria* for ferns, and branching *Gorgonia* for shrubs.

Along the centre of the concave side of the main islet is banked, as already mentioned, masses of sand which are arranged in low broad undulations, parallel to the long axis of the islet. Nowhere do they form dunes as occur on other atolls, probably because an active vegetation fences off the wind. This increment of sand is still adding to the islet's breadth. A space was pointed out in front of the village where a man could formerly take a

\* *Scavola kenigii*, Vahl. See Vegetation.

† The version I heard on Funafuti was that the ship's chronometer was taken through a port of the captain's cabin,—a much more serious offence.

deep dive, but which is now barely knee deep. Mr. O'Brien, the resident trader, told me that within his recollection this place had become much shallower. A similar spot in the lagoon of Nukulailai was shown to me by Mr. Collins, the local trader, who had remarked that it had shoaled visibly during his residence on the atoll.

North and south of Funafuti islet are shallow passages\* a few hundred yards in width, interruptions in the thread of land which encloses the lagoon but not in the reef rim upon which the islets stand. At low water these are nearly dry, to windward the surf breaks upon the outer edge of the reef, which continues from islet to islet without reference to the passage, and to which my previous description of low mounds, crevasses, and inner platform applies. Within these the passage offers a broad, almost level floor of shingle and rolled blocks. This area is nearly destitute of life, the great rush of water sweeping all before it and the unstable floor giving little holdfast. A few of the hardest Gasteropods and odd scraps of living coral contrive however to withstand these adversities. Coming to the lagoon shore the passage floor is seen to extend into it in a fan, identical in shape and structure with the fan a mountain torrent spreads on entering a lake. Below and beyond the steep delta slope a coral garden stocked with fish, shells, sea anemones, and many other pretty things, flourishes exceedingly. A collector remembers with what cupidity he, floating over them in a canoe, gazed at treasures so near in the clear water and yet so far from sketch book or microscope. As well as I could ascertain the water, driven by the surf, pours from without to within across the passage, during ebb tide as well as flood. Whether or not these passages are growing into islets there was nothing to show, if so the shingle floor might represent the breccia in course of formation; but certainly the filling in of the lagoon proceeds at the passage delta.

#### SUMMARY OF PRECEDING GEOLOGICAL OBSERVATIONS.

1. An elevation of Funafuti by at least four feet is proved by dead sub-fossil reef-corals in the position of life near high water mark.

2. Darwin's theory of coral reefs as opposed to Murray's is favoured by these facts:—Firstly, soundings show the atoll to be planted not on a bank but on a cone; secondly, they also show it girdled by a precipitous submarine cliff, explicable only on the subsidence theory; thirdly, our observations and the experience of residents agree that the lagoon is filling up, whereas Murray demands its excavation.

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\* These "passages" are not to be confounded with the deep and navigable channels through which warships may enter the lagoon.

8. A peripheral growth at present level is indicated on both sides of the islets.

#### CLIMATE.

During our visit in the "winter" of this latitude, the thermometer never fell below  $75^{\circ}$ ; when it approached this minimum the natives seemed to feel the cold, as their bare skins puckered into "gooseflesh." A native who had visited Auckland, New Zealand, amused me with a description of how in that, to him, distant and frigid clime, he saw his breath appear one cold morning "like smoke," and how he felt alarmed that he were stricken by some dire malady. The highest temperature we noticed was about  $92^{\circ}$ , sometimes for days together the thermometer would oscillate within a few degrees of  $80^{\circ}$ , the latter being the temperature of the surface of the lagoon. The readings of the wet and dry bulb were seldom far apart in that humid atmosphere.

A week hardly ever passed without rain, and it sometimes poured hard all day.

The wind rarely shifted out of the east. Our hut upon the lee side of the islet had its sides open to the weather, yet it seldom blew enough there to extinguish a match. Only twice do I recollect a gust from the westward strong enough to scatter loose papers on the table.

The zodiacal light was sometimes seen distinctly.

Hurricanes seldom occur, but a few have impressed their memory upon residents. I have already stated my belief that the Mangrove Swamp is a scar upon the islet resulting from one of these conflicts of the elements. "The group," says Becke, "suffers but seldom from droughts or hurricanes, although the terrible drought experienced in the near-to Gilbert Group in 1892, which has not yet broken up, has also affected the Ellices, and at the present time Nanomea and Nanomaga present a parched up appearance. A heavy blow in 1890 also did terrible havoc among the cocoanuts, which had not the strength to bear up against the drought."\* Describing the Gilbert Islands, Woodford† remarks: "I suspect that it is not till the cyclone in its course reaches a latitude of about  $12^{\circ}$  to  $18^{\circ}$  from the equator, that the level of the water accompanying it attains a height sufficient to do serious damage. Were it not so, the Ellice Group, of similar formation, which lies much further to the southward, would be rendered uninhabitable. A wave of the height of eighteen feet would be sufficient to sweep away the whole of the population of the Gilbert and Ellice Groups."

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\* Becke—*loc. cit.*    † Woodford—*loc. cit.*

## VEGETATION.

I regret that I was unable to form a Botanical Collection in Funafuti. I did indeed attempt to dry plants in blotting paper, but the extreme moisture of the climate caused the specimens to rot even in the press. Zoological study being the principal aim of my visit, and the exhausting work of reef collecting leaving little time or energy, botany was reluctantly sacrificed; specimens of such plants only as related to ethnological inquiry being preserved in a solution of two or three per cent. of formol.

The study of atoll floras was initiated by Henslow's examination\* of the plants collected by Darwin on the Keeling Islands, our knowledge of which was expanded by Forbes† and by Guppy.‡ Lists of plants from the Marshall Islands,§ Maldon Island,|| Gilbert Islands,¶ Sikaiana Island,\*\* Caroline Island,†† and Fanning Island,‡‡ show a small number of the same species repeated from atoll to atoll over enormous distances across the Pacific Ocean. The identity of the vegetation possessed by tiny islets separated by thousands of miles of deepest ocean is very striking, since paradoxically they present a greater continuity of life range than any continent can show. The inferences deducible from the distribution of atoll plants are so admirably drawn by Dr. H. B. Guppy, and are so entirely in accordance with my own conclusions, that I extract from his article "The Polynesians and their Plant-names,"§§ the following expression of his views:—

"The low coral islands and the shores of the more elevated and mountainous islands are occupied by plants such as *Barringtonia speciosa*, *Calophyllum inophyllum*, the Mangrove, *Morinda citrifolia*, the Pandanus, *Thespesia populnea*, &c., that are known to be dispersed by the currents; and they are all plants that are widely distributed over the Indian and Pacific Oceans. The only doubt arises as to the particular route along which the floating seed were drifted, and if that can be established we may obtain a clue as to the route pursued by the Polynesians. Now a species that, like *Barringtonia speciosa* or *Thespesia populnea*,

\* Florula Keelingensis, Ann. Nat. Hist., i., 1838, p. 337.

† Forbes—A Naturalist's Wanderings in the Eastern Archipelago, 1885, p. 42.

‡ Nature, xli., 1890, p. 492.

§ E. Bêche, Berliner Gartenzeitung, 1844.

|| Hooker in Hemsley, Challenger Reports—Botany, i., 1885, p. 18.

¶ Woodford—Geogr. Journ., vi., 1895, p. 346.

\*\* Beck—Ann. K.K. Naturhist. Hofmus., iii., 1888, pp. 251–256.

†† Dixon—Mem. Nat. Acad. Sci., ii., 1884, p. 88.

‡‡ Hemsley—"Challenger" Reports—Botany, iii., 1885, p. 116.

§§ Trans. Vict. Inst., 1896.

is almost universally distributed in the tropical islands of the Pacific can scarcely aid us in the matter. If, however, we can find a littoral plant that has only partly performed the traverse of this region, then we shall possess in the interrupted operation an important piece of evidence. The Mangrove (*Rhizophora*, *Bruguiera*, &c.) is absent, or very rare, in Eastern Polynesia, but unfortunately for our purpose this is in great part explained by the lack of a suitable station on the precipitous shores of the larger islands. We have, however, in *Nipa fruticans* a plant well fitted for our object, and one well known to be dispersed by the currents. For a littoral species it has a limited range. It is found on the tropical shores of Asia, east of the Ganges, and in the Indian Archipelago, where it abounds; and there is no question as to its great antiquity in this region. Now the Nipa Palm, as it is sometimes termed, has attempted to reach Polynesia by two routes from the Indian Archipelago, viz., by Melanesia and Micronesia. Along the first route it has in the course of ages reached the Solomon Islands, where I found it in 1884. Along the second route it has extended its range to Ualan or Kusaie, at the eastern end of the Caroline Group, where it was observed by Kittlitz about seventy years ago. Since its intrusion so far into the Pacific seems to have escaped the notice of later botanists, and as no reference is made to it by Hemsley in his account of the floras of oceanic islands, given in his 'Botany of the "Challenger,"' I may here remark that it is described in general terms in the narrative of Kittlitz, and is figured in his 'Views of the Pacific Vegetation,' where it was also identified and noted by Dr. Seemann in his English edition of the 'Views.' Now the island of Kusaie lies in the course of the Pacific Counter Current, which runs to the eastward from the Malay Archipelago right across the Pacific between the parallels of about 4° to 8° N. Here the Nipa Palm has reached the last spot where it could find a station. Beyond lie the coral atolls of the Marshall Group that could afford no home to a plant that frequents the extensive coast swamps, and lines the mouths of large rivers in Asia and in the Archipelago. Most of the familiar littoral plants of Polynesia have probably reached their present home by the path attempted in vain by the Nipa Palm. Since they for the most part frequent coral islands, the atolls of the Marshall, Gilbert, and Ellice Groups would form so many stepping-stones by which, in the season of the north-west winds, they would be able to find their way to Samoa and Fiji in spite of the westerly drift of the Equatorial Current."<sup>\*</sup>

<sup>\*</sup> Among Mollusca the *Trochomorpha* would seem to have "reached their present home by the path attempted in vain by the Nipa Palm;" and *Rhysota sowerbyana*, Pfr., to have accompanied the Nipa to the Carolines, and like it to have there "reached the last spot where it could find a station."—C.H.

No account of the botany of the Ellice Group appears to have been published. In his recent works on Polynesian Botany, Drake del Castello neglects to make any reference to this Archipelago. A few plants were gathered by the Rev. S. J. Whitmee during his missionary tours and presented to the Kew Herbarium. From this collection Hemsley in the "Challenger Reports—Botany" incidentally quotes *Suriana maritima*, Linn., and *Rhizophora mucronata*, Lamarck, from Funafuti itself, and from the Ellice in general the following:—*Ochrosia parviflora*, Henslow, *Tournefortia argentea*, Linn. f., *Acalypha grandis*, Bentham, *Pipturus argenteus*, Weld, *Guettarda speciosa*, Linn., *Premna taitensis*, Schauer, *Nephrolepis exaltata*, Schott, and *Octoblepharum smaragdinum*, Mitten.

The vegetable monarch of the atoll world is the coconut palm (*Cocos nucifera*, Linn.), tall individuals of which, rearing their plumes to a height of over eighty feet, give to the mariner his first landfall. Every available rod of dry land is planted with coconuts, one tiny islet, a mere shingle bank, so swept with spray that lichens are the only other vegetable life, yet grows three poor stunted and battered palms. It is to be emphasised that all coconuts are *planted*; the idea of a wild palm being as strange in Funafuti as that of a wild peach might be in England. Gill in describing the primeval forest of the uninhabited island of Nassau in 1862, alludes to but a single coconut tree among the indigenous vegetation.\* I doubt whether, despite popular opinion to the contrary, a wild coconut palm is to be found throughout the breadth of the Pacific. Certainly it is most rare, again contrary to popular theory, for a drifted coconut thrown upon the beach by winds and waves to produce a tree.† So intimately is this palm now associated with native life that it is difficult to imagine an atoll before its introduction.

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\* Gill—Jottings from the Pacific, 1885, p. 30.

† From eye-witnesses I have heard of several wild coconut palms on Facing Island, Queensland, and again of one at Emu Park, Queensland. But, if the popular idea were correct, the Queensland beaches should have presented many hundred miles of coconut groves to their earliest explorers, receiving, as I can testify they do, abundance of drifted nuts and fulfilling every requirement of soil and climate. As Jukes says: "The entire absence of these trees from every part of Australia is a most striking fact, since it is I believe the only country in the world so much of which lies within the tropics in which they have never been found."—(Voy. "Fly," i., 1847, p. 132.) I have been told by Queensland Aborigines that they always tore up and ate any sprouting nuts they might find, but even this scarcely accounts for the remarkable absence of the coconut palm from Queensland. Guppy's remarks on the germination of stranded coconuts (*Nature*, xli., p. 492) will repay perusal, also Dana's in *Corals and Coral Islands*, 1872, p. 181. Where the original home of this palm was, has been discussed at length by Seemann in the *Flora Vitiensis*, and by De Candolle—*Origin of Cultivated Plants*, 1884, p. 429.

Though romance and poetry have always linked together reef and palm, yet truth to tell, the coconut does not attain its greatest luxuriance upon the low reef islands. To an eye, not to mention an appetite, accustomed to the coconuts of New Guinea, the fruit of Funafuti seems to be dwarfed and stunted, and the palm trunks to be small and slender. A hundred nuts on a stem is a maximum yield for Funafuti, but double that amount is obtained elsewhere. "As big as a Rotumah nut," is a phrase often heard upon Funafuti, the richer soil of that high island producing larger nuts than the atolls; the shells of very large nuts being valued for flasks and toddy vessels.

Native traditions point not only to the fact that the coconut is an introduced plant, but that the date of its introduction into Funafuti is, historically speaking, comparatively modern, possibly a couple of centuries ago. Certain of the tallest and presumably oldest\* palms about the principal village are known as "Touassa's trees," having been planted in the reign of that chieftain. Tradition narrates how the priest Erivada despatched double canoes, "fouroua," or ocean-going craft, to Vaitupu to bring thence seed nuts, Vaitupu having previously received the coconut from the Gilberts. On the canoes returning with their cargo, the sprouting nuts were dexteriously split so that the spongy core could be extracted for food, while the germinating plant, uninjured by this treatment, was cultivated. At this period land other than the village site and the taro gardens first acquired a value, and the whole atoll was then parcelled out among the tribe, each man proceeding to plant his portion with coconuts. Two generations ago so valuable were the nuts that to steal them was a crime which these gentle islanders punished by drowning the culprit in the lagoon. Two varieties of coconut are recognised, the sweet nut "uta maunga" and bitter "niu."

When the nut is a couple of inches long it is called "kaieri," a little older† when the creamy deposit begins to form it is "mukkamuk," the contained liquid being "swanu," later when it is sufficiently ripe to be plucked for drinking the nut is termed "bee," the milk of which is "swabee," and the kernel "ingati;" a more mature nut whose shell begins to turn black is "mutta-mutta," and when the nut drops naturally from the tree it is "niu." A store of these old nuts is kept always in the huts against time of famine, they are partially husked, but care is

\* Dr. Gill states that "The coconut palm attains the age of from 180 to 200 years in well sheltered places."—Jottings from the Pacific, 1885, p. 203.

† The stage in ripeness which the nut has reached is ascertained by tapping on it with the knuckles, as in Fiji. See Seemann—Flora Vitiensis, 1865-73, p. 278.

taken to leave the husk intact over the "eyes," else the cockroaches would gnaw through at this point and spoil the fruit. A rib of husk like the crest on a fireman's helmet is usually left, and the nuts are tied in couples by a wisp of husk fibre. After the lapse of a year the liquid has dried out, and the kernel turning red and soft is considered more palatable and termed "tukkatukka gea;" this is eaten with bonito. Preserved for three years the kernel turns black and still softer, and, though it now stings the tongue, is yet thought wholesome; this stage is known as "tukkatukka kula." In a sprouting nut the contained liquid turns to a white spongy mass filling the cavity. I found this, as do the natives, an agreeable food. From the old times the people here have extracted (by what process I unfortunately neglected to ascertain) coconut oil, with which, scented, they anoint themselves.

