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ISLAND NEWS AND COMMENT

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ISLAND NEWS AND COMMENT

To be more in keeping with our broadened scope, to include islands, generally, rather than only atolls, we make the above change in title for this feature of ARB. We hope our readers will continue to send in news items, short original observations and ideas, and publications (or brief reviews of publications) pertaining to islands. In this issue we may have omitted some items that should have been included. If so we hope that we will be excused. We have just made a catastrophic move to less satisfactory quarters, and many things have not yet come to the surface. We hope to be better organized shortly, and also to be more prompt with future issues. The timing of appearance of issues is dependent on receipt of satisfactory manuscripts, as well as on our efficiency or lack thereof.

News

INDIAN OCEAN ATOLLS: Aldabra Expedition: The Royal Society Expedition to Aldabra was landed on the Island by HMS Vidal August 13, 1967, has continued in the field to the present, and is planned to go on for an indefinite period, in phases of about three months each. Some change of personnel has taken place with each phase, but some members have stayed on for two or even three phases. The aim is to get scientific coverage as broad as possible.

The threat to establish an air staging post by the Royal Air Force, aided by the U.S. Air Force was, at least temporarily, abated shortly after the devaluation of the British pound in November 1967. Dropping this foolish and expensive plan resulted in substantial savings to both the British and U.S. taxpayers and in the preservation for continued scientific study of a remarkable and uniquely interesting set of biological phenomena.

It is the hope of the Royal Society to establish a small permanent scientific station on the island, with several field camps at strategic points around the 60-mile oblong of the atoll. It will make possible the long-term studies that may lead to far more than the usual superficial understanding resulting from short and hurried visits. As a first step toward this end the present expedition is trying to amass as complete an inventory as possible of the biota and the physical features of the ecosystem. In addition, behavioral studies of some of the conspicuous animals have been started.

To the end of phase 3 there have been a geomorphologist, a malacologist, an ichthyologist, a marine ecologist, two algologists, a fresh-water biologist, four herpetologists, three ornithologists, three

entomologists, two mangrove ecologists, two vascular plant botanists, and a conservationist as members of the expedition, as well as several supporting personnel.

An enormous amount of data and vast collections of specimens have been gathered, and much more activity is planned for future phases of the expedition, after phase 5 which is in the field at present. It is hoped to bring together these substantial bodies of information in a special volume of the Philosophical Transactions of the Royal Society next year. Preliminary notes, tentative and incomplete observations and discussion may appear in the future numbers of the ARB.

Assumption, Astove, Cosmoledo: Short visits to Assumption, Astove, and Cosmoledo atolls were made by personnel of the Aldabra Expedition. Collections of plants, birds, and insects were made to the extent possible in one-day visits, and observations on many features of the islands were recorded. On Astove the new lessees of the island, Veevers-Carter and his family were courteous hosts and supplied much information about the island and their plans for developing it.

It is hoped that a future issue of the ARB can be devoted to the results of these visits. These three islands are slightly elevated atolls similar to Aldabra but much disturbed by phosphate mining.

The following list of participants has been furnished by Dr. David R. Stoddart, of the Royal Society Aldabra Committee:

As plans are made to extend the Royal Society Expedition to Aldabra into its second year, more than thirty scientists will have participated by the end of August 1968. The following list covers personnel from Phases I (August-September 1967), II (October-December 1967), and III (January-March 1968), with some indication of the fields covered by each.

Dr. D. R. Stoddart (leader), Department of Geography, Downing Place, Cambridge, England: August-September 1966 and August-September 1967. Geomorphology and collections of plants during the dry season.

J. F. Peake, Department of Zoology, British Museum (Natural History), Cromwell Road, London, S.W.7.: September 1967. Land mollusca.

Dr. J. Morton Boyd, The Nature Conservancy, 12 Hope Terrace, Edinburgh, Scotland: September 1967. Conservation studies.

J. H. Price, Department of Botany, British Museum (Natural History), Cromwell Road, London, S.W.7.: September 1967. Marine algae, particularly algal distribution along transects at West Island.

