AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Cooksey, T., 1896. Rock specimens from Funafuti. II. Rock specimens. *Australian Museum Memoir* 3(2): 73–78. [21 December 1896].

doi:10.3853/j.0067-1967.3.1896.488

ISSN 0067-1967

Published by the Australian Museum, Sydney

ROCK SPECIMENS FROM FUNAFUTI.

By T. COOKSEY, Ph. D., B. Sc.,

Mineralogist and Chemist, Australian Museum.

[II.]

ROCK SPECIMENS.

By T. Cooksey, Ph. D., B. Sc.,

Mineralogist and Chemist, Australian Museum.

The following are brief Notes on the Rock Specimens collected by Mr. C. Hedley :—

Coarse Sand.—A specimen of coarse sand from the western sea beach of the Atoll, consists principally of waterworn fragments of coral and coral rock, comminuted or small shells, the tests of the Foraminifera *Orbitolites complanata*, *Tinoporus baculatus*, and to a smaller extent *Polytrema muriaceum*, *Amphistegina lessonii*, and a few fragments of Echinoderms. It is entirely calcareous.

Calcareous Conglomerate. — A calcareous conglomerate was obtained from the bore put down at Luamanif, on the southern sea coast of the islet of Funafuti, at a depth of ten feet. The mass is rather loosely cemented together, and the individual particles are similar to those composing the beach sand. Their relative quantities, however, differ somewhat. The tests of *Orbitolites complanata* although numerous, do not form such a large proportion of the mass, while those of *Amphistegina lessonii* are much more numerously represented. It also contains well worn pebbles of coral rock up to one inch and one inch and a half in length. A thin layer of carbonate of lime encrusts all the components and forms the cementing material. This coating has previously been noticed by Mr. J. E. Carne* to occur on surface sand at Norfolk Island.

Conglomerate.—A firmly coherent conglomerate containing similar materials to those of the preceding rock, the tests of *Orbitolites complanata*, however, appearing to be relatively still less numerous. The mass consists more especially of waterworn pieces of coral-rock, with a large proportion of the tests of both *Tinoporus baculatus* and *Amphistegina lessonii*. It is much consolidated by a deposit of carbonate of lime around each separate

* An. Rep. Dep. Mines, N.S.W., for 1885, p. 145.

particle, which is considerably heavier than that in the preceding specimen, but has not been sufficient to fill up the interstitial spaces.

Coral-Rock.—A portion of coral-rock obtained from the breccia about a mile south of Luamanif at about the high tide level. The structure of the coral has been much impaired. This is due to subsequent alteration, which has consolidated the mass leaving only a few small pores.

Analysis.

Hygroscopic moisture...	0·27
$CaCO_3$	97·69
$MgCO_3$	1·69
P_2O_5	trace
	99·65

Soil from Taro Plantation.—The plantation lies in the centre of the main islet of Funafuti, and the soil has been formed from beach sand, enriched with decayed vegetable matter. The various components of the sand are distinctly seen, some of the tests of the smaller Foraminifera being still but slightly damaged.

An analysis of an air-dried sample gave the following results :—

Hygroscopic moisture...	1·81
CaO	47·23
MgO	1·07
K_2O	·05
Na_2O	·44
Fe_2O_3	·28
P_2O_5	6·00
SO_3	·44
Cl	·02
CO_2	33·65
Organic matter	8·97
Residue (insol. HCl.)...	·04
	100·00

The large percentage of phosphoric acid would seem to shew that a considerable quantity of animal matter, either in the shape of bones or excrement has been added to this soil as a manure, Mr. Hedley, however, failed to observe that any other means of enriching it was employed beside the addition of green leaves and decayed vegetable matter.

Pumice Pebbles.—Pebbles of pumice stone, the largest of which resemble a walnut in size, all much water worn and rounded, were collected from various places on the outer circumference of the Atoll, and possibly occur on all of these islets. They possess a fibrous texture, and contain macroscopic crystals of sanidine. The colour varies from light to dark grey, one or two having a brown or greenish tinge. Similar pebbles occur on most of these Pacific Islands,* and along the eastern coast of Australia.†

An analysis of one which was much rounded by attrition, and possessed a very light grey colour, gave the following percentage composition :—

Hygroscopic moisture...	·09
Loss on ignition	2·29
SiO_2	66·50
Fe_2O_3	3·21
Al_2O_3	16·84
CaO	3·03
MgO	1·03
K_2O	5·44
Na_2O	2·53
P_2O_5	trace
	100·96

A partial analysis of another pebble of a darker shade gave 60·37 % of SiO_2.

On referring to analyses already published of drift pumice, the figures above are seen to agree very closely with that made by Prof. A. Liversidge, F.R.S., of white pumice found on the beach at Bondi, near Sydney,‡ and again with some others published somewhat earlier of ashes and pumice derived from the eruption of Krakatoa in 1883. The pebbles examined by Prof. Liversidge were collected before this eruption took place, but he suggests that this volcano may have been the source from which the pebbles were derived.

It is possible, of course, that the specimen obtained from Funafuti may have found its way from there also, as its analysis would seem to suggest; but its path would have been so long and devious, that one naturally turns to a nearer and more likely source. An obvious one is that of Tanna, in the New Hebrides. In the same publication, however, Prof. Liversidge gives some analyses of dark or black lava from the latter place, which differ

* *Cf.* The Solomon Islands, by H. B. Guppy.—Nature, Dec. 5, 1878.

† *Cf.* Jukes.—Voyage of H.M.S. "Fly," 1847, p. 336.

‡ Journ. Roy. Soc. N.S.W., xx., 1886, p. 235.

very considerably in composition from that of the white pumice found either at Bondi or Funafuti.

It would perhaps be of interest to append these analyses for comparison.

White Pumice, Bondi.

Moisture at 100° C.	1·818
SiO_2	68·149
Al_2O_3	16·493
Fe_2O_3	3·255
MnO	·256
CaO	4·005
MgO	none
Na_2O	3·881
K_2O	1·590
	99·447

Krakatoa, 1883.

	No. 1	No. 2	No. 3
Loss of ignition...	2·17	2·74	2·12
SiO_2	63·30	65·04	68·06
Al_2O_3	14·52	14·63	15·03
Fe_2O_3	5·82	4·47	·28
FeO		2·82	3·66
MnO	·23	trace	trace
CaO	4·00	3·34	2·71
MgO	1·66	1·20	·81
Na_2O	5·14	4·23	4·25
K_2O	1·43	·97	3·41
TiO_2	1·08		·38
	99·35	99·44	100·71

NOTE.—No. 1 by Sauer, No. 2 by Renard, No. 3 by K. Oebbeke.—Journ. Chem. Soc., 1884, pp. 974-5.