In former years a considerable trade was done in coconut oil locally expressed and casked. The dried kernel or copra now furnishes the sole export of Funafuti, amounting annually to about 8,000 lbs. In return the natives receive through the local trader, tobacco, calico, tools and other requirements. Out of the revenue so obtained, the salary of the native missionary teacher and the taxes due to the Imperial Government are both paid.

Palms devoted to the manufacture of toddy (Fig. 1) are readily distinguished by having step notches cut in their trunks. Every month the palm puts forth a budding spathe. In toddy palms this is not permitted to develop into flower and fruit, but on its first appearance is lashed round with twine, "marled" in seafaring language, from the base to the apex. The peduncle of the spathe is scraped and slightly split to allow it to bend more freely. Then the spathe is bent downwards gradually by tying down the tip for two or three days, the cord being shortened at intervals, till the spathe has acquired the proper inclination. Three or four inches are cut off with a knife from the tip, to which a little spout or gutter of leaf is attached. This spout guides the drip of the sap into an empty coconut shell hung from the spathe. Twice a day a lad ascends the tree, unbinds the tip, shaves a little off it with his knife to make the sap run freer, re-binds it and exchanges the full shell for an empty one. Several spathes in one palm are in operation simultaneously.

The juice so obtained is strained, and lest it should turn sour is kept warm in a coconut shell by the fire. "Freshly drawn from the tree, it is of an agreeable taste resembling ginger-beer."\* When sufficient is accumulated it is boiled down to molasses, from which a native sweetmeat is made. For the following recipe I am indebted to a Funafuti lady: "Beret," adopted from the

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\* Woodford—*loc. cit.*

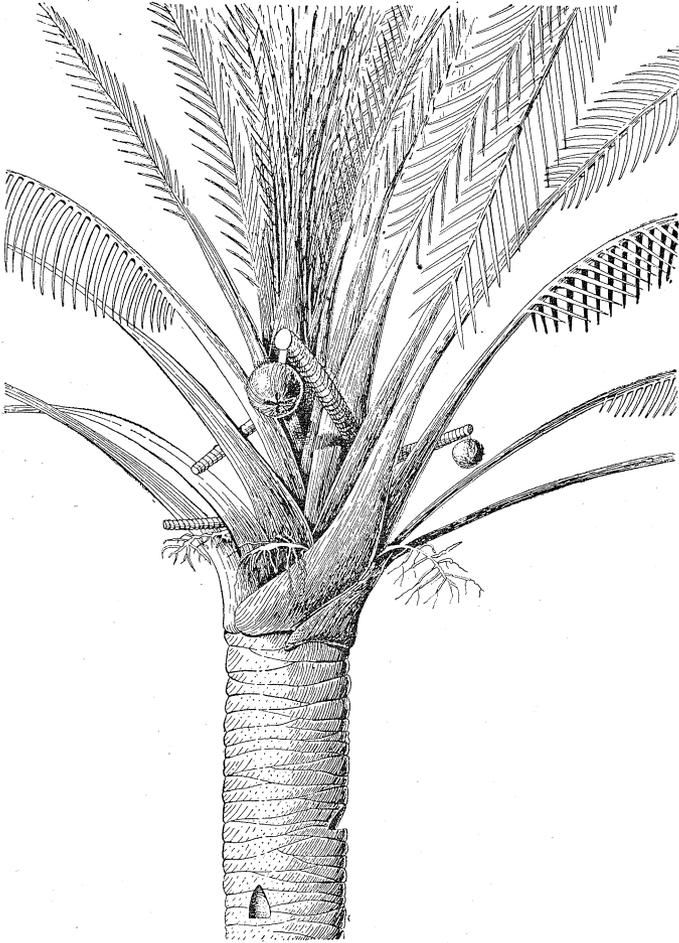


Fig. 1.—Method of collecting sap dropping from wounded spathes (toddy) into suspended coconut-shell flasks.

Gilbert Islands, take hard old coconut kernel, grate fine, dry in the sun and pound to the consistency of oatmeal; upon this pour boiling syrup of molasses. Water sweetened with molasses is an ordinary drink, and as an alternative to coconut milk a thrifty householder pointed out that the supply of beverage for his family from one tree yielding toddy, equalled that from ten trees yielding nuts. The Ellice Islanders, who were also unacquainted with kava or betelnut, never fermented or distilled their toddy into an intoxicant like the Gilbert Islanders, among whom free

indulgence in toddy was the usual prelude to murderous fights. The manufacture of toddy is an art unknown to either Polynesians or Melanesians, and was certainly derived from Micronesia, reaching in the Ellice its furthest extension southward.

The green heart of a coconut palm being only to be obtained by sacrificing the tree, was a dainty seldom eaten by the islanders.

The timber of the palm was not as far as my observation went ever employed by the natives. The only insect foes to the palm in Funafuti were the white ants, which committed much damage by eating away the trunk a few feet from the ground. I saw several tall palms snapped by the wind where these pests had weakened the stem. My colleague, Mr. W. J. Rainbow, recognised in this pest *Calotermes marginipennis*, Latr.

The cultivation of the coconut is confined to the simple operations of placing a sprouting nut where it is to grow, of clearing the shrubs and vines from around it, and of gathering the produce. The work of collecting and husking the nuts devolves solely upon the men. For climbing the palms a stout rope loop, "kafunga," is twisted into a figure of eight, into this each foot is thrust as far as the instep. Placing his hands around the stem the man leaps on to the trunk, resting his manacled feet on either side of it. Raising his hands to a higher grasp he makes another leap, and ascends the tree by bounds of a couple of feet or so. Arrived at the summit he plucks from his belt a short notched stick and attached cord, "kouteki." Applying the stick against the palm stem like a ship's crosstrees against her mast, he winds the rope half round the trunk, over the notch on the stick, back round the tree and over the other notched end. Repeating this twice or thrice the stick is securely hitched to the trunk, and the native standing upon the crosstrees may conveniently do his work. A nut is gathered by seizing the apex with the fingers and twirling it round till the twisted stalk breaks, when the nut is allowed to drop to the ground.

Husking is effected by fixing a stout stake, which presents a sharp spear point, in the ground at an angle of about 45°. The nut held in both hands is driven against the stake so that the point penetrates the husk but not the shell, and with a twist a strip of husk is wrenched off. After two or three repetitions the husk is torn off, except a strip by which it is fastened to another nut. The labourer returns from his work with his plane iron adze caught in a loop of the kafunga, and these with the koutekei slung with his freshly husked nuts from the husking stake, a valued implement and potential weapon, over his shoulder.

A proprietor wishing his tree to be untouched resorts to the "Niu tabu," (Fig. 2) effected by tying a coconut frond around the stem. This widespread South Sea warning, equivalent to our "Trespassers will be prosecuted," I saw in use throughout British

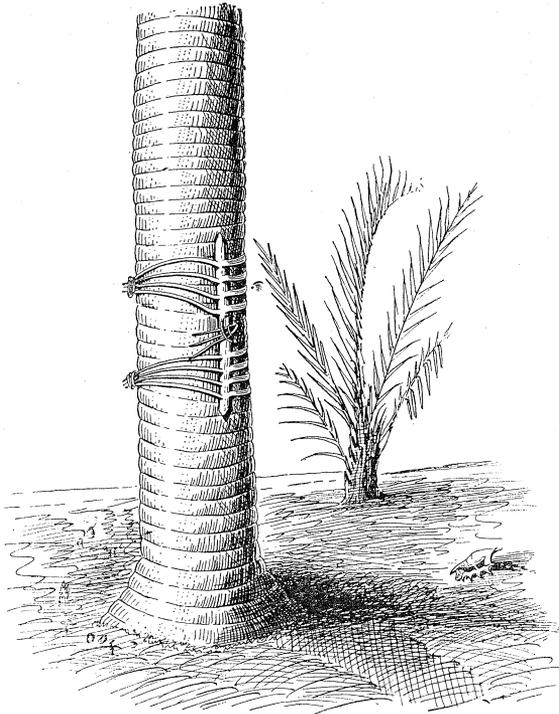


Fig. 2.—A palm reserved by the “Niu Tabu.”

New Guinea, and the Rev. W. W. Gill described\* it in Rarotonga. There it is held to represent the owner clasping the tree with his arms and legs, separate bunches of pinnules being knotted to represent the limbs. Dr. Gill tells me that in old Rarotonga, if the midrib of the niu tabu was injured the owner would consider that his spine was figuratively broken, a mortal injury only to be atoned by the blood of the offender. In Tonga the trespasser incurred a curse that his child would die within the year, but in peaceful Funafuti I did not learn of any dire evil befalling the offender. The tip of the coconut frond, the sacred “iku kukau,” was a religious emblem in former days.†

Anyone athirst in another man’s land was in Funafuti at liberty to pluck his neighbour’s coconut, but he was expected to report the circumstance to the owner on his return.

\* Gill—Jottings from the Pacific, 1885, p. 205.

† Gill—*loc. cit.*, pp. 15 and 22. On Nukufetau the American Expedition observed a coconut leaflet tied around the neck, probably as a sign of amity and peace. Wilkes—*Narr. Amer. Explor. Exped.*, v., 1845, p. 43.

Baskets similar to, but not identical with that recently figured and described\* by the writer from New Guinea, are constructed from palm fronds, as are trays for carrying fish, eyeshades, and rough mats for the floors and walls of houses. Rough dresses, "titi," for working in are made from palm leaves. Temporary huts are thatched with coconut, but pandanus replaces it in permanent residences.† A leaning palm is used to collect rain water (Fig. 3),

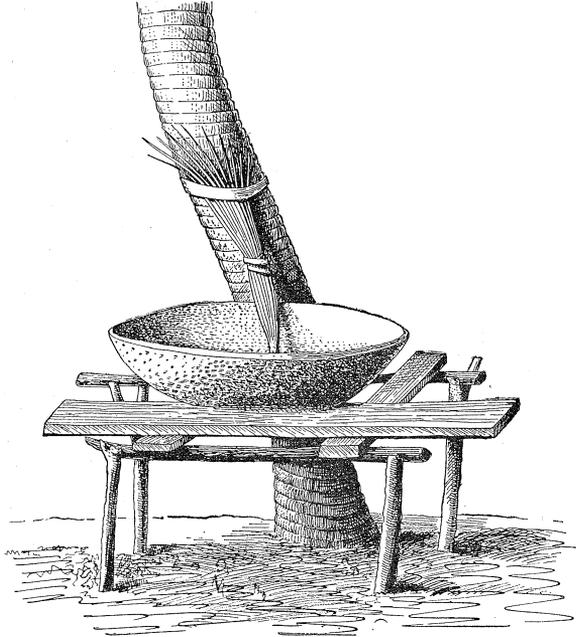


Fig. 3.—Method of draining rain water from a leaning palm.

which trickling down the stem is turned by a wisp of leaves and caught in a wooden trough. The fashion is not in vogue in Funafuti which Dana‡ describes from the neighbouring Tokelaus as follows: "Water is sometimes obtained by making a large

\* Proc. Linn. Soc. N.S.W. (2) x., 1895, p. 615, Pl. lviii., f. 2.

† "The thatch of Atupa's house [in Nanomanga] is merely the leaf of the coconut, which is very pervious to rain; whilst the idol-temples are well covered with the leaf of *Pandanus odoratissimus*, the finest thatch in the world. We suggested to a chief that the king's dwelling might have a better thatch. He replied, "The king's house is thatched with coconut leaves, not with pandanus, because he is but mortal." The same feeling formerly existed on Mangaia with reference to this celebrated thatch tree." Gill—Jottings from the Pacific, 1885, p. 23.

‡ *Loc. cit.* p. 284.

cavity in the body of a coconut tree, two feet or so from the ground. At the Duke of York's Island, and probably also at the adjacent Bowditch Island, this method is put in practice; the cavities hold five or six gallons of water."

The dried leaves tied in bundles are used at night for torches while fishing.

Fibre for sinnet is obtained by macerating green coconut husk for three or four weeks in fresh or salt water, such is known as "loukafa."

A kind of fish trap like our crab pot was wove in basket work from the roots of the palm.

After the coconut the principal tree, both in numbers and utility, is the Fala, Screw Pine, probably *Pandanus odoratissimus*, Linn., but the confused literature\* of this difficult genus has not allowed a satisfactory identification of this species. The natives recognise and name several varieties of the native Fala, but I do not know whether these are botanical species. On the third islet south of the permanent village I remarked an apparently starved form with scanty foliage and slender limbs. Approaching the atoll from the sea, the pyramidal shape and vivid green of the Fala enables the eye to detect it before any other indigenous plant. It extends over the whole of every islet, and appears to have no especial choice of soil or situation, attaining a height of 25 - 30 feet, and a diameter of trunk of 12 - 14 inches. The faceted fruit, "fui Fala," about the size of a man's head, is orange-red when ripe and then emits a sweet smell, three or four in different stages of maturity being usually carried on one tree. The fruit being broken open the proximal soft portion of the phalanges is chewed. The sweet sugary taste is a favourite with adults and children alike, and meets the approval of the Robber Crab, *Birgus latro*, but does not commend itself to a European palate. Having chewed the ends into the semblance of a paint brush, the eater throws the phalanges away and never opens them for the edible seeds they contain. There appears to be no private property in Pandanus, anyone may take any ripe fruit he may meet.

The trunk and branches of the Fandango, as the beach-combers call it, are soft and useless for fuel or building, but the leaves, "lau Fala," yield material for the local arts and manufactures. For thatch the leaves are dressed, stripped of their thorns, folded in a row over a batten and pinned by a riblet of palm frond; battens so loaded are arranged on the roof one above another with a considerable lap. Such a thatch is excellent and lasts four or five years. The leaves yields material for fine mats, and

\* *Vide* Balfour, Observations on the genus Pandanus, Journ. Linn. Soc. Bot. xvii. p. 54.

is one of the fabrics for the titi, or native kilt. These leaves readily take a dye, and patterns of red, white and black, have of old figured in the mats and dresses. The aerial roots were in other atolls of the Ellice chewed\* into fibre for the titi. "It is believed to attain to a great age. . . I have seen the veritable screw-pine on which Mautara, some hundred and fifty years ago, disembowelled Kikau in revenge for the murder of his son Teuanuku. The tree was uprooted in the cyclone of 1860, or it might well have lived on for many a long year."†

A different Pandanus from the wild one is cultivated near the village, it has a sweeter fruit, twice as large as the indigenous species, longer, broader leaves, and stouter stem. The natives call it the Fala kai, edible Screw Pine, and they told me that it had been introduced from the Gilbert Islands. This is probably the species mentioned by the Rev. S. J. Whitmee, who writes of Peru :‡ "The natives appear to value the Pandanus even more than the coconut palm. They consume immense quantities of the fruit raw, and the variety which they cultivate in the Gilbert Group (which is much superior to that found in the Ellice Islands, and immeasurably superior to the kind cultivated in Samoa) produces a very palatable fruit. The women prepare a kind of cake by baking the fruit till it becomes soft ; they then pound a large number in a large mat, and spread the prepared pulp in cakes two or three feet wide by six or eight long, and one-sixth of an inch thick. The whole is then dried in the sun, and made into a roll like an ancient manuscript. This keeps for a length of time and tastes something like old dates."