C. F. Rhyne, Department of Botany, Smithsonian Institution, Washington, D.C. 20560, U.S.A.: August-September 1967. Collection of marine algae, and also lichens.

Dr. H. A. Fehlmann, Oceanographic Sorting Center, Smithsonian Institution, Washington, D.C. 20560, U.S.A.: August-September 1967. Marine fish.

C. W. Benson, Department of Zoology, Downing Street, Cambridge, England: September 1967 and January-April 1968. Land birds.

Dr. J. D. Taylor (field leader, Phase II), Department of Palaeontology, British Museum (Natural History), Cromwell Road, London, S.W.7. Intertidal ecology, with special reference to mollusca but with attention to corals, algae, crustacea and other groups.

M. J. Penny, Department of Zoology, University of Bristol, Bristol (address c/o The Wildfowl Trust, Slimbridge, Gloucestershire, England): August-December 1967. Shore birds.

A. W. Diamond, Department of Zoology, University of Aberdeen, Aberdeen, Scotland: September 1967 - April 1968. Sea birds.

P. Grubb, Zoological Society of London, address c/o Department of Zoology, University College, Gower Street, London, W.C.1: September 1967 - April 1968. Population studies of the Giant Land Tortoise.

Dr. K. G. McKenzie (field leader, Phase III), Department of Zoology, British Museum (Natural History), Cromwell Road, London, S.W.7: January-April 1968. Hydrology and fauna of the freshwater and brackish pools.

J. Frazier, Department of Zoology, University of Oxford, Oxford, England: January-July 1968. Behavioral studies of the Giant Land Tortoise.

Dr. F. R. Fosberg, Smithsonian Institution, U.S. National Museum, Washington, D.C. 20560, U.S.A.: January-February 1968. Vegetation and flora.

S. A. Renvoize, Royal Botanic Gardens, Kew, Richmond, Surrey, England: January-April 1968. Vegetation and flora.

Dr. W. MacNae and N. I. Passmore, Department of Zoology, University of the Witwatersrand, Jan Smuts Avenue, Johannesburg, South Africa: January-February 1968. Mangrove biota.

B. H. Cogan and A. M. Hutson, Department of Entomology, British Museum (Natural History), Cromwell Road, London, S.W.7: January-April 1968. Insects.

Dr. J. C. Shaffer, Department of Entomology, Smithsonian Institution, Washington, D.C. 20560, U.S.A.: January-April 1968. Insects, especially Lepidoptera.

A list of personnel from Phases IV, V and VI (April 1968 - February 1969) will be published in the next issue of ARB.

PLANT COLLECTION ON WESTERN INDIAN OCEAN ATOLLS: Drs. David Wood and M. D. Gwynne visited many of the atolls in the Seychelles, Amirantes, and Aldabra groups in November 1967, on the M. V. Manihine, of the EAMFRO (see below). Somewhat over 400 collections of plants were made, under the auspices of the East African Herbarium, where the principal set will be deposited, as well as a set at Kew. A list of these will be published in a future number of ARB.

CHRISTMAS ISLAND (INDIAN OCEAN): Dr. Bryan Nelson, formerly of the University of Aberdeen, has recently returned from several months ornithological work on the elevated limestone island of Christmas Island, eastern Indian Ocean. Christmas is the last known nesting place of Abbott's Booby, Sula abbotti, first described from Assumption Island near Aldabra. Nelson's book, Galapagos, Islands of Birds (London: Longmans, 1968, 338 pages, fifty shillings), though not about atolls, contains a great deal of useful information on the behavior of the Red-footed Booby, the Frigate-birds, and other common tropical oceanic sea birds, much of it not readily available elsewhere.