"In the Line Islands, during frequent seasons of drought, when the coconut palm ceases to bear fruit, the natives contrive to exist upon fish and the drupes of the never failing screw pine. The inner part of the drupe is fleshy and pleasantly sweet. Several tiny kernels, in extremely hard shells, fill up the outer part. On many of the Gilbert Islands preparations of the Pandanus were presented to us, as the most valuable gifts they could bestow. First, the ripe fleshy parts of the drupe, pounded into a flat cake, in appearance like a mass of pressed oakum ; this we could not eat. Next came extremely thin, paper like stuff, consisting of the sugary juice of the fruit dried in the sun ; this was very palatable. Lastly came a sort of sawdust, or fine nutritious particles out of the kernel and drupe dried ; this too

\* In the New Hebrides the petticoat worn by women and girls is prepared from the exposed roots of the Pandanus by splitting and chewing them. Gill—Jottings from the Pacific, 1885, p. 186.

† Gill—*loc. cit.*, p. 187.

‡ Whitmee—A Missionary Cruise in the South Pacific, Sydney, 1871, p. 36.

was very nice, but it would take a great deal of such food to satisfy the appetite.”\*

Leichhardt writes of Northern Australia: “At the deserted camp of the natives, which I visited yesterday, I saw half a cone of the *Pandanus* covered up in hot ashes, large vessels (koolimans) filled with water in which roasted seed-vessels were soaking; seed vessels which had been soaked, were roasting on the coals, and large quantities of them broken on stones and deprived of their seeds. This seems to shew that, in preparing the fruit when ripe for use, it is first baked in hot ashes, then soaked in water to obtain the sweet substance contained between its fibres, after which it is put on the coals and roasted to render it brittle, when it is broken to obtain the kernels.”†

In Funafuti the children make necklaces out of bits of the brightly coloured nuts.‡

Of the timber trees the most imposing is the Fetau (*Calophyllum inophyllum*, Linn.). On the lagoon side of the north-eastern islet and overhanging the water are some handsome examples of this tree forty feet in height and six or seven in diameter, whose roots extend downwards to the high tide mark, and clasp the rocks in the fashion of the Maritime Pines of Europe, or the Spotted Gums of Australia. The rough barked, short, stout trunk branches like an oak abruptly into heavy, thick limbs. The foliage is dense, glossy and dark green; among which is borne a profusion of delicate, sweet smelling, white flowers, greatly valued by the natives, and woven by them into garlands for feasts and festivals. On the main islet were a few small trees, but the species was not abundant there. I did not notice the hard dark timber in use by the natives. Probably it was not workable by the shell adzes used before civilisation.§

Another of the taller timber trees is the Pouka|| (*Hermandia peltata*, Meissn.). On a sandy flat just behind the village, is a wood chiefly composed of this species. Hemmed in by each other and the palms they have shot up into straight, unbranched, slender saplings, forty feet high and twenty inches in diameter;

\* Gill—*loc. cit.*, p. 185.

† Leichhardt—*Journal of an Overland Expedition in Australia, 1847*, p. 406.

‡ As described by Gill—*loc. cit.*, p. 186.

§ Seemann (*Flora Vitiensis, 1865-73*, p. 12) says of the oil of this tree in Fiji, “the natives use it for polishing arms and greasing their bodies, when coconut is not at hand. The leaves are torn in small pieces, soaked in water for a night and then used for washing inflamed eyes. Boats and canoes are built of the wood and it is named with the Vesi (*Afzelia bijuga*) as the best timber produced in Fiji.”

|| “Buka” in Rarotonga—Gill, *loc. cit.*, p. 166.

these, the first examples noted, were too lofty to show flower or fruit, but the peltate leaf, alluded to by the specific name, enabled me to recognise later the species, in a graceful round topped tree, twenty feet high, growing in the open. The curious capsule of the bell shaped fruit recalled that of the Cape Gooseberry. During our stay on Funafuti several canoes, "vaka," were built, all of which were carved out of the soft white Pouka wood, together with their accessories, balers, outriggers and paddles. In past times, from seed of this, the pigment used in tatooing was made.

For posts and the frames of houses the natives had recourse to the hard, heavy, white wood of the Fau (*Ochrosia parviflorus*, Henslow), a smooth barked, small, round topped tree, twenty-five feet in height and a foot in diameter, which flourished among broken coral debris, independent of sand or soil. In hot weather the dense foliage of large, smooth, glossy leaves offered a refreshing shade. The nuts, which Darwin aptly compared to walnuts in appearance, turn yellow when ripe, and hang from long stalks in clusters of twos and threes. Beneath the tree are thickly scattered on the ground the fallen fruit, looking, when the outer rind decays, as if meshed in netting. No use is made of these nuts by the natives.\*

Only one clump of the handsome *Barringtonia butonica*, Forst., was seen, it grew a little beyond the north arm of the mangrove swamp. I am not aware if the Rarotongan method† of poisoning fish with *Barringtonia* was practised by the Ellice Islanders. Of the uses to which this tree is put in Fiji, Seemann writes: "A magnificent seaside tree, from which liku (woman's dress) is made. The large square fruits are used by the natives for floats of fishing nets, and in a favourite game (veitegi vutu). The outer portion of the fruit, which is poisonous, is employed for stupefying fish, for the purpose of catching them."‡

Around the swamp a hedge of Tonga (*Rhizophora mucronata*, Lamk.) extended for most of its circumference. This was the only spot it inhabited in the atoll, and no other species of mangrove grows in Funafuti. The arched hoop-like roots, springing high from the trunk, stretch out for yards across the mud, and from them spring smaller and yet smaller hoops that anchor the tree further and further into the swamp. The pendulous viviparous fruit is called "pika." It is not used for food upon

\* In the Solomons, "The fruit of the common littoral tree *Ochrosia parviflora* ("pokosola") contains an edible flat kernel." Guppy—Solomon Islands, 1887, p. 87.

† Gill—*loc. cit.*, p. 140.

‡ Seemann—*loc. cit.*, p. 87. See also Guppy—Solomon Islands, 1887, p. 158.

Funafuti, but is eaten on neighbouring atolls where food is less plentiful.\* *Rhizophora* tan was formerly used as a dye, but its place is now taken by European tar. "A mangrove which supplies a black dye" is noted by Dr. Steinbach from the Marshall Islands.† The hard wood of this mangrove was carved into "afa," meshing needles. In Fiji, Dr. Seemann observes of this tree: "The sap has a blood red colour, and is much employed by the natives, amongst whom it is as fashionable to dye their hair red as it was amongst the ladies of ancient Rome, after their roving husbands had become acquainted with the fair locks of the Teutonic race. On the Island of Nukubati I also saw the sap employed by potters for painting their crockery. Just after the pots had been baked, and were still quite hot, a mixture consisting of this fluid and the sap of of *Hibiscus moschatus*, L., was used for that purpose, the colours of the paint remaining almost unchanged after the vessels had become cool and dry. The aerial roots, being very elastic, offer good materials for bows of which the Fijians avail themselves."‡ Both the Solomon Islanders and the Tongans also used this wood for bows.§

The Fo fafini, or Woman's Fibre tree (*Hibiscus tiliaceus*, Linn.), grows in abundance as a small tree thirty feet in height, bearing numerous large, showy, lemon coloured flowers, with a brown centre. The western end of the mangrove swamp was overgrown by a dense thicket of this tree. I did not notice that its very soft white wood was applied to any purpose by the natives. The bark, as elsewhere in the Pacific, is a favourite material with the local costumières, who soak it in sea water for a couple of weeks, dry it in the sun, and bleach it with lime, or stain it red with Nonou bark, or blacken it with charcoal, bonito blood, or Tonga tan. In the Ellice this use of Fo was restricted to Nukulailai, Funafuti, Nukufetau, and Vaitupu, beyond which it was replaced by Pandanus.

Seemann says: "In most countries the fibre of this species is extensively used for cordage, but in Fiji the chief use made of it and that of the foregoing species (*H. tricuspis*) is for women's "liku," a dress consisting of a number of fringes attached to a waistband. The bark of these trees is stripped off, steeped in

\* Near Cooktown, Queensland, the writer saw in a black's camp a quantity of *Rhizophora* fruit collected for food, and in Western British New Guinea he learnt that it was resorted to in time of famine. In Proc. Roy. Soc. Qd., v., 1888, p. 11, it is recorded as eaten by the Solomon Islanders. For an allusion to its use as an esculent in Torres Straits, see Haddon—Folklore, i., 1890, p. 190.

† Review, in Geogr. Journ., 1896, p. 297.

‡ Seemann—*loc. cit.*, p. 91.

§ Mariner—Tonga, ii., 1817, p. 287.

water to render it soft and pliable and to allow the fibres to separate. The fibres are either permitted to retain their original whiteness, or they are dyed yellow, red, or black. The yellow colour is imparted with turmeric, the black with mud and the leaves of the Favola (*Terminalia catappa*, Linn.), and the red with the bark of the Kura (*Morinda citrifolia*, Linn.), and that of the Tiri. The liku worn by the common women consists always of one row of fibres, all of the same colour; whilst those worn by ladies of rank are often composed of two or three rows or layers (flounces), every one of which exhibits a different colour. In Captain Cook's time the Tahitians used to suck the bark of this plant when the breadfruit season was unproductive, and the New Caledonians ate it, as they probably still do.\*

"It is the Talwalphin of some of our Aborigines, who use the fibre of the bark for fishing lines and nets."† "By the Central Queensland natives the roots and tops are used as food."‡ In Hawaii, Hillebrand says: "The light wood serves for outriggers of canoes, the bark furnishes a tough and pliable bast for ropes, and a decoction of the flowers is a useful emollient in bronchial and intestinal catarrhs.§

Near the village were several bushes of Fo tangata (*Broussonetia papyracea*, Vent.), distinguished from the other Fo (Hibiscus) as the Man's Fibre tree. These grew as shrubs eight feet high, with slender withy branches and coarsely veined soft leaves; apparently they were limited to two or three acres. No care was bestowed on them, and while on the island I considered the plants to be quite wild. Numerous references to this species, as widely cultivated throughout Polynesia, make me now suspect that this tract had originally been planted. Of Fiji Seemann writes: "The cultivation of the plant does not seem to extend further westwards towards the New Hebrides, New Caledonia, and the Loyalty Groups; nor does it seem to be in vogue amongst the islands of the Indian Archipelago and in India. . . . Materials for the scanty clothing worn by the Fijians are readily supplied by a variety of plants, foremost among which stands the Malo or Paper Mulberry (*Broussonetia papyracea*, Vent.), a middle sized tree, with rough trilobed leaves, cultivated all over Fiji."¶ Hillebrand thought that *B. papyracea* was a native of

\* Seemann—*loc. cit.*, p. 18.

† Maiden—Useful Native Plants, 1889, p. 624.

‡ Thozet—quoted *id.*

§ Hillebrand—Flora of the Hawaiian Islands, 1888, p. 49.

¶ "Botanical classification has often no place in vernacular nomenclature, and through some resemblance in habit or in utility plants are often placed together that to a botanist lie far apart." Guppy—Trans. Vict. Inst., 1896.

¶ Seemann—*loc. cit.*, p. 246.

Japan. The bark is used for manufacturing fishing lines, which are white, hard and extremely strong. After it is peeled from the twig the fibre is obtained, not by maceration, but by scraping away the inner and outer layers of bark.

An indigenous Fig is known as Ferra. It resembles the illustration, Pl. lxiv., of *Ficus aspera* in the Flora Vitiensis, producing small green fruit the size of marbles, and rarely attaining an altitude of twenty feet. The root, "djakka ferra," formerly yielded excellent fibre for cordage, equal to that obtained from *Broussonetia*, but is no longer employed. It was manufactured from the bark of the root by peeling, chewing, and drying it in the sun. A dish from the fruit of the Ferra was prepared by pounding it up with coconut milk. In Fiji, "when the plantations of *Broussonetia papyrifera* fail to produce a sufficient quantity of raw material for making native cloth, recourse is had to the Baka, *Ficus obliqua*, Forster."\*

Several different species of trees which agree in having white, scented, night flowering blossoms, and somewhat similar foliage, are apt at first acquaintance to be confounded with each other. Indeed, all the flowers seen on the island, with the exception of Malvaceous plants, the *Dioclea*, and a minute small flowered convolvulus, were white or green.

On landing, the first plant encountered is almost sure to be the Ngashu (*Scaevola kaenigii*). This is a thickly growing shrub about eight feet high, with bare stems and terminal tufts of large fleshy leaves, among which are borne the inconspicuous white flowers and white berries. The wood is very soft, hollow, with a white central pith like elder. These plants love to grow at the very margin of the sea. The pith is said to have been used for caulking the seams of canoes.

Some of the most sterile tracts in Funafuti, of decaying coral washed by high tides, were densely overgrown by the Ngia or Ngia bush, for the botanical name of which, *Pemphis acidula*, Forst., I am indebted to Mr. E. Betcher, who made the acquaintance of this plant in the Marshall Islands. To whites it is known as ironwood, and is valued as furnishing the best firewood on the island. The natives carve the hard wood into various implements, and in former times weapons. The Ngia has small white flowers, narrow linear leaves, stem and branches like an overgrown heath, and attains a height of six or seven feet. Its general aspect reminded me of the "Manuka" of New Zealand, also a gregarious shrub delighting in the worst of soils. To this widespread species, a characteristic of atoll floras, evidently refer

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\* Seemann—*loc. cit.*, p. 251.

Cooper's\* notes of "Nangiia" on San Bernardo and Palmerston Islands.

Besides the Fetau already described, there are two other blossoms especially valued for their scent by the natives, the Boua and the Jiali. In "the old times" flowers were worn lavishly, and are interwoven with many native tales and customs. A lover's wishes were granted by the lady of his choice, who crowned him with a scented garland, but a refusal was conveyed by handing to the less fortunate swain an unscented wreath. The passion for scent among the Polynesians was illustrated by the Hawaiian chiefs, who reserved the choicest scent trees for themselves by tabuing them to the common people.

The Boua (*Guetarda speciosa*, Linn.), grows abundantly as a small tree twenty feet high, with large, ovate, opposite, rough leaves, bearing in cymes a profusion of richly perfumed white flowers, with long slender corolla tubes. The leaves are used for poultices, and the flowers are employed both for scenting the anointing coconut oil and are worn as wreaths.†

The Jiali, determined by the kind help of Mr. R. T. Baker as *Gardenia taitensis*, D.C., is not so common, I noticed it only at Luamanif. It grows into a small tree, with glossy, opposite, obovate leaves, and bears large, handsome, white, sweet smelling, hypocrateriform flowers, which are used in the same way as the Boua. "A singular enchantment was employed [in the Hervey Group] to kill off the husband of a pretty woman desired by someone else. The expanded flower of a *Gardenia* was stuck upright—a very difficult performance—in a cup (*i.e.* half a large coconut shell) of water. A "prayer" was then offered for the husband's speedy death, the sorcerer earnestly watching the flower. Should it fall the incantation was successful."‡ For a married Mangaian man to dream of *Gardenia* meant, if the blossom were expanded, that he was about to become the father of a boy, if unexpanded, of a girl. The *Gardenia* blossom (the flower of flowers in native estimation) was, and still is, worn in the pierced ears of both sexes.§ In Tonga the same plant apparently had the same name and use, for a verse in an old song ran:

\* Cooper—Coral Lands of the Pacific, ii, 1880, p. 76. "On Palmerston Island Damana timber is very plentiful, and so is a wood called Nangiia, generally found in the Pacific on desert shores, or on the brink of lagoons where its roots are bathed by the tide. Its characteristics are great weight, intense hardness, and closeness of grain. Mr. Sterndale considers that it would be very valuable as a substitute for boxwood for engravers. The logs were about 18 in. in diameter."

† The Vitians make necklaces (taube or salusalu) of the corollas of this and other white odoriferous Monopetalæ." Seemann—*loc. cit.*, p. 131.

‡ Gill—The South Pacific and New Guinea, Sydney, 1892, p. 22.

§ Gill—Proc. Austr. Assoc. Adv. Sci. for 1892 (1893), p. 613.

“ We will plait thick wreaths of *jiale* for our heads, and prepare strings of *hooni* for our necks, that their whiteness may show off the colour of our skins;”\* and we read that “ sweet scented plants, principally the *jiale*,” were planted before the grave of the Tongan king.†

Near the town were a few *Crinum* plants, whose flowers were woven by the girls into wreaths. They seemed to me to have been planted there, but the natives assured me that the species was indigenous, which I am more inclined to believe after reading that Woodford remarked it in the Gilberts.‡

*Thespesia populnea*, Soland., known both to the Ellice Islanders and Tahitians by the name of Miro,§ grew on the embankments between the cultivated swamps, I saw none undoubtedly wild. It is chiefly valued for producing the long, straight poles used in bonito fly fishing. The handsome dark wood I saw carved into a native drum.||

The Tausoun (*Tournefortia argentea*, Linn.) grows upon sandy soil and flourishes upon the leeward islands, where it gives its name to one locality. It appears as a low, round-topped tree with rough bark, dense foliage, and large dense cymes of small purple flowers. The large, obovate silky leaves attract a visitor's attention. No use is made of the soft wood, but the leaves are applied as a styptic to incised wounds; they are also collected to enrich the soil of the Taro plantations.

A bush, Valla valla (*Premna taitensis*, Schauer), grows abundantly on sandy ground, the large, thin, light green leaves of which emit an agreeable scent when crushed in the hand. These are used by the natives to scent coconut oil. When matches were unknown, the usual material for raising fire was Valla valla wood, a pencil being ploughed in a groove till friction produced ignition. At Nukulailai cauterisation was practised by applying a piece of Valla valla bark glowing from the fire to the seat of the pain.¶ I was told on this island that the root of this shrub was sometimes used as a dye. “ The natives of Fiji, who call the tree ‘ Yaro,’ employ the wood for house building.”\*\*

\* Mariner—Tonga, i., 1817, p. 308.

† Mariner—*loc. cit.*, p. 409.

‡ Woodford—*loc. cit.*, p. 346.

§ Guppy—Trans. Vict. Inst., 1896.

|| “ The natives in Fiji do not seem to make any use of the fibre of the Mulomulo (*T. p.*) so frequently used in other countries for cordage, but bestow great praise on the tree on account of the almost indestructible nature of the wood whilst under water. In Tahiti the tree was formerly regarded as sacred and planted on the ‘ Marae.’ ” Seemann—*loc. cit.*, p. 19.

¶ Mariner tells us that the Tongans applied ignited tappa to cases of hard indolent tumours.—*Loc. cit.*, p. 261.

\*\* Seemann—*loc. cit.*, p. 187.

The favourite dye wood of Funafuti is the Nonou\* (*Morinda citrifolia*, Linn.), a shrub growing plentifully wherever soil and shelter could be found. A height of ten or twelve feet is reached by this as a weak, straggling shrub, whose leaves are opposite, ovate-acuminate, large and glossy. The peculiar green fruit, an inch or two in length, somewhat resembles a green strawberry or a small, immature pine cone. The terminal twigs are four square. By the natives the fruit is eaten† medicinally, but they chiefly value the plant as a dye producer. A bright crimson-vermilion stain results from grating the bark of the root with a piece of rough coral and applying lime thereto. The native kilt or titi is thus coloured,‡ and the red strands in mat patterns similarly produced. Where the natives have more communication with Europeans the Nonou dye is discarded for aniline dyes. At Tonga, Mariner observed the Pandanus leaf, "first soaked for six or eight hours in lime water, and afterwards in an infusion of the root of the nono, where it remains for about a week; it is afterwards exposed to the sun, and becomes of a bright red; the root of the nono is of a dark bright yellow, which, upon the action of lime water becomes red."§

Once only was a *Cordyline*, probably *C. terminalis*, seen; upon the north-eastern islet I saw a few plants of this genus about three or four feet high, without flower or fruit. A native guide to whom it was pointed out called it Ti, a name by which it is known from Hawaii to New Zealand; he added that the root was "allee same sugar." Two species of *Cordyline* are cultivated in Fiji, where their roots are eaten by the natives.||

A rampant climber, smothering shrubs and young palms in its embrace, is the Sageta, a "vine" which Mr. E. Betche has kindly identified for me as *Dioclea violacea*, Mart. The large, purple, papilionaceous blossom is succeeded by a broad pod three inches long and an inch wide, along the flat side of which runs a raised ridge or keel. English residents of the Ellice assure me that the

\* The island in the Tokolau Group, Nukunonou, seems to have taken its name from this plant.

† "The Queensland Aborigines are said by Thozet to be very fond of the bitter-flavoured granulated fruit." Maiden—*Useful Native Plants*, 1889, p. 45.

"The fruit though rather insipid is eaten either raw or after undergoing some kind of cooking in Fiji." Seemann—*loc. cit.*, p. 129.

"The natives of the Shortland Islands informed me that the neighbouring people of Rubiana were accustomed to eat the fruits of the common littoral tree *Morinda citrifolia* (urati), but that they themselves did not eat it." Guppy—*Solomon Islands*, 1887, p. 89.

‡ It was doubtless with this not with "red ochre" that the dress presented to Capt. Moresby (New Guinea, p. 79) on Niutao was coloured.

§ Mariner—*loc. cit.*, p. 209.

|| Seemann—*loc. cit.*, p. 311.

bean of this plant is excellent eating, as indeed its botanical affinities would suggest. Yet as a source of food it is entirely neglected by a race whose diet is almost limited to the two staples of fish and coconut. As I have elsewhere remarked,\* “we must remember that even among the most degraded races everything eatable is not eaten. As famine presses heavier upon a tribe so are coarser and less agreeable foods used.” Dr. Guppy also points out “the singular fact that the inhabitants of one Pacific group are often unacquainted with, or make but little use of, sources of vegetable food which in other groups afford a staple diet.”† I gathered from one source that the Sageta was used to caulk the seams of canoes, but I do not know exactly how it was applied. In general the natives described it to me as but a weed, and the only use to which they put it is to crop the foliage for green-soiling the gardens.

A common herb everywhere was the Tulla tulla (*Triumfetta procumbens*, Forst.), whose prostrate stems trailed for several feet over the ground. In sunshine only did the golden yellow petals unfold, but the burr-like seeds attracted attention in all weathers. This was the most valued medicinal plant for the native doctors, who made of its foliage both decoctions and poultices. The native pharmacopeia included several other plants, as the Talla talla gemoa (*Psilotum triquetrum*, Linn.); wounds from the spine of the *Monacanthus* fishes were treated with a poultice of this, and another mode of treatment was to pile the plant on a fire and hold the wounded limb in the smoke then produced. For ear ache a remedy was sought in the cruciferous herb Lou (*Cardamine sarmentosa*, Forst.), the leaves of which being chewed the juice is strained in a cloth and poured into the ear. “In New Caledonia this species is eaten instead of Cress and as an antiscorbutic.”‡ A cure for boils is a poultice of the leaves of the Lakoumonong, kindly identified for me by Mr. R. T. Baker, as *Wedelia strigulosa*, D.C., a tall composite herb with yellow flowers, which grew among the *Broussonetia* bushes and reached a height of about six feet. It was further used as a scent plant. The leaves are chopped fine, wrapped in a cloth and strained by twisting, cloth and leaves are then soaked in coconut oil to impart to it a perfume.

Another scent was given to the anointing oil by crushing in it the fronds of Meili (*Polypodium*, sp.), a common fern there. Several other species of ferns flourished in shady places in the centre of the island, the most conspicuous of which were the large tufts of *Asplenium nidus*, Linn.

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\* In J. P. Thomson—British New Guinea, 1892, p. 283.

† Guppy—*loc. cit.*, p. 90.

‡ Seemann—*loc. cit.*, p. 5.

An *Abutilon* grew as a small shrub with handsome orange-brown blossoms in dry sunny places. On the north-eastern islet I once noticed an *Ipomœa* trailing over the ground. It resembled in habit but differed in leaf from *I. biloba*, Forsk.; neither flower nor fruit was seen. No parasites or epiphytes were noticed with the exception of a *Cuscuta*, which entangled low bushes in its skeins of thread. The introduced couch grass, *Cynodon dactylon*, had obtained a footing around the village. Another grass grew thickly in small patches of swampy flats clear of trees. Two species of mosses occurred, one probably *Octoblepharum smaragdinum*,\* Mitten, wrapped around the butts of the palms as a soft green mantle a handsbreadth deep.

The fallen trunks of trees were encrusted by a fungus, possibly a species of *Polyporus*.

A specimen of *Azolla rubra*, floating in the men's bathing pool, was the only instance of aquatic vegetation that came under my notice.

A log came ashore upon the windward reef, which an experienced bushman of our party having split and chewed, determined by its grain and taste to be New Zealand kauri, *Dammara australis*, Lamb. "An occasional log drifts to the shores, and at some of the more isolated atolls, where the natives are ignorant of any land but the spot they inhabit, they are deemed direct gifts from a propitiated deity. These drift logs were noticed by Kotzebue at the Marshall Islands, and he remarked also that they often brought stones in their roots. Similar facts have been observed at the Gilbert Group, and also at Enderby's Island, and many other coral islands in the Pacific."†

#### SUMMARY.

My observations on the Funafuti plants used by the islanders are far from exhaustive. A thorough inquiry into such a subject can only be undertaken with success by one speaking the language fluently. Medicine and magic are too intimately associated to be lightly discussed by a native herbalist, even in the present stage of civilisation. I could not attempt to unravel the sources of information, but some ideas at least of the virtues of plants are recent importations from Fiji or Samoa.

The above notes may thus be briefly classified: Food plants—*Cocos*, *Pandanus*, *Ficus*, and *Cordyline*; Fibre—*Cocos*, *Pandanus*, *Ficus*, *Hibiscus*, and *Broussonetia*; Timber—*Hernandia*, *Ochrosia*, *Thespesia*, *Rhizophora*, and *Pemphis*; Dye—*Prenna*, *Morinda*, and *Rhizophora*; Scent—*Calophyllum*, *Guettarda*,

\* Mitten—Challenger Reports, Bot., ii., p. 254.

† Dana—loc. cit., p. 287.

*Premna*, *Gardenia*, *Crinum*, *Wedelia*, and *Polypodium*; Medicinal—*Triumfetta*, *Tournefortia*, *Morinda*, *Premna*, *Psilotum*, *Cardamine*, and *Wedelia*. Neglected by the islanders as food are the seeds of *Pandanus*, eaten in Australia; of *Ochrosia*, eaten in the Solomons; of *Rhizophora*, eaten in Papua; and of *Dioclea*, eaten by Europeans.

#### POPULATION.

Louis Becke, author of those charming and vivid South Sea stories, "By Reef and Palm," and who once resided upon Funafuti writes,\* "sixty or seventy years ago, so the American whaling captains of those days said, there were 3,000 people in the thirty and odd islets. Then, for the next thirty years, unknown and terrible diseases, introduced by the white men, ravaged not Funafuti alone, but the whole group, and where there were once thousands only hundreds could be counted; and until about 1860 it looked as if the total extinction of the whole race was but a matter of another decade. But, fortunately, such was not the case. In 1870 the writer counted one hundred and sixty people; in 1882 they had increased to nearly two hundred."

At the time of our visit (May - August, 1896) the census amounted to two hundred and fifty or sixty. Woodford† remarks upon a similar decrease in the Gilberts.

#### HISTORY.

"Seven of these islands or groups are probably Samoan in origin, with an admixture of Tongese. In some cases the Tongan was introduced at a late stage, in others the Tongan element was almost contemporaneous with the Samoan, but in all cases the Samoan preponderates so much as to have controlled the language. As far as I am able to judge from a comparison of the most familiar words, the Tokelau and the Ellice Island dialects have become practically assimilated to each other. Samoan largely prevails in the whole of the Tokelau and the Ellice Islands; it is the literary language, except in the Gilbert or Kingsmill Island colony of Nui, where the Gilbert Island dialect is spoken with a small admixture of Samoan or Ellice Island words and constructions."‡ Captain Wilkes in 1841 observed of Funafuti that: "It was soon found that they understood the Samoan language, and spoke a purely Polynesian dialect. The Samoan native easily conversed with them."§ Mr. John O'Brien tells me that he remarked

\* Becke—*loc. cit.*

† Woodford—*loc. cit.*, p. 334. An exhaustive Report on the diminution of the native population of Fiji is, I understand, in course of publication by Dr. Corney.

‡ Newell, *loc. cit.*

§ Wilkes, *loc. cit.*

thirty or forty years ago that both the natives of Fotuna Island\* and the Tokelau Group use the same dialect as the Ellice Islanders but a few words have different meanings.

“A most decisive proof of their history [the people of the Ellice Group] was recently obtained by Dr. G. A. Turner while visiting the missions of the group. He was shown, and he ultimately obtained, a spear or staff, which their orators held while speaking, a Samoan custom indicating the holder’s right to speak; this staff was very ancient, and the greatest treasure of their heralds and genealogists; they said they brought it with them from Samoa, and named the valley where they came from thirty generations back. The staff was decayed or worm eaten, and bound together by splints and sinnet. Dr. Turner took it to Samoa, found that it was made of Samoan timber, visited the valley they named, and discovered a tradition there of a large party having gone to sea exploring, and never returning.”†

The Samoans themselves look down upon the Ellice Islanders as rough, uncultured boors and would not acknowledge them as close relations. Their physical appearance, broad faces, large frames, hair often curly but sometimes straight, and short beards,‡ all support the conclusion drawn from the language and customs that a Micronesian element has here been grafted on a Polynesian stock.

Funafuti is, however, a most unfavourable locality for studying the relations of the Ellice Islanders. About thirty years ago most of the adult population were kidnapped by a Peruvian slaver recruiting labour for the Cincha Islands. The atoll has since received an immigrant population from various sources. Colonists from Samoa, the Tokelaus, Manihiki, and other of the Ellices settled in the depopulated village. There are two half caste families by white fathers and one by an American negro. Altogether there are not a dozen left of tattooed, white headed men and women who remember the Funafuti of forty years ago.

“Tradition says that the place was first inhabited by the porcupine fish, whose progeny became men and women. Another account traces the origin of the people to Samoa. It is said also that the islands were formed by a man who went about on the

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\* A comparison of the manners and customs of this island with those of the Ellice Group would be of much interest. I have not, however, met sufficient information relating to this French Possession to do so. Fotuna or Horn Island must not be confounded with Futuna near Tanna in the New Hebrides.

† W. L. Ranken—*Journ. Anthrop. Inst.*, vi., 1877, p. 233. See also Whitmee—*Journ. Anthrop. Inst.*, viii., 1879, p. 271.

‡ For characteristic figures of Funafuti natives of the pre-Christian time, see Wilkes—*Amer. Explor. Exped.*, v., 1845, pp. 40 and 41.

ocean with a basket of sand on his back, and wherever some ran out an island sprang up.”\* Under a slightly different guise the latter version of the genesis was repeated at Niutao.

A native tradition related to me names the Kaounga as the first inhabitants of Funafuti and tells that they swam from Samoa. According to Newell a similar legend prevailed in Vaitupu. Among the Kaounga were the chiefs Toa, Touriki and Moroti, the names of the two former are still perpetuated by the localities in Funafuti called after them. According to Newell, “The people are descended from Samoans, known to posterity as Lafai, Le Fe’e (cuttlefish), Sa Seve (the clan of Seve), and two others, five clans in all.”

The following account of the ruling dynasty was given to me, through the interpretation of Mr. O’Brien, by the present king of Funafuti. Terematua, he said, was the first king of Funafuti; he was succeeded by his eldest son, Kisosunga; and he by his eldest son Tiro, and he by his son Tiro the Second. A system long prevailed on the island of government by a king and subordinate chief. The latter succeeding to the supreme office on the death of the former and being succeeded in the subordinate position by the late king’s son.