CLIPPERTON ISLAND: A small permanent station was established on Clipperton by the French Navy in 1966. In addition to continuing meteorological data collection, observations on the hydrology of the lagoon and on the flora and especially fauna of the atoll have been carried out during several expeditions, mostly by French Navy physicians, and some results assembled in mimeographed reports of the "Division de Biologie générale et Ecologie" of the "Centre de Recherches du Service de Santé des Armées". These reports are mostly preliminary in nature and of very limited distribution, but we hope to include some of the results on the fauna and hydrology in a future issue of ARB.

RENNELL AND BELLONA ISLANDS: John Grover, Director of the Geological Survey Department of the British Solomon Islands since 1950, has now left to take up a similar post in Fiji. During his work in the Solomons, visits were made to the elevated atolls of Rennell and Bellona, south of Guadalcanal. Rennell has become reasonably well known from the work of the Noona Dan Expedition, and Grover has also written a short account of it ('Rennell--the great uplifted atoll on the edge of the Coral Sea', Geol. Surv. Brit. Solomon Islands Memoir 2, 1958, 134-139). Much less was known of Bellona until recently. Grover published a short report on 'The discovery of phosphate rock on Bellona Island, 1956' (Geol. Surv. Brit. Solomon Islands Memoir 2, 1958, 120-134), which stimulated further work. Two papers appeared in the Brit. Solomon Islands Geol. Record, 1, 1960: 'Rennell Island--prospecting for phosphates, 1957', pp. 42-43, and 'Bellona Island--further prospecting for phosphate 1957, and a brief description of geological features', pp. 44-53, by P. A. Pudsey-Dawson and J. H. Hill, respectively. Volume 2 of the Geological Record, published in 1965, contains two further papers: 'Survey of phosphate deposits in the southwest Pacific and Australian waters--Bellona Island', by W. C. White and O. N. Warin, pp. 72-84, and 'Extracts from a report on the investigations of phosphate deposits on Bellona Island', by T. A. Adams, pp. 85-88. The publications of the Solomon Islands Survey are available from the Department of Geological Surveys, Honiara, B.S.I.P.; Crown Agents,

4 Millbank, London, S.W.1. (up to 1960); or Her Majesty's Stationery Office, Kingsway, London (1965). Dr. Torben Wolff has published a very useful guide to the work of the Noona Dan expedition, including that on Rennell ('The Noona Dan Expedition 1961-1962, General Report and Lists of Stations', Vidensk. Medd. fra Dansk naturh. Foren., 129, 1966, 287-336); this paper lists the expedition's publications to date.

The above listed exploration reports, though marking a great increase in our knowledge of two of the more interesting islands in the Pacific, may be taken as a prophesy of disaster for them. The discovery of commercial quantities of phosphate on an island has yet to spell anything but destruction for the ecosystem concerned. Even where the islanders have shared in the profits of the phosphate enterprise, this has merely enabled them to leave their homes after conditions had become intolerable.

BIKINI ATOLL: According to a recent announcement from the White House, Bikini is now considered again safe for human habitation, and plans are under way to permit the Bikini people to return from Kili Island to Bikini. It is said that the coconut crabs still retain enough Strontium-90 in their shells to pose some radiation hazard, and that measures will have to be taken to eliminate them. This would be a very foolish thing to do, at least until work was done to determine just what age groups are radioactive, whether the flesh is so as well as the shells, and whether there is any concentration taking place from the present very low level of soil radioactivity. Plans are even being considered to cover the major islands with a layer of coral rock "to reduce further the low level of radiation from the soil". It is to be hoped that before this is done the coral rock used will, itself, be tested for radioactivity.

BRITISH HONDURAS ATOLLS: Through the courtesy of the Rev. Leonard E. Dieckman, S.J., of Belize, we are able to note the drilling of two holes, one on Turneffe Atoll, the other on Glover's Reef, by the Belize Shell Development Co. in 1966 and early 1967. The Turneffe hole went through 4000 feet of reef limestone, then 200 feet of boulder clay, then to a depth of 7000 feet through clay, to a diorite basement. The Glover's Reef hole reached basement at 3147 feet. The object of the drilling was, of course, oil, but none was found. It is hoped that the cores or cuttings will be preserved and made available for study.