“The so-called king of Fakafo bears the title of “ariki” (Samoan, alii = chief), and is the only person until quite recently so described. The “ariki” is always the oldest male member of the four principal families of Fakafo, all of whom trace their descent from the two brothers above referred to—namely Kava and Pi’o. When the “ariki” dies the oldest man then living among these four families becomes “ariki.” No others possess this title, and there are no clan names or titles outside this circle. The Samoan custom of conferring the name of the head of the family upon the heir does not exist in the Tokelaus.”† An arrangement resembling this seems latterly to have prevailed in Funafuti. Turner says of Funafuti, † “The kingship alternated in four or five leading families, and when one king died, another was chosen by the family next in turn.” Whitmee says of Niutao § “the king and chief have sole authority on the island. Although the king has the higher title, he pays great deference to the chief, and they live on excellent terms with each other.”

Now Tiro the Second and Tibouro were kings together. And Tibouro was killed by his brother Ningi, who assumed the kingship but was killed by a spirit a fortnight afterwards. Takamiti succeeded Ningi. The next king was Palou, the son of Tibouro, who was followed by Touassa. In Touassa’s reign the land was

\* Turner—*loc. cit.*

† Newell—*loc. cit.*

‡ *Loc. cit.*, p. 282.

§ Whitmee—*loc. cit.*, p. 22.

first portioned out, every individual receiving a share. But after Touassa's death, Erivada the priest instituted a redistribution in which the adult males or fighting men alone participated. The conflicting land titles granted by Touassa and Erivada breed dispute to this day.

Touassa's son Sirimiou succeeded him and was in turn succeeded by his son Jira, who was followed by his son Sikamani. Tarafo, another grandson of Touassa next ruled Funafuti; followed first by his son Taturi and then by his brother Teriki, who was reigning when Mr. O'Brien arrived on the island about forty years ago. The next king was Matavai his cousin, followed by the latter's eldest son, Yakoba (Jacob), in whose reign the people adopted Christianity. Manu his brother succeeded and was followed by the reigning king.

Another native gave me a story of the Tongan invaders who harassed the Ellice in bygone times. The marauders sailed from Tonga in two or three war canoes,\* each holding a hundred men, and were accustomed to make the circuit of the entire Archipelago landing at each atoll and massacring the people. Their object was not head hunting or to procure the means of a cannibal feast, but merely slaughter to indulge their lust for bloodshed. On their return south they habitually carried with them a boy captive to Tonga, to serve, when he grew to manhood, as a reminder that the northern islands were ripe for another foray. When it is considered that these feats of navigation were performed without sextant or compass, and with but the rudest of charts, they may well be held to eclipse the boasted deeds of the mediæval Venetians, Genoese, or Portuguese, and to rival alone in daring or in seamanship the voyages of Scandinavian vikings.

Borouselif, the son of Toua and grandson of another Toua, the latter of whom was killed by the Tongans, was a great warrior. He drove back several of the Tongan incursions and slew many Tongans, including Tinaman,† a celebrated Tongan warrior, but was at last slain in battle by the Tongans. The last Tongan invasion, which occurred before the grandfather of my informant was born, is represented as having been repulsed with much slaughter. A spot in the reef is still pointed out where a fugitive was speared while swimming back to his vessel.

The Rev. J. E. Newell thus writes‡ of the neighbouring atoll of Nukufetau: "A full and explicit account is given here of a Tongan invasion. Unfortunately I could get no clue as to the probable date of that invasion and the war which ensued. Two

\* For a description of one of these vessels, see Cook's *Second Voyage*, ii., 1777, p. 17.

† Probably the Tinaimanu of the Nukufetau legend.

‡ Newell—*loc. cit.*, p. 608.

large war canoes were sighted, and with one of them, the warrior of Nukufetau, named Laupapa (evidently a Samoan name), was speedily in contact. After a parley a battle took place in which two Tongan "chiefs" named Savea and Tinaimanu were engaged. Tinaimanu is referred to as the breeder of wars in the "Eight Islands"—*i.e.*, the Ellice Group. The Tongans were driven off and went to Funafuti. There one of the Tongan chiefs (it is not clear whether this was Tinaimanu or not) established himself, but Savea and his people returned to Tonga. The chief who remained at Funafuti very quickly acquired a reputation for savagery. He practised cannibalism to such an extent that very shortly there were none but women and children left. Ten young boys, who were attached to the chief as his servants, when they grew up, formed a plot to murder the cannibal, which they successfully accomplished, thus ridding the Eight Islands of a scourge. . . . At Fakaofu, too, I heard that they had a tradition (which I could not obtain) of a war which had, hundreds of years ago, been waged between the Tokelau Islanders and the Tongans."

In the early days of the present king (say forty or fifty years ago), a feud existed between Funafuti and Nukulailai. To avenge the starvation of some Funafuti travellers on Nukulailai, a war party from the former island sailed across to Nukulailai and killed many men.

The Funafuti natives have long ceased to make or use any weapons,\* but to resist the Tongans spears were fashioned of split palm tipped with shark's teeth. A shark toothed sabre, like that made in the Gilbert Islands, was called "kei;" another with a bristling knob of sharks' teeth was "kekana." An aged, white haired and tattooed man, made for me models of a war missile, "tiapa," and a club, "lakoutoua," also a slender unarmed spear, as formerly used by his people.

In the canoes which put off from Funafuti to the "Peacock," "Their spears were only poles of coconut wood, pointed at one end; and their knives made of small shark's teeth, inserted into a stick with gum and fine sennit, and are about a foot long.†

"Clubs and great double-edged wooden swords, fifteen feet long, and edged with sharks' teeth, were kept in the larger temples for display on festive occasions in honour of the gods, and taken occasionally to the rocks at the landing-place to flourish about and frighten away any party from a ship, or from another island attempting to land"‡ at Nanomana.

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\* Whitmee wrote in 1870 (*loc. cit.*, p. 27), "On some of the islands wars are unknown. An old man on Vaitupu brought me a hatchet made out of the back of a turtle, and I asked if it ever had been used in war. He replied that he had never heard of war on Vaitupu."

† Wilkes—*loc. cit.*

‡ Turner—*loc. cit.*, p. 290.

In some of the Northern Atolls the natives were adepts at singlestick and wrestling. Some of these men showed me a variety of adroit tricks, whereby an unarmed man might safely seize a knife from his enemy's hand, break down his guard, or trip him. This skill at fence was taught them by the Gilbert Islanders.

A British Protectorate was proclaimed over the Ellice Group in Sept., 1892, by Captain Gibson of H.M.S. "Curaçoa."

#### HEATHEN WORSHIP.

To-day Paganism claims not a single adherent throughout the Archipelago. Christianity has now been embraced for a quarter of a century, and the memory of the old rites is rapidly vanishing. In a few years the knowledge of these that might still be gleaned will have become extinct. I have therefore added to my own gatherings a digest of information relating to the Ellice previously published. The religious customs of this Group, no doubt, were closely approximated to those of the Tokelaus described by Turner.\*

On the subject of heathen worship, and indeed upon Funafuti lore in general, I owe most of the information gathered to the unwearied kindness of Mr. John O'Brien, who during forty years' residence has acquired a greater knowledge of native manners and customs than the younger generation of natives possesses. Mr. O'Brien kindly supplemented his recollections by questioning and interpreting from aged men on my behalf.

The first objects to which worship was addressed seem to have been Thunder and Lightning. A spirit, Tufokoula, was worshipped in the form of a sea bird. The Areva or cuckoo (*Urodynamis taitensis*, Sparrm.) was sacred on Nanomana.† For the interesting superstition regarding this bird on the Gilberts, see a paper by Mr. A. J. North.‡ To this succeeded ancestor worship. Toa, one of the traditional "Kaounga," or first inhabitants, believed to have swum from Samoa, was one of the earliest deified. Erivada, son of Erikobai, a famous and powerful priest of the olden time, appears to have arranged the rites and deities. Firafi,§ a former king and famous warrior, was introduced as an object of worship, and any distinguished tribesman was on his death added to the Funafuti pantheon. "They appear," remarks Newell, "to have had more elaborate religious rites than other

\* Turner—*loc. cit.*, p. 267. † Gill—Jottings, p. 25.

‡ Proc. Linn. Soc. N.S.W. (2), ix., p. 585.

§ Turner writes (*loc. cit.*, p. 285) the name "Foilape," and adds that he was also one of the principal gods of Nukufetau. The reigning chief of Nukufetau when the "Peacock" visited the group bore his name. Newell says (*loc. cit.*), "Foilape was a man of enormous physical strength and a fearful despot. He had to flee for his life to Vaitupu, where he was honoured as a god, after he had been murdered as a despot."

islands in the group. The group of atolls seems to have been filled with sacred places and shrines."

Erivada related that in a dream he was instructed by seven\* spirits to make a god of a red stone, obtained by diving in the passage, wrapped in pandanus leaves and placed in a case, "fe'ou," like (as O'Brien described it) a hen-coop. If anyone fell sick the stone was taken out and beseeched to relieve or cure the sufferer. Erivada also manufactured from coloured pandanus leaves and shells the sacred casket, "bourou," supposed to be worn like a hat by Firafi. O'Brien, on his arrival, saw a ceremony performed by the priest, or as he termed him the "devil-master," to induce the spirit to send abundance of fish. This consisted of the bourou being taken out of the temple and carried thrice around it, followed by a procession of men and women stripped naked for the occasion. "Foilape," writes Turner, "was the principal god, and they had a stone at his temple. There was an altar also on which offerings of food were laid. At the order of the priest the altar was carried about the settlement, and as the god was supposed to be on it, the people danced in front and all around to please him." On Nukufetau, "Occasionally, after a death for instance, the people assembled, and in honour of the god paraded about the settlement, carrying shoulder high the box containing his treasures."†

No fisher would use his catch till an offering was made to the temple. Receiving the first fruits of every haul, the priest would walk around the temple, and calling each of the numerous spirits by its name, would deposit upon post after post for each his fish in sacrifice. A barracouta was always appropriated by the temple, presenting this perquisite was called "greasing the mats of the temples."

Such valuables as fine mats or pearl shell fish-hooks were frequently offered. When any new or wonderful object was acquired, if for instance a bottle or tin came ashore, it was at once taken to the temple. In Nukufetau, Turner tells us‡ that "Any rare beads or other fancy articles from a ship were presented. If concealed, the god knew it, he was omniscient, and brought death on the culprit." At Fotuna, "It forms an important part of the religion of this island to consider everything that arrives there, whether of great or little value, as the property of the gods, no matter whether it be a large canoe or a log of wood."§

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\* Referring to this mystic number, Newell writes (*loc. cit.*) of the ransom for a child's life upon Nukufetau of seven bowls of faausi, "So far as I know this is the only instance of the number seven being considered the number of completeness, as in the Hebrew Scriptures."

† Turner—*loc. cit.* ‡ Turner—*loc. cit.*, p. 205.

§ Mariner—Tonga, i., 1817, p. 318.

Sometimes it would be announced by the sorcerer that a certain person was about to fall sick. The threatened victim then had to reside in the temple, and enchantments were pronounced over him twice a day; he was anointed with coconut oil, and was placed in the smoke of a fire so that the demon's eyes might be blinded and he escape.

A kind of divination was practised by spinning a coconut before the altar; if it came to rest in a particular position success was prophesied, but if the result was unpropitious the nut would be coaxed, fondled, and spun again. A similar divination by spinning a coconut is described by Mariner in Tonga.\*

"A temple with a covering was known as a 'Fale-Atua,' a shrine was an 'Afu,' and the priest, as in the Tokelaus and in Samoa, was a 'Vakatua.' Long after the significance of the temple was forgotten the stone shrine or memorial was worshipped."† A beautiful illustration of the gods and temple of Fakaafu by a member of the first European party who visited that island of the Tokelau Group, faces p. 274 of Dana's Corals and Coral Islands, 1872.

The last temple on Funafuti was destroyed by the hands of Mr. O'Brien.

On this atoll the priests chose the sailing dates for canoes visiting other islands. If the vessel missed her destination, the drifting and starving crew used first to kill and eat the "devil-master."

Regarding heathen worship, the Rev. S. J. Whitmee writes‡ of the Ellice Group in general at the time when the Archipelago was passing from Paganism to Christianity:—"They worshipped the spirits of their ancestors; mostly those who originally peopled the islands, but some of later generations have been deified in some of the islands. They have shrines in some places where they offer their devotions, and where the gods come to hear their prayers and accept their offerings. Some have tangible representatives of their gods in the shape of stones;§ but as far as I could learn, they always had the idea of spiritual beings taking up their abode in them either for a time or permanently. They have also a number of sacred men through whom they communicate with their gods. In some of the southern islands, now Christianized, there was only one sacred man in each village. He was chosen by the people from one particular family. At

\* Mariner—Tonga, ii., 1817, p. 239.

† Newell—*loc. cit.*

‡ Whitmee—*loc. cit.*, pp. 26, 27.

§ At the temple of Maumau on Nanomea, there stood a nine feet high coral sandstone slab from the beach. Turner—*loc. cit.*, p. 291.

his death, his successor was generally, but not necessarily, his brother or son. If one failed to satisfy the people, he was deposed and another chosen. This man was regarded as very holy. He dwelt with his family apart from the rest of the people. His house was generally built on piles over the shallow water in the lagoon. He never worked, but he and his family were fed by the community. He gained power over individuals and abundance of food, by promising the favour of the gods to those who treated him well, and denouncing their anger upon those who were niggardly and brought him little food. When the gods communicated with him he pretended to be possessed,\* threw himself into all kinds of attitudes, raved, foamed at the mouth, and his eyes glared wildly. Then he pronounced the oracle to the people who had assembled around at a respectful distance. On two islands, the places where the houses of the priests stood were pointed out to me, and also the places where the people congregated. The distance between them could not have been less than two hundred yards. The priest performed incantations before the people went out to fish; and to the anger or favour of the gods the success or non-success of a fishing expedition was ascribed. On the northern islands there are several priests; they mix with the people, and seem to be far less exclusive than the single priest was on the southern islands."

"The natives of Niutao," writes Dr. Gill,† "were accustomed to worship their heathen deities in a marae in the centre of the village. Of this great marae only one stone is now left, representing Tangaloo, god of heaven and principal deity of Polynesia. . . . Only forty [Aug., 1872,] still adhered to their ancient faith, and these were easily distinguished by a single sacred leaf of the coconut worn on the left arm. . . . Half a mile distant in the bush is their ancient burial ground. Adjoining it is their pantheon, consisting of an oval, low enclosure, composed of flat stones, some higher than others, each representing a distinct divinity; so that the sacred men standing inside the enclosure—the people of course outside—could worship all the gods at once. . . . Returning to the village, we entered an idol-house. The god is the central side post, stouter than the rest and crooked. To the crooked post—utterly destitute of ornament—three green coconuts and a sacred leaflet were offered‡ morning and evening. On these occasions the worshipper (with

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\* "When the priest on Vaitupu became 'red,' by which they meant flushed and excited, it was a sign that the god had something to say." (Turner—*loc. cit.*, p. 284.) For a description of Tongan priests in religious frenzy see Mariner—*loc. cit.*, p. 106.

† Gill—*loc. cit.*, p. 12.

‡ This act is illustrated by a woodcut in the text on p. 15.

whom we conversed) goes through his incantations, and, husking the nuts with a stick kept for the purpose, drinks the water and eats the kernel, and then puts newly-plucked nuts in their place. Each new act of worship necessitates the tying of a fresh leaf round the post, and another round the arm of the worshipper. Four old coconuts lay at the foot of this queer post god. In another idol house, we saw on a swinging tray, a smooth round pebble worshipped as a god. Offerings of green coconuts lay near it, with the sacred leaflet."

Of the same island, Niutao, Moresby observed :\* "Native missionaries have been two years at work here, but half the people are as yet devil worshippers, and adore the evil spirit under the form of coconut leaves, skip jacks, and wooden posts. Every heathen family has a small devil hut, in which a tiny grass hammock is slung for the evil spirit to sleep in, and where offerings of fresh nuts are brought him every morning ; many of these huts were in full use, but we were pleased to find others forsaken."

Turner informs† us that "Kulu was the principal god in Niutao, and at the evening meal was prayed to for rain, coconuts, fish, freedom from disease, &c. Offerings to Kulu were eaten only by the priest, or by any *stranger* to whom he might hand a share."

The same author says of Nanomana,‡ "Foelangi and Maumau were the principal gods. They had each a temple ; and under the altars, on which were laid out in rows the skulls of departed chiefs and people,§ were suspended offerings of pearl shell and other valuables. Foelangi had an unchiseled block of stone to represent him, something like a six feet high gravestone. The household gods were incarnate in the fish. Offerings of food were taken to the temples, that the gods might first partake before anyone else ate anything. While visiting one of these temples I saw a number of fresh plucked and husked coconuts laid down, one before each skull. After a time the nuts were taken away and eaten by the family who laid them there. Clubs and great double edged wooden swords, fifteen feet long, and edged with sharks' teeth, were kept in the larger temples for display on festive occasions in honour of the gods, and taken occasionally to the rocks at the landing place to flourish about and frighten away any party from a ship or from another island attempting to land, until at least special permission from the

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\* Moresby—New Guinea, 1876, p. 78.

† Turner—Samoa, 1884, p. 288.

‡ Turner—*op. cit.*, p. 289.

§ In Nanomana "On a 'paata' (= shelf) were laid human skulls and jawbones."—Dr. Gill's MS. Diary.

gods had been asked." The destruction of these temples by Christian converts in 1877 is related by Dr. Gill.\*

Upon Nanomana Dr. Gill remarked to a native: "'Jehovah made the sky, the ocean, and all men.' The prompt reply was, 'Very likely Jehovah made *you* and *your* land; but the good gods Maumau and Foelangi' (their ancestors who came from Samoa) 'made us and Nanomanga.' . . . . They worship shooting stars and rainbows; but the principal objects of adoration are the skulls and jawbones of the dead. . . . . Crowds of men ran to the beach to meet us, besmeared with ashes mixed with oil, each wearing the sacred leaflet on the left arm, with necklaces of flowers. In this costume they had been dancing and performing their wild incantations to the gods during the night. The response of the oracle was, that no foreign god or instructor should dwell on the land sacred to Maumau and Foilangi. . . . . In one of these temples on a large swing tray we counted eleven human skulls; on another tray, nine. It was to accommodate these skulls that the temples were built. It is the disgusting custom in Nanomanga, when a great chief or much loved head of a family dies, to bury the corpse, but on the third day, the head is removed, and the flesh gnawed off and eaten raw with coconut by the sacred men.† The clean skull with the jawbone are then put on a tray in the appropriate temple, and thenceforth become objects of worship. . . . . I called on King Atupa. He was reclining on a mat, with an ominous cough, and seemingly far gone in consumption. We were told that on his death his skull would be added to the tray of gods in the adjoining temple."‡

"In Ellice's Group skulls of head chiefs are hung up in houses and taken down periodically, and oiled during the weeping and wailing of women. I was present at one such ceremony. At some islands the women not only weep, but beat their eyes from time to time with their fingers, until the eyelids are so swollen as to render it necessary to keep in the house for some days."§

An extraordinary species of quarantine is thus described by Mr. Whitmee|| at Nanomea: "At this island and at Nanomanga there are some singular heathen ceremonies gone through on the arrival of a ship or a canoe from another island. As these ceremonies occupy from six to eight hours, the whole of which is spent in a burning sun, and the ceremonies are not of the most pleasant nature, I was desirous of escaping their infliction if

\* Gill—*loc. cit.*, p. 24.

† "By the teeth of children," according to Turner—*loc. cit.*, p. 289.

‡ Gill—*loc. cit.*, p. 21.

§ (? Gill in) Davis—*Anthrop. Rev.*, vii., p. 192.

|| Whitmee—*loc. cit.*, p. 24.

possible. . . . The four new arrivals were marched to the place where the representatives of their gods were, and there a number of prayers were offered by the priests. These were to deprecate the wrath of the gods on account of the arrival of a foreign ship, and especially this ship of the foreigner's God. They also prayed that no disease might be brought by the ship to their island; but if disease was on board that it might be taken to Fiji. And as they are suffering at the present time from drought, they also prayed the gods to send them plenty of rain, and plenty of food. These prayers were repeated at the shrines of the different gods (and they seem to be very numerous), and were followed by an offering of a large quantity of coconuts, which the people themselves eat after they have been presented to the gods. Then they marched around the gods in single file, and marched around the strangers, and afterwards joined in a dance. . . . I was told by Tavita there was no fear of a repetition of the previous days ceremonies, as they were vicarious, and gave all on board the freedom of the island while our ship remained. Had any other vessel arrived while we were there, those on board of her would have been free also, but for one arriving after we were out of sight the ceremonies must be repeated."

In describing the same rite, Turner says:\* "Meat offerings were also laid on the altars, accompanied by songs and dances in honour of the god. While these ceremonies were going on all the population, except the priests and their attendants, kept out of sight."

Gill writes† of Nanomana under date August 13, 1872: "We were the first visitors fortunate enough to escape being 'devilled' whilst the heathen performed incantations to prevent the introduction of disease."‡

#### BURIAL.

As in New Guinea the dead are buried in the village streets near the houses of their relatives. A few small cemeteries, or groups of a dozen graves, occur besides close to the village. Whitmee's description is as correct of the Funafuti fashion of to-day as it was at the time of his visit. "Their dead are interred in the earth, and their graves are surrounded by a border of large stones with a covering of small pieces of broken coral in the middle. These are generally very carefully kept in order. In the case of a chief, a mound is raised for two to four feet high over the grave, and all around is kept free from weeds."§

\* Turner—*loc. cit.* p. 292.

† Gill—*loc. cit.*, p. 19.

‡ Admiral Moresby has described a like exorcism which he as a visitor underwent in the New Hebrides.—New Guinea, 1876, p. 102.

§ Whitmee—*loc. cit.*, p. 27.

On Vaitupu: "The dead were buried inside the houses, and in the grave they deposited with the body pearl-shell fish hooks, necklaces, and other ornaments."\* In the Hervey Group: "If a body were buried in the earth, the face was invariably laid downwards, chin and knees meeting, and the limbs well secured with strongest sinnet cord. A thin covering of earth was laid over the corpse, and large heavy stones piled over the grave. The intention was to render it impossible for the dead to rise up and injure the living. The head of the buried corpse was always turned to the rising sun, in accordance with their ancient solar worship. It was customary to bury with the dead some article of value—a female would have a cloth-mallet laid by her side, whilst her husband would enjoin his friends to bury with him a favourite stone adze, or a beautiful white shell (*Ovula ovum*) worn by him in the dance. Such articles were never touched afterwards by the living."†

#### DOMESTIC LIFE.

The old order has changed to such an extent that it is difficult to gain information upon the former social system. The elder natives are averse to discussing what they now regard as the shameful and deplorable past. From tales and odd remarks I was however able to glean a little.

As usual among the Polynesians, sexual morality on Funafuti was of the laxest before the introduction of Christianity, and chastity was unknown. A wife belonged to her husband in so far as she shared his home, he supported her and he was entitled to the produce of her labour in cooking, weaving, fishing, gardening, and so forth, but he did not claim the exclusive right to her person. If a man desired the society of another's wife, he might throw a pebble into the hut as he walked past; the complaisant husband, accepting the signal, would then leave and allow the visitor to enter unmolested.

A marriage was celebrated by the presentation of coconuts and other trifling gifts. Where friends or relatives opposed a union, the couple would sleep in the bush, and stay away from the village till they were forgiven, much in the way that Pritchard describes runaway matches in Samoa.‡ Matriarchal rule prevailed over patriarchal; a bridegroom left his father's house to join his wife's family, sometimes two sisters and their husbands shared a hut. Dr. Gill writes of Nanomana: "Women here though married are common; but the children belong to the legal husband."§

\* Turner—*loc. cit.*, p. 284.

† Gill—*The South Pacific and New Guinea*, 1892, p. 23.

‡ Pritchard—*Polynesian Reminiscences*, 1866, p. 136.

§ Dr. Gill's MS. Diary.

The usual sequence of such unrestricted intercourse, infanticide, was generally practised upon Funafuti. Indeed it was once obligatory to destroy each alternate child. Mr. O'Brien tells me that thirty or forty years ago, he knew women to enter the lagoon before the occurrence of birth, that the child might be immediately drowned. On Niutao, "the ancient rule was to rear only two children in each family. The life of the third might be redeemed; the rest were put to death as soon as born."\* "On Nukufetau, as elsewhere, infanticide or foeticide was the law of the land. Only one—some say two—were allowed to live in each family, the rest were strangled. But it was possible for parents to ransom their offspring by giving a present to the chiefs."†

At times, to allow the coconuts to grow up and to give the fishing grounds a rest, the permanent village is temporarily abandoned, and the whole tribe move to another locality. Several duplicate villages are built about the lagoon, perfect sometimes even to the chapel and court house, wherein each family owns a residence, and to which they periodically move to enjoy a change of air and scene. Probably it was one of these temporary settlements which Moresby‡ saw at Funafuti, and mistook for a deserted village.

The permanent village consists of a score of huts arranged in a long straggling street parallel to the beach. This street has a hard beaten floor, which is kept swept and weeded with great care by the women, who devote fixed hours to this work. From the main street branch roads, which are metalled with shingle and curbed with blocks of coral. Wrong doers are punished, under the modern system, in imitation of colonial justice, by being set to repair these roads. An avenue of breadfruit trees casts a pleasant shade along the street, while around and above all tower the loftier coconut palms. Each hut is at least a dozen yards from its next door neighbour, and has its own kitchen situated some little distance away. Two or more married couples sometimes live together in a hut of about twelve by twenty feet. The floor is usually carpeted with large pandanus mats, but in the more pretentious stone dwellings the ground is covered with fine shingle.§ The roof, pitched in European style with

\* Gill—Jottings from the Pacific, 1885, p. 27.

† Newell—Proc. Austr. Assoc. Adv. Sci., 1895 (1896), p. 609.

‡ Moresby—New Guinea, 1876, p. 74.

§ Until lately the caverns of Atiu and Mangaiia were despoiled of the finest stalactite columns, in order to adorn the premises of the chiefs by keeping the snow white sea pebbles in their place, much as at home we use ornamental tiles for gravelled walks. Anciently the maraea of their gods were thus adorned."—Gill—*loc. cit.*, p. 86. The graves in Funafuti were likewise gravelled.

ridge pole and rafters, is covered by an excellent thatch of pandanus leaves. Sometimes the walls are protected by the same, but more often are enclosed by palm mats swung on cords, which may be raised, lowered, or pushed aside at discretion, and doors or windows are thus formed anywhere caprice directs.

All small articles, tools, garments, or fishing utensils are usually suspended from the roof or stuck in the thatch. By day the only furniture visible is the usual locked trade box in the corner, but by night the hut is partitioned off into numerous small chambers by the calico mosquito curtain of each single individual or married couple.

“A house after the usual Samoan fashion just described has but one apartment. It is the common parlour, dining room, &c., by day, and the bedroom of the whole family by night. They do not, however, altogether herd indiscriminately. If you peep into a Samoan house at midnight, you will see five or six low oblong tents pitched (or rather strung up) here and there throughout the house. They are made of native cloth, five feet high, and close all round down to the mat. They shut out the mosquitoes, and enclose a place some eight feet by five; and these said tent-looking places may be called the bedrooms of the family. Four or five mats laid loosely, the one on the top of the other, form the bed.”\*

The Papuan custom of avoiding mosquitoes by sleeping in the smoke seems unknown here. For further particulars about the mosquitoes, the reader is referred to Mr. Rainbow's article on the Entomology of Funafuti.

A European on entering is always requested to seat himself on a bunk or trade box, and is at once welcomed with a drinking coconut, opened and handed to him by a daughter of the house.

Artificial light was quite unknown upon Funafuti before the advent of the whites. Mr. O'Brien told me that to bring fire into a dwelling house was most strictly tabued; he described to me the astonishment of the natives when an early visitor improvised a rough lamp from a coconut shell bowl filled with coconut oil. On Niutao, “No fire was kindled at night lest it should prevent the gods from coming in a shadowy form with a message.”† And on Fakaafu, in the Tokelau Group, Dr. Turner likewise tells us “No fire was allowed to be kindled at night in the houses of the people all the year round. It was sacred to the gods, and so, after sundown they sat and chatted in the dark.”‡

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\* Turner—Samoa, 1884, p. 155.

† Turner—*loc. cit.*, p. 288.

‡ *Id.*—*Op. cit.*, p. 269.

No cooking is ever done in the house, but each family has a separate kitchen, a roughly built hut, some distance away from the dwelling. No native pottery exists, nor do the islanders seem to appreciate European earthenware, but iron pots are valued. Coconut shells are used to heat fluids. The usual Polynesian method of cooking with hot stones in a hole in the ground still prevails, it has been well described by the Rev. S. Ella,\* as well as by numerous other writers. For lack of better stones the cooks are obliged to use coral, of which they select the hardest kinds, such as *Montipora* and *Millepora*, even these soon crumble in the fire. If any volcanic rock was brought as ship's ballast from Fiji or elsewhere, it was eagerly seized upon for cooking-stones. The roots of trees drifted ashore were also carefully searched for hard stones.

A missionary says: "Missionaries are by some charged with too great strictness in their dealings with the failings and weaknesses of recent converts. If those who make the charges took the trouble to enquire, they would find that missionaries generally take the opposite side, and endeavour to modify the severity of the converts themselves towards their erring brethren."† The severity of the Native Teacher towards the gentle, submissive Islanders, remarked upon by all the members of the Expedition, is probably, as indicated by the foregoing quotation, contrary to the wishes of his superiors. He seemed as anxious to obliterate native manners, and to substitute the habits and customs of the European, as he understood them, as to preach the European's creed. One instance of this that came under my notice was where children were scolded for indulging in the pretty native custom of wearing wreaths of flowers in their hair. In their progress towards civilisation the natives have lost most of their old amusements. The elders often look back with regret to the merry old days of heathendom, when the village was not so dull. Foot racing, lance throwing, quarterstaff fencing, wrestling, and dancing have died out under the Native Teacher's disapproval. Singing is still keenly enjoyed, but is only permitted under the supervision of the Native Teacher or Deacon, and in a subdued tone. Attention is directed rather to singing passages from the Scriptures, or the multiplication table set to verse than to the stirring native chants. A public meeting for singing takes place twice or thrice a week. The sexes sit apart, usually facing each other from opposite sides of the house; they both sit cross legged or tailor-wise. A leader on one side or the other usually strikes up, and the rest at once fall in. The old Funafuti airs which were danced to wild

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\* Aust. Assoc. Adv. Sci., 1892 (1893), p. 636.

† Whitmee—*loc. cit.*, p. 13.

and stirring music are now, I am told, entirely forgotten except by a few of the oldest inhabitants, yet Mr. O'Brien tells me they survive on Vaitupu still. On asking the interpreter for a translation of the song, I am answered that such a one is the story of Lot's wife being turned to salt, another is in praise of the Bible or composed of passages from the Scriptures, another subject is a battle between England and France; Captain Webb's feat of swimming across the Straits of Dover forms, oddly enough, the theme of yet another. All these songs are sung squatting on the ground, anyone attempting to rise is promptly suppressed by the Native Teacher. Appropriate gesticulation is given with hands and arms, paddles are swung, axes are lifted, guns are aimed, and strokes are swum in unison. Time is marked by incessant clapping of the hands, for variety the palm is occasionally slapped against the arm, the thigh, or upon the ground. As the fervour grows the music sinks and swells, time beats grow faster and faster till the words and notes cannot be more quickly repeated, and in a paroxysm of clapping a dead stop is reached by the breathless and perspiring chorus. Watching in the lamplight the soft, brown arms tossing with the cadence of the song, the waving hair, the gleaming teeth and glistening eyes of a score of handsome women, one can imagine to what a pitch of excitement the dances, the real dances of the olden time, roused this impressionable people. The music is simple, yet thrilling, and to most Europeans though attractive is singularly evanescent. I, for one, could never afterwards recall a tune however much I had enjoyed it. Hickson has noted a similar impression of savage music.\* The natives on the other hand seem to find as much difficulty in catching European tunes as we do in recollecting theirs. An exception, however, I noted in "Ta-ra-ra Boom-de-ay," which was a favourite and correctly repeated air on Funafuti.