R. V. MANIHINE: It may be of interest to those concerned with work in the western Indian Ocean islands that the research vessel Manihine, a motor ship 118 feet long and 208 tons displacement, is available for oceanographic and biological investigations, operating out of Mombasa, Kenya. The vessel is owned by the East African Marine Fisheries Organization (EAMFRO), headquarters in Zanzibar, and operated for them by Southern Lines, Inc., Mombasa.

The Manihine has a fair-sized biological laboratory, a small hydrology laboratory, and two cabins for 5 scientists, 2 bunks in one, 3 in the other. It is equipped with freezers, 2 echo-sounders, a bathythermograph, deep-water sampling equipment, and appropriate winches, as well as the gear for studying pelagic fisheries.

It makes frequent cruises and interested and qualified scientists are invited to make use of it.

Inquiries may be addressed to the director of EAMFRO, Mr. Basil Bell, Zanzibar, Tanzania.

ATOMIC BOMB TESTS IN THE TUAMOTUS: A "before and after" program of scientific observations on the test area does not seem to have been formulated, or at any rate made known to the scientific community, when atomic testing was planned for the Tuamotus. That geological as well as biological surveys have been conducted is slowly becoming apparent as papers begin to appear (cf. Cahiers du Pacifique, below). An example is a report on borings on Mururoa Atoll, two of which reached the basaltic substratum (Chauveau, J.C., et al., C.R. Acad. Sci. Paris 265 (sér. D): 1113-1116, 1967). Dating of Mururoa limestones had been reported by Lalou, C., et al., loc. cit. 263 (sér. D): 1946-1949, 1966.

E. H. BRYAN HONORED: Ed Bryan has probably visited more atolls than anyone else and is certainly a walking encyclopedia of information on them. It seems fitting, therefore, to reproduce the following from Ka 'Elele, Staff Newsletter of the Bishop Museum, No. 53, 1968, for the benefit of our readers:

"On the occasion of his 70th birthday, April 13, Mr. Edwin H. Bryan, Jr., was appointed by the Trustees to be the first William T. Brigham Senior Fellow in recognition of nearly 50 years of distinguished service to Bishop Museum. The day began with a special honorary symposium and closed with a birthday dinner and the presentation of the award. The symposium, held in the Paki Hall Conference Room, included speakers from the University of Hawaii and the Museum staff, with Dr. Roland W. Force, Director of Bishop Museum, as Chairman. Entitled 'Aspects of Natural History in the Pacific', the five speakers and the papers given were: Dr. E. Alison Kay (University Professor and Chairman of General Science, and Museum Honorary Associate in Malacology), 'The History of Natural History in Hawaii'; Dr. Andrew J. Berger (University Professor and Chairman of Zoology, and Museum Honorary Associate in Ornithology), 'The Breeding Season of Hawaii 'Amakihi (Loxops virens)'; Dr. Harold T. Stearns (Consulting Geologist), 'Glaciation and Atolls'; Dr. John E. Randall (Hawaii Institute of Marine Biology, and Museum Ichthyologist), 'Fish Names of Tahiti'; and George W. Bunton (Kilolani Planetarium Astronomer), 'The Planetarium as a Classroom'. These and additional papers will be compiled in a special volume honoring Mr. Bryan and published by Bishop Museum Press at a future date. About 35 people, including Mrs. Bryan, took part. In the evening, some 100 friends and colleagues gathered at the Pacific Club for dinner and the award presentation. Mr. Bryan responded with a lively account of his reminiscences of the early days of the University and Bishop Museum.