A popular song on Funafuti, an importation I believe from Samoa, runs as follows:—

E piu i se sevi lou manamea,  
 E i ai i le maunga o Peteri,  
 Ina ta tuu ia Lapanona,  
 La'u ava ina ta tuu.

O loo silasila i faamalama  
 O loo pupula mai lona tino  
 Ina ta tuu, &c.

Internal evidence, reference to Lebanon, &c., show the words to be a modern composition, the tune is however probably older. I am indebted to the kindness and musical talent of my friend,

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\* Hickson—A Naturalist in North Celebes, 1889, p. 79.

Mr. H. Foden, R.N., Acting Paymaster of H.M.S. "Penguin,"  
for the following air current on Funafuti :\*—

*Allegro.*



The narrow bounds of habitable land has restricted the introduction of domestic animals. Pigs are owned by every family,

\* But few of the native chants of Polynesia appear to have been reduced to writing. A Tongan tune is given by Mariner—Tonga, 1817, ii., p. 338; Samoan by Wilkes—*loc. cit.*, ii., pp. 152-3; and Melanesian by Guppy—*loc. cit.*, p. 140.

they are usually confined in sties and fed upon waste coconuts. No other Ungulates have been brought to the atoll.

Dogs were at one time domesticated, the manner of their extermination, told me upon Funafuti, is thus related by Moss: "At Funafuti the Turimen march round the village during the night, and quietly steal into the houses to see if all is right. It was found that the house dogs barked and gave notice of their approach, so they forthwith decreed the destruction of all dogs on the island and again became masters of the situation,"\* This little episode illustrates the severity of the Inquisition which the rule of converts imposes on Polynesia.

Cats have long been introduced, they are known to the natives by the name of "pussy," and have proved of service in destroying the brown rat, formerly a great pest to the Islands. The European rat and mouse have effected an uninvited entrance to the village, and have multiplied fast.

The Frigate-bird is tamed in the Ellice Group, and is said to have been used like carrier pigeons (*vide* Ornithology). None were kept at Funafuti during the visit of the Expedition, but I saw one in captivity at Nukulailai. On Niutao, "They are fond of taming the frigate-bird (*Atagen aquila*) or man-of-war bird. A high perch is built near the sea, and the bird secured to it by a long string. The native pastors on most of the islands—lying about sixty miles apart—of the Ellice Group, correspond with each other by means of the frigate-bird. The note is concealed in a bit of reed and tied to one of the wings. In the olden time pearl fish hooks were in this way sent from one island to another. Its long black feathers were formerly in great request for head dresses."† That this system of taming Frigate-birds prevailed beyond the Ellice and the Gilberts, where Woodford has remarked it, is suggested by an incident related by Webster. Landing in 1851 on Ocean Island or Paanopa, he says, "I was well nigh making an unlucky mistake; observing a number of large birds at a short distance, I raised my gun to fire at them, but was suddenly checked by my companions, who motioned me not to fire. They turned out to be tame fish hawks belonging to the king; but for what purpose I am at a loss to determine."‡ Moss also noticed these birds tamed on Pleasant Island.§ Probably the habit was a Micronesian custom received with the art of toddy making from the North. The natives of the Solomons delight in portraying this bird in their carvings.||

\* Through Atolls and Islands in the Great South Sea, 1889, p. 118.

† Gill—Jottings from the Pacific, 1885, p. 17.

‡ Webster—The last Cruise of the Wanderer, Sydney, n.d., p. 43.

§ Moss—*loc. cit.*, p. 187.

|| See Brenchley—Cruise of the Curaçoa, 1873, p. 260.

Fowls, of which there are abundance, complete the list of domesticated animals.

During the last ten years the Islanders have abandoned their native names, and call each other by Samoan forms of Scriptural names, as Salamona, Solomon ; Paulo, Paul ; Yakoba, Jacob, &c.

In former days incorrigible criminals were drowned by throwing them into the lagoon with a stone tied round the neck. A story was told me of a woman convicted of theft, who was exposed with her infant upon a distant, small islet, and allowed to slowly perish there. On Nanomana, "It is reported by the traders that if any one breaks their laws, he is sunk in the mud of the lagoon shore, out of which it is impossible to get, and there is miserably suffocated."\* On Funafuti, and probably throughout the group, Mr. O'Brien told me that any condemned could claim sanctuary who could escape to the king's house. A similar practise prevailed in Samoa.† Upon Nukulailai, "Stealing was punished by restoring double, adultery and murder by sending off the culprit to sea alone in a canoe, there to die or take his chance of drifting to some other island."‡ Mariner describes such an execution in Tonga, by drowning in a leaking canoe.§

Near the village, a quarter of a mile apart, were two small ponds about four feet deep, twenty or thirty long, and half as wide, containing foul green water. These were the public bathing places, one was reserved for men, the other for women. Clothes were also washed here. There were also several small circular wells with stone walls about six feet deep, above ground they were carefully fenced round with sticks. A pole to which an empty coconut shell was attached was always kept handy to bail water out with. Dr. Gill records a case where two Europeans so exasperated the inhabitants of Niutao by bathing in one such well that they were put to death.

#### CULTIVATION.

Landed property is here of three species ; the town allotment or stand of a hut in the village street, the bush land planted with coconuts, and the garden land. The culture of the coconut, pandanus, and paper mulberry has been noticed under the preceding section on Vegetation. The whole chain of islets is parcelled out, usually divided by lines running across from ocean to lagoon, which boundary lines are strictly preserved. Considerable disparity of wealth exists, some families owning as

\* Dr. Gill's MS. Diary.

† Wilkes—*loc. cit.*, ii., p. 158.

‡ Turner—*loc. cit.*, p. 281.

§ Mariner—Tonga, i., 1817, p. 295.

many as forty blocks, others but a single piece of land. In the past overtures for selling or leasing the coconut lands to copra traders were steadfastly resisted by the natives, and under British rule the title is inalienably vested\* in them. Parents sometimes divide their estate to provide for their married children. Lands pass by will on the owner's death; instances have occurred where relatives have been cut off with the proverbial shilling, and being left to starve have been supported by public charity.

A space of about ten or twelve acres south of the Mangrove Swamp is occupied by the gardens, which in former times, when the population was more numerous, covered a larger area. The gardens are in excavations six or eight feet deep, the object of excavation being to reach the level of permanent swamp. At Nukulailai, where I saw the cultivation ground being enlarged, the natives were digging down ten or twelve feet. The gardens are irregularly divided into blocks of a couple of acres or more by embankments, which represent the original level of the land, and are three or four yards in breadth. These serve as paths, and are usually planted with *Artocarpus*, *Thespesia*, or *Hibiscus*.

Each family has at least one plot of garden land, and most have more, a plot may be as small as ten paces square. The plots of one owner are not necessarily contiguous, nor are the lands of various owners divided from each other by any boundary visible to a stranger.

The wooden shovel or turtle shell hoe of the past is now replaced by metal bladed spades, and these are their only agricultural implement. Like all semi-civilised people the Ellice Islanders keep their gardens beautifully free from weeds. An analysis of the soil from one of their gardens by my colleague, Dr. Cooksey, follows in another Section. The appearance of phosphate of lime I am unable to account for. The only system of manuring I observed was that of twisting palm leaves in a wreath, and laying them around the roots of the brokka, in a basin thus made were buried basketfuls of leaves of various bush trees gathered by the women. †

The staple vegetable food of the Funafuti Islanders is furnished by the *Alocasia indica*, Schott, known to them as "brokka." ‡ It is said to require from six to eight years to reach maturity,

\* By Proclamation in The Fiji Royal Gazette, 5th Sept., 1894.

† Cultivation on Funafuti is also described by Whitmee—A Missionary Cruise, 1871, p. 12.

‡ In the Hervey Islands (Gill—The South Pacific and New Guinea, 1892, p. 10) it is called "kape." Some writers refer to it as Puraka. Guppy (Trans. Vic. Inst., 1896) quotes numerous other names from the Pacific and Indian Ocean.

when the leaves attain a height of twelve or fifteen feet, and the flower stalk six or seven, the root, a greater load than a man can carry, is then about four feet long and twenty inches in diameter. As the plant grows the root is "hilled up" to two or three feet. It is generally harvested about a year after planting, before it has attained the full size. The tuber is hard and unpalatable to Europeans, when cooked it looked to me like brown soap. The Islanders preserve it cooked and packed in coconut shells. At the time of our visit a quantity of brokka so prepared was collected to send to a Native Teacher on one of the Gilbert Islands where a famine was then occurring. Dr. Seemann thus describes this plant in Fiji: "The *Via Mila*, always growing in swamps, is a gigantic species, often twelve feet high, the trunk or corm of which—the edible part—is when fully developed, as large as a man's leg, a single leaf weighing three and a half pounds. The petiole was found to be four feet long, and ten inches in circumference at the base; the blade of the leaf three feet two inches long, two feet six inches broad, and thirteen feet six inches in circumference. The plant emits a nauseous smell, amply warning, as well as the various popular names it bears, against any incautious contact with it. Besides the name of *Via mila*, which signifies "acid *Via*," we have that of *Via gaga* or poisonous *Via*. What may be the meaning of *Via seri* and *Dranu*, occasionally applied to it, I have not been able to find out. In order to remove the acid properties, the trunk is baked, or first grated and then treated as *madrai*, or bread; yet, notwithstanding all precautions, the natives are frequently ill from eating it."\*

With the brokka is planted the "taro" or "talo," as is indifferently called the *Colocasia antiquorum*, var. *esculenta*, of Botanists. Two varieties are distinguished, one with a green another with a red petiole. The leaves are cooked and remind a European of spinach, and the root is roasted or grated as in general use throughout the Pacific.

Besides brokka and taro there are two other species of aroids, "Ikamakini" and "Ikourourou," which I have not been able to identify botanically. I commend to future travellers the importance of ascertaining exactly the species of aroids cultivated in Polynesia.

Other varieties of these in cultivation, which have probably been introduced during the present generation from the Gilbert Islands *via* Nui or Vaitupu, are "Ikoroa," "Kairoro," "Ikamava," and "Teioumai."

Bananas (*Musa sapientium*) were planted by the natives in the ground excavated to grow brokka. These low lying swamps

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\* Seemann—*Flora Vitiensis*, 1865-73, p. 286.

do not agree with the constitution of this plant, which never here attains ordinary height and thickness, and the yield was but a few meagre bunches. On the north-eastern islet there is a plantation on red soil and dry ground, and the bananas here grow more vigorously. In the old time but three varieties were known, the "Sai," "Fungiotagnia," and the "Ngiangia." Of later introduction are the "Fouamouarounga," "Butta," "Tamatamilema," "Fungipalangi" (*lit.* white man's banana), and "Fouamoualara." That the natives should plant bananas in the swamp suggests that their acquaintance with brokka preceded their knowledge of bananas. The people of Nukufetau possessed no bananas at the time of the visit of the "Peacock," but they recognised some they saw on board as "futi o rotuma."\*

An avenue of breadfruit (*Artocarpus incisus*) runs down the length of the village street, whose well grown, leafy and symmetrical trees about forty feet in height add greatly to the beauty of the landscape. A few are also planted on the embankments that separate the fields of brokka, but these are straggling trees with small, scanty foliage, and generally unhealthy in appearance. I was shown by Mr. O'Brien a fruit of another variety introduced from the Gilberts, which he called jackfruit. The leaf I did not see, but I do not think that this Gilbert Island tree was *A. integrifolia*, or I should have detected its presence on the Island by its familiar leaf.

A recent addition from Fiji to the stock of cultivated plants is the sugar cane (*Saccharum officinarum*), which the natives have not yet learned how to grow properly. Instead of planting joints to propagate the species, a whole cane was sacrificed. The sandy soil yields poor, thin rattoons.

A few trees of Pawpaw (*Carica papaya*) planted by the Samoan Mission Teacher near his house, presented a healthy appearance.

#### FISHING.

Throughout the coral islands of the Pacific fish abound. So plentiful a food supply do they furnish that these specks of land have been able to support a population paralleled alone in density by the cities of civilisation. The two staples upon which human life in every atoll archipelago depends, and around which cluster their distinctive myths, traditions, customs, manners and habits, are fish and coconut.

Skilful fishermen as are the Ellice Islanders, they are surpassed by the inhabitants of the Northern Groups, who having less cultivatable land are probably even more dependent upon their dexterity for their livelihood. They employ in fishing, hooks and line, nets, crab-pots, and torch and spear.

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\* Wilkes—*loc. cit.*, v., p. 45.

Various hooks (which will later be described more fully in the appropriate section) were designed for different methods of angling. Large wooden hooks were baited with split fish and sunk scores of fathoms for the "palu" and other deep sea fish. Pearl shell hooks "hawonga," were trailed unbaited over the surface to tempt the bonito with their gleaming nacre. Large almost ringed hooks, the "matou tifa," were formerly carved out of pearl shell or hard coral, but these have passed out of use. Though special modes of fishing, as for palu and bonito, still engage the ancient types of hooks used by past generations, yet for ordinary sport the metal hooks of Europeans are in great demand and constant use. European fishing lines I did not see used, the (probably superior) native cord of *Broussonetia* being invariably employed. A favourite bait is the scarlet hermit crab which may be at any time gathered ensconced in a borrowed *Turbo* shell, among coral blocks and palm debris in the most barren parts of the islet. This in Funafuti is known as the "ounga koula," Mr. Whitelegge calls it *Cenobita olivieri*. My tutor in Funafuti fishing taught me to tie the crab bait securely to the hook with English thread.

An extraordinary bait, attractive where all others failed was the ink of the "Feki" or *Sepia*. This was preserved, dried to the consistency of tar, and before using was moistened with kerosene; it was esteemed more fatal if a little European perfume were added. For use, this was just smeared on the tip of an unbarbed hook. It was with some incredulity that I first received this; but experience soon showed that when fishing, not "for the pot," but for the Museum collecting drum, I could obtain numerous dainty species which declined a free passage to Sydney when lured by any ordinary bait. Fish are often devoured raw the moment they are pulled from the sea.\* The heavy toll taken by friends and relations when a successful angler returns sometimes induces him to snatch a meal while he may.

Two kinds of fishing nets were observed, a seine and a cast net. They were of the type common throughout the Pacific, and are well described by Turner.† As has been observed by Moresby in New Guinea, Turner in Samoa, and Guppy in the Solomons,‡ the mesh and meshing are identical with European modes. A torn net belonging to one of our party was readily repaired by a native.

The native crab pots I did not see, they were described to me as wove basket-wise out of palm rootlets. No line and floating buoy was used to mark the sunken trap. The fish, they said,

\* To show the prevalence of this custom throughout Polynesia, I will merely cite Fanning's notice of it in the Marquesas in the east (Voyages round the World, 1834, p. 145), and Mariner's in Tonga in the west.

† Turner—*loc. cit.*, p. 167.

‡ Guppy—*loc. cit.*, p. 154.

seeing through the clear water the line extending to the surface would thereby be scared away. The trap was lowered to the bottom and unhooked. By taking careful bearings the position could be found and the trap recovered by dragging for and hooking it up. An apparently similar crab pot is described by Dr. Wiley\* as employed by the natives of New Britain for capturing Nautili.

At low tide on the reef fish were speared by torch light at night. In the lagoon flaming brands of dry palm attracted the gar fish and flying fish to the canoes. A scene described at Nukunau in the Gilberts by Webster,† was often mirrored by the Funafuti Lagoon, "In the evening, the Island appeared to be completely illuminated along the margin of the beach; hundreds of little lights were in motion by the water's edge, and dancing in the surf. We presently discovered that the natives were busily employed catching flying fish, torches being carried in the canoes for the purpose of attracting them, when they were caught in scoop nets as they rose to the light." Eels in the shore pools were taken by hoop-nets, "titisi." The "palolo" worm is not known in the Ellice Group.

A year or two ago considerable quantities of pumice drifted ashore, and the native mind linked this to the fact that a man died after a meal of fish taken on the outer reef. All fish from the outer beach were after this occurrence held to be unwholesome, but the fish from within the lagoon still continued to be eaten. At the time of our visit, it was yet considered unsafe to eat any fish from the ocean beach, though it was believed that at some future date they would again become fit for consumption.

The bright hued labroid fishes are eaten though poorly esteemed. A Giant Ray, *Ceratoptera* sp., was harpooned in shoal water in the Lagoon; the huge fins were cut off to make a meal for the families of its captors. As previously noted the barracouta in former days was sacred to the priests. On Arorae in the Gilberts the Rev. W. W. Gill records in his Diary that sacred fish only eaten by the priests were the shark and the turtle.

The only turtle occurring at Funafuti is the Green Turtle, "Fonu," *Chelone midas*, which is far from common, one example only being taken during our stay on the atoll. From its shell an axe, "taku-fonu," was formerly made, and domestic utensils are still fashioned from its bones. In Queensland the Aborigines manufacture the carapace of this Chelonian into a shield.‡ In past times, owing doubtless to its rarity, the flesh of the Funafuti turtle was meat

\* Wiley—Natural Science, vi., 1895, pp. 409 and 414, fig.

† Webster—*loc. cit.*, n.d., p. 31.

‡ Etheridge, Junr.—Proc. Linn. Soc. N.S.W. (2), ix., 1894, p. 508, pls. xxxv. and xxxvi.

tabued to all but the king. If the captor of a turtle tasted a morsel thereof he was heavily fined, being required to at once bring it to the king. Then, according to ancient ceremonial, the turtle being laid upon its back, the head turned towards the door before the house of the king, the king himself wrapped in fine mats pronounced over it the following incantation :—

Te ulu o te Fonu e soa,  
 Te ikamua e soa,  
 Te ikamuli e soa,  
 Te vaesiosio e soa,  
 Te alaya mua e soa,  
 Te matua tinae e soa,  
 Te pulou e soa,  
 Te matua tua e soa,  
 Te gakau e soa,  
 Te laukape e soa,  
 Te fatumanava e soa,  
 Te ate e soa,  
 Te mama e soa,  
 E kiukiu te fua.

For the following translation of the above I am indebted to Mr. John O'Brien, the resident trader :—

*Incantation to Turtle.*

The head of the turtle is alike,  
 The two fore flappers are alike,  
 The two hind flappers are alike,  
 The white and the green fats are alike,  
 The heart is alike,  
 The belly shell is alike,  
 The back shell is alike,  
 The guts are alike,  
 The yellow fat is alike,  
 The heart is alike,  
 The rump is alike,  
 The lights are alike,  
 Thousands and thousands of eggs.

At Tonga Mariner tells us that, "Turtle are considered almost a prohibited food, at least very few will venture to eat them without first offering a portion to some god, or sending some to any chief that may be at hand."\*

At Rakaanga Dr. Gill informs us that, "All turtle were formerly sacred, being eaten only by kings and priests.† It is

\* Mariner—Tonga, ii., 1817, p. 133.

† This writer has published an interesting legend from Rakaanga (The South Pacific and New Guinea, 1892, p. 38), where the "motif" is the failure of the people to bring to the king the sacred turtle."

quite otherwise now (except at Rarotonga, &c.)” And at Penrhyns, “Turtle and porpoises were eaten only by men. The superstition of those days was that if a woman ate of the porpoise, her children would have porpoise faces.”\*

At Daudai, New Guinea, “Everything is eaten without regard to persons or occasions except the flesh of the porpoise.”†

Porpoises‡ are occasionally captured by the men in a fleet of canoes, who drive a shoal of them to the beach in front of the village, and when penned in shallow water the women wade into the sea and haul them ashore. It is impossible, I am told, to grasp a porpoise by the tail, but by putting an arm round the animal’s head, it may be dragged ashore with ease. Some women even capture two at once, and with one tucked under each arm successfully land them.

The following graphic description is from the pen of Dr. Gill :§ “Shoals of porpoises are occasionally driven ashore by the Penrhyn Islanders ; they think it poor fun if the result is less than four or five porpoises apiece. When a shoal comes in sight, as many boats and canoes as they can muster, each carrying large stones, go right out to sea to cut off their retreat. The porpoises are easily driven towards shore by the sight of approaching boats and the shouts of excited natives. On nearing the reef, some of the big stones are dropped into the sea to add to their alarm. Again and again great stones are dropped. When close in, numbers of natives dive down among them, until, in sheer terror, they rush through the boiling surf on the reef, and are at once despatched by those ashore.”

With expressions of disgust, the natives received the information that beche-de-mer were eaten in some countries. Unlike the Samoans, the Funafuti Islanders were unacquainted with Echini as articles of food.

I was surprised to find how little the Mollusca were laid under contribution. The large *Pteroceras lambis*, “Karea,” I saw eaten raw and roasted. *Tridacna squamosa*, “Fasua tuka,” and *T.*

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\* Gill—Jottings from the Pacific, 1885, pp. 128 and 146.

† Beardmore—Journ. Anthropol. Inst., 1890, p. 462.

‡ Throughout Australasia this is the only name by which *Delphinus* is known, a misapplication of even greater popularity than the Australian “Iguana” and “Alligator.”

§ Gill—*loc. cit.*, p. 147. Whilst these pages were receiving their final revision, the friends of this veteran Missionary and Author are deploring his loss. The late reverend gentleman evinced a most kindly interest in the progress of this Report, and, as will be seen from the numerous references, placed his MS. notes and experience unreservedly at my disposal.

*elongata*, "Fasua noa," were habitually used. The former clam was sometimes collected and stored near the village on rocks under water till required. A *Sepia*, which I did not see, the "Feki," was esteemed a delicacy. The children amused themselves by collecting from the sandy beach, cooking and eating *Paphia mitis*, "Assouri." Piles of shells confirmed the statement that the *Strombus luhuanus*, "Paneia," was consumed. There were pointed out to me as eatable, an *Arca*, "Kashi," a *Chama*, "Saupou," *Nerita*, "Sebo," *Asaphis deflorata*, "Kosh," and *Vermetus maximus*, "Gea."

Of Crustacea the Robber Crab, *Burgus latro*, "Taou," and the crawfish *Palinurus guttatus*, "Oula," were prized.

#### HYGIENE.

The visit of a ship, though an agreeable break in the dull monotony of atoll life, is yet almost as much dreaded as welcomed. For such contact with the outside world almost invariably induces a severe cold from which the whole population suffers. Upon the arrival of our party in H.M.S. "Penguin," it was not observed that any of the visitors had a cold, yet in a few days all the islanders were coughing and sneezing from a severe attack of cold which they said the ship brought.

Mr. Whitmee, "once visited several islands of the Ellice Group about a fortnight after a trading vessel from Sydney, which had influenza on board. This vessel had taken some of the natives from one island to another as passengers, and at three of the islands the entire population was suffering from the epidemic. Had this been a more severe disease the people would have been utterly helpless."\*

From some manuscript notes made during his voyage round the Ellice Archipelago and kindly placed at my disposal by the Rev. W. W. Gill, LL.D., I learn that he saw on Nanomana, "a woman carrying a pendulous excrescence weighing doubtless 75 lbs. (= elephantiasis pudendi—a rare thing)," also that it was the custom for the women in attendance at a birth to taste the uterine haemorrhage which occurs after parturition. From the same source I extract the following:—"At Vaitupu, circumcision is not practised; but instead of it the prepuce of little boys is drawn back over the glans and left thus. As at Niue it is clear (indeed they assert the fact) that their ancestors were in the habit of practising circumcision." Also at Vaitupu, "It was a common custom before the introduction of Christianity, to cut off a joint of a finger on the death of a child, or any other member of the

\* Whitmee—Art. Polynesia, Ency. Britt. (9), 1885, xix., p. 422, foot note.

family specially beloved. On shaking hands I noticed almost every third woman had lost a finger or more of the right hand, and some gave the left rather than expose the mutilated hand.”\*

Under the heading of Vegetation will be found what notes I could collect of plants used medicinally by the natives. And in the Ethnological Section will follow an account of the lancets used for blood letting. To the kindness of my friend, Surgeon F. W. Collingwood, R.N., of H.M.S. “Penguin,” I am indebted for the following interesting notes.

*Prevalent Diseases of Funafuti.*

“*Ruffa*, or Tokelau ringworm, *Tinea desquamosa*.† The skin appears rough and scaly from constant desquamation, in many cases the whole body is affected, in others the face and neck are the parts attacked. The rate of desquamation varies considerably, where the process is slow the skin is covered in small patches an inch and a half by an inch in size; desquamation commencing at the borders of these small patches causes sinuous outlines running one into the other. The scalp seems to entirely escape the disease. As indications of scratching are only occasionally seen, it seems that the irritation caused by this condition is only moderate, and in the two cases where such indications occurred the disease had attacked the face and neck.

“*Ruffa*, when cured, leaves a peculiar mottled appearance of the skin, usually a lighter tint is produced by diminution of the colour, but the opposite effect appeared when persons of advanced age had been attacked. Never does the skin regain its smooth velvety condition.

“Most encouraging results were obtained by a treatment of this disease which consisted in washing the patient with soap and water to remove as many of the scales as possible, after thorough drying the patient was told to rub with ointment two or three times a day for three days, then to leave the ointment on the body for two or three days and finally to again wash the body with soap and water; the process being repeated two or three times. In a case under my treatment where the disease was limited in area, three such applications sufficed to effect a cure.

“The following perscription proved very beneficial, and after employment in cases which I personally superintended, and with

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\* Whitmee—A Missionary Cruise in the South Pacific, 1871, p. 16. A finger joint was sacrificed in Tonga for the recovery of sick relations.—Mariner—Tonga, ii., 1817, p. 222.

† Bakua or Tiripa in New Britain. Danks—Proc. Austr. Assoc. Adv. Sci. for 1892 (1893), p. 616. For a full discussion of this disease, see Guppy—Solomon Islands, 1887, p. 172.

whose results I was most gratified, was an ointment in great request among the natives:

Chrysophanic acid	...	...	2 drachms
Liquor picis ligni	...	...	2 ounces
Carbolic acid	...	...	20 drops
Beeswax...	...	...	2½ drachms
Clarified Lard	...	...	1 pound

There is little doubt that the essential element in killing the parasite is the Chrysophanic Acid, and the Liquor picis ligni diminishes the tendency to inflammation which is apt to be caused by the Chrysophanic Acid. The latter also gives a pleasant smell which is congenial to the native.

“After constant application for a fortnight one case was cured by this prescription:—

Ammonia chloride of mercury...	1 ounce
Liquor picis ligni	1 ounce
Beeswax...	2½ ounces
Clarified lard	1 pound

“*Tonna*.\*—There is a disease called *Tonna*, which consists of a scattered pustular eruption attacking the face, neck, trunk and limbs of children between one and three years of age. In severe cases it lasts from three to eighteen months, during which time the general health of the child seems to be deficient. The comparatively healthy skin between the pustules is dull, dry, and has, as a rule, lost its smooth soft state. In severe cases the pustules, through dirt, neglect, and unhealthiness of constitution, are apt to break down into an ulcerative process causing cicatricial contraction in healing.

“In a few cases this ulcerative condition and its results are seen in adults, and, when attacking the face and neck, causes much disfigurement, exposing the mucous surface of the eyelids, lips, &c, and in one case, if not fixing the head in an immobile position, at least rendering considerable diminution in movement.

“Amongst the adult population, besides the above described conditions, periosteal enlargement of the tibia and arm bones occur, which is occasionally accompanied with pyrexial attacks lasting for a few days, when increased pain and tenderness over the nodular masses is experienced.

“Again, a similar ulcerative process that attacks the skin, takes place in the mucous membrane, bones and cartilage of the nose and larynx, causing a marked flattening of the nose.

\* Compare H. S. Cooper—Coral Lands, ii., 1880, p. 73. The Tongans knew this disease by the same name in the first decade of the century, *vide* Mariner—*loc. cit.*, ii., p. 270.

“From the foregoing remarks it will be gathered, that between these symptoms and the ordinary course of specific disease there are many points of similarity. Before proceeding further it is well to state that I was unable to find any venereal disease amongst the natives; in fact, disease the result of intercourse seemed unknown. Yet though, in the disease called “tonna,” there was no point observable of primary inoculation, many of the symptoms are allied to those noticed in the course of a syphilitic history; thus the pustular symptom is similar to the secondary rash of syphilis, the ulcerative process apt to follow the above lesion might be said to correspond to the remainder or early tertiary stages, while the periosteal nodes and the ulcerative process of the nasal cartilages would be the tertiary stage. This comparison of course presumes that the periosteal condition, &c., is a direct result or sequence of the early pustular disease. And in support of this presumption it may be added, that in all patients who had these periosteal manifestations that there were indications or history of tonna. On the other hand, it may be said that most natives have had tonna.

“Ordinary care and protection much improved the pustular or early ulcerative state, and specific remedies were most efficacious in ulcerative and periosteal conditions.

“Several cases of permanent blindness among the natives had been caused by Keratitis and Iritis. One case of Iritis developing in a lad of eighteen from no apparent cause, was effectually cured by atropine solution locally supplied, with two grains of mercury and chalk given twice a day for a fortnight.”



## CORRECTIONS.

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- Page iii., paragraph 2, line 2—*for* “Mervyn” *read* “Mostyn.”
- „ 9, „ 4, line 1—*for* “Mervyn” *read* “Mostyn.”
- „ 20, foot-note § —*for* “1844” *read* “1884, p. —.”
- „ 71, paragraph 3, line 4—*for* “supplied” *read* “applied.”
- „ 97, line 6 —*for* “Nob” *read* “Latr.”
- „ 98, line 17 —*for* “Nob” *read* “Macq.”
- „ 155, heading, above Echinodermata, *read* “[VII.]”
- „ 220, line 34 —*for* “VIRIDE” *read* “VIRIDIS.”
- „ 231, line 2 —*for* “genealogies” *read* “genealogies.”
- „ 250, foot-note § —*for* “ix.” *read* “xi.”
- „ 276, foot-note † —*for* “1897” *read* “1887.”
- „ 301, foot-note \* —*for* “1876” *read* “1878.”
- „ 389, paragraph 3, line 1—*add after* fig. 2, “and Plate xxvii., fig. 1.”
- „ 389, „ 4, line 3—*for* “fig. 6” *read* “fig. 2.”
- „ 389, „ 4, line 7—*for* “fig. 7” *read* “fig. 1.”
- „ 390, „ 3, line 2—*for* “fig. 8” *read* “Plate xxvii., fig. 2.”
- „ 390, „ 3, line 10—*delete* “fig. 8.”
- „ 392, „ 2, line 4—*for* “perceptable” *read* “perceptible.”
- „ 398, „ 2, line 4—*for* “indicate” *read* “indicates.”
- „ 398, „ 4, line 4—*for* “have” *read* “has.”
- „ 399, „ 4, line 8—*for* “reject” *read* “rejects.”
- „ 528, line 16 —*for* “davidi” *read* “davidis.”
- „ 530, line 38 —*for* “Chiridota” *read* “Chirodota.”