"Philadelphia-born Ed Bryan, the man who knows the Pacific like the back of his hand, came to Hawaii in 1916, just out of a California high school. He attended the College of Hawaii, now the University, and graduated with a B.S. in 1920. A year at Yale earned him a Ph.B., and in 1924 he received his M.S. from the University of Hawaii. His interests in Pacific and Hawaiian Islands natural history were kindled

early in college by various science courses and associations with faculty scientists, and eventually he landed at Bishop Museum in 1919 as Assistant in Entomology, a part-time summer job that continued through his senior year. Thus began Ed Bryan's long career, as Curator of Collections for 32 years, contributor to scientific journals and the daily press for 46 years, traveler, astronomer, botanist, entomologist, geographer, historian, teacher, and bibliographer. For the past 8 years, as Manager of the Pacific Scientific Information Center, his continuing focus has been on efforts to make available to scientists everywhere the rapidly accumulating masses of data about the Pacific. He has served under four of the five Museum Directors and was acquainted with the first, Dr. William T. Brigham, for whom his new staff designation was named. His star charts, appearing in the Sunday paper, have been guides to Hawaii's skies since the early 1920's, and his "Bryan's Sectional Maps of Honolulu, Rural Oahu, and the Hawaiian Islands" is standard glove-compartment equipment for all motorists. Typically, he has moved into the next 70 years with characteristic vigor and enthusiasm for the countless projects and jobs that demand his attention in a growing Museum and a busy Information Center.

"Members of the committee who assisted Dr. Force in coordinating the events of the day were: Eleanor Anderson, Administrative Assistant to the Director; Brenda Bishop, Pacific Science Association; Dr. Dennis Devaney, Marine Biologist; Dr. Adrienne Kaeppler, Anthropologist; Dr. Kay; Dr. Yoshio Kondo, Malacologist; Dr. Randall; and Douglas Yen, Ethnobotanist."

EMORY FESTSCHRIFT: Another 70th birthday of an old atoll hand was that of Kenneth P. Emory. The Bishop Museum honored this event by publishing a book, Polynesian cultural history: Essays in honor of Kenneth P. Emory. We have not seen this yet, so cannot review it. Kenneth is the dean of Polynesian ethnology and archeology, and has been anthropologist on the Museum staff for over four decades and was recently appointed to the John Ledyard Chair in Cultural History. His investigations on Napuka and Kapingamarangi atolls, as well as others, are outstanding. We all wish him many more decades in which to get all he knows written down and published.

PROFESSOR RICHARD J. RUSSELL has recently published a book that will be of interest to the geologically and geographically minded among our readers, River plains and sea coasts, (Univ. Calif. Press). We hope to have a review of it soon.

MARINE SCIENCE INSTITUTE: We are distressed to read that the Marine Science Institute of the University of Miami has lost its library and many unpublished papers in a fire. There seems to be something seriously wrong with the economics and/or administration of science that such foreseeable catastrophes are allowed to happen in an age when fireproof construction is not only feasible but regarded as normal.

Dr. Donald P. deSylva, of the Institute, writes that he lost his entire personal library, as well as manuscripts and specimens, in the fire. He solicits reprints and other printed material to start rebuilding his library in the fields of ichthyology, fisheries, and biological

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oceanography. We would suggest such contributions, also, to the library of the Institute of Marine Sciences, itself (Rickenbacker Causeway, Miami, Florida 33149, U.S.A.).

SYMPOSIUM ON CORALS AND CORAL REEFS: "The Marine Biological Association of India has great pleasure in proposing to hold a Symposium on CORALS AND CORAL REEFS as its fourth of the series of symposia during 12-16 January, 1969 at Mandapam Camp, India.

"The scientific study of coral reefs dates back to the time of Darwin. Since then, corals and coral reefs have attracted the attention of naturalists, marine biologists, geologists, palaeontologists and geographers alike, the world over. Corals comprise members of the Hydrozoa and of the Anthozoa. Perhaps there is no sphere of biological study in which the continual interplay between the animal and environment is so well displayed or worthwhile studying as in this group with its characteristic distribution. A coral reef harbours a rich and varied reef-building and reef-dwelling fauna and flora forming a unique biotype. The degree of variability within this group and the influence of several factors, especially the water movements, on their growth is remarkable. The building of the reefs is primarily a constructive biological process while the geological processes such as erosion and sedimentation which are continuously in action form the main destructive causes, the effects of which need study by scientists other than the biologists. Thus the study of coral reefs is intimately connected to the earth sciences. Information on the coral reefs for safe navigation is also quite obvious. Many an industry is dependent on corals for raw material. They are also much sought after as curios and for their ornamental and medicinal value.

"The late nineteenth and early twentieth century researches on this group have yielded many interesting results. Still, many major problems on the various aspects of this group remain to be satisfactorily explained. To review the past findings, to bring forth the results of current investigations and to discuss problems of interest for research in the light of the experience gained, it is felt desirable to hold a Symposium on the various aspects of coral and coral reefs, particularly their systematics, ecology and biology.

"Mandapam Camp has been chosen as the venue for this Symposium considering the unique opportunities this place lends for discussion on this particular subject. Perhaps this is one of the few places in the Indian region where a rich and active coral reef can be seen within a few metres from the shore and in the vicinity of a Research Institute. Mandapam itself is located on a narrow peninsula with seas on all the three sides. The shallow seas all around with a chain of coral islands on one side present a fascinating panorama to any visitor. It is no wonder that in view of the rich and varied marine fauna and flora in this area it is rightly known as the marine biologists' paradise.

"Contributions from scientists all over the world are invited on the following subjects:

"Systematics, Distribution, Physiology, Histology and Histo-Chemistry, Biology, Reproduction, Larval and Post-larval development, Phylogeny and Evolution, Formation of Coral reefs, Structure and Ecology of Coral reefs, Animal and Plant communities on reefs, Utility of Corals and Coral reefs and Review.

"Background papers on the above subjects are also invited.

"Titles of contributions for the symposium will be registered up to 31st July 1968. Abstracts of papers in triplicate should reach the Convener by 31st August 1968 and the full papers by 31st October 1968.

"All correspondence may be addressed to: The Convener, Symposium on Corals and Coral Reefs, Marine Biological Association of India, Marine Fisheries P.O., Mandapam Camp, Madras State, India."

Information furnished by the Convener.

SYMPOSIUM ON LIMESTONE-BORING ORGANISMS: Of much interest to our readers may be the following (quoted from AIBS Newsletter 1(12): 4, 1967): "An international symposium entitled Penetration of Calcareous Substrates by Invertebrates and Lower Plants is scheduled during the AAAS meetings at Dallas, Texas in December 1968. The symposium will be limited to papers on invertebrates and lower plants which mechanically, chemically or mechanically-chemically penetrate invertebrate and algal exoskeletons of calcite and aragonite, limestones, and composites containing a calcareous cementing mixture. Interested investigators are invited to submit, as soon as possible, a tentative title and brief summary of a proposed paper for consideration, and to indicate whether travel support will be required. Address all correspondence to: M. R. Carriker, Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Massachusetts 02543."

SOUTH PACIFIC STUDY TOUR: The Department of Oceanography, University of Washington, has just announced a 3-week study tour to the South Pacific, to be sponsored by the University's Division of Evening and Extension Classes, and to be conducted by the Faculty of the Department of Oceanography. Among the features to be studied are the great Barrier Reef and Coral Atolls. The tour will take place January 11-February 1, 1969. Inquiries may be addressed to:

University of Washington
Division of Evening and Extension Classes
Seattle, Washington 98105

Original Observations

A NEW METHOD FOR SEWAGE TREATMENT ON CORAL ATOLLS

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Sanitary disposal of human and animal excreta is an important problem confronting people the world over which is accentuated for those people living on coral atolls. As island populations increase rapidly the problem of sewage treatment increases apace. A recent development in Taiwan promises to help alleviate sewage treatment problems and appears to be ideally suited for use on small coral islands: it is safe, simple, effective, and inexpensive.

In one form this invention is constructed of two metal drums, tubing, and a sealing lid all of which are placed in the ground under a privvy. Where corrosion of metal is a problem (as on atolls) the drums can be treated with a sealer. Only one drum is used at a time. When it is partially filled the head is sealed and a process of fermentation by anaerobic bacteria begins. This fermentation produces methane gas which can be used with a gas burner for cooking or with a gas mantle for lighting. Once fermentation in one drum is finished the residue is a sterile and usable fertilizer. By rotating the two drums one continuously is assured sanitation, light, heat, and fertilizer. Such a system appears to have great potential for use on coral atolls where pollution of the fresh water lens or the lagoon is an ever-present possibility.

One form of the invention which has been developed treats hog manure or chicken droppings rather than human waste.[1/] This unit has proved very successful on Taiwan and costs about U.S. $90.00 to construct. It is built using bricks or concrete blocks which are plastered and waterproofed on both sides eliminating the threat of seepage. A hole is dug and lined with sealed and plastered building blocks. This is then capped with a gasholder made of 16-gauge (1.5 mm) sheet iron. From the gasholder a hose can be run to carry the methane gas to its point of use.

Workers at the Animal Industry Division, Chinese-American Joint Commission on Rural Reconstruction, Taiwan, have ingeniously wedded the second method of methane production described above to Chlorella

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1/ Plans for this system may be obtained by writing: China Productivity and Trade Center, 62 Sining South Rd., Taipei, Taiwan.

production.[2/] Produced in large quantities, this alga provides an animal feed of high nutritive value. Such a system has obvious implications for those islands lacking large quantities of suitable animal feed.

The above described sewage treatment systems merit further study not only by specialists in sanitary engineering and in public administration, but also by those in marine biology, in island ecology, and in anthropology.

A NOTE ON MEDITERRANEAN BEACHROCK: ITS HISTORY

by Andrew Goudie
Department of Geography, University of Cambridge

The existence of beachrock is now well established in the Mediterranean. Taillefer (1964) gave an interesting description of some beachrock at Viransehir, near Mersin, southern Turkey. During field work in 1965 at Arsuz, on the other side of the Gulf of Iskenderun from Mersin, I examined another large expanse of beachrock. Mistardis (1963, 1964) has made a thorough study of Greek examples, most of which are concentrated in Attica, and Boekschoten (1962, 1963) has described various Cretan beachrocks. There are also reports of beachrock from elsewhere in the Levant by Schattner (1967), Emery and Neev (1960) and Fevret and Sanlaville (1965). However, beachrock is not confined to the Eastern Mediterranean for Mabesoone (1963) and Russell (1962) mention examples from Cadiz and Barcelona in Spain, and Bloch and Trichet (1966) give details of a small exposure in Liguria, Northern Italy.

One problem which has concerned most of those who have investigated beachrock in the Mediterranean is the age of the deposits, and whether this age indicates some association with a slightly warmer phase in the past, for the northern Mediterranean is probably a fringe area for beachrock formation, and many examples are undergoing severe solutional alteration at present.

Taillefer (1964) believed that the beachrock at Viransehir was formed during the Monastirian and is now a relic feature suffering degradation. He based his evidence on the absence of included archaeological remains, and as Viransehir is very near to the major classical site of Pompeiopolis he believed that this absence was significant. However, it is doubtful if this date applies to other Turkish beachrock. The beachrock at Arsuz, for example, contains pots, bricks, and the like which are of Roman or Byzantine origin. Similarly, Emery and Neev (1960) state that one of the exposures of beachrock in Israel comes

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2/ Po, Chung, "The Animal-Methane-Chlorella Cycle, Additional Uses of Manure for Fuel and Food Production", Chinese-American Joint Commission on Rural Reconstruction, Taipei, August, 1965.

from "post-Roman or even post-Crusader times, as revealed by the inclusion of brick, pottery, and marble fragments in beachrock at Caeserea and Acre". In Greece, the beachrock overlies some reddish breccias of Upper Pleistocene age and some superficial sandstones of early Holocene/End Pleistocene age. The majority of the Greek examples are at present sea level which suggests no great age, though some examples are known from slightly below sea level. However, Mistardis (1963) mentions that some beachrock has been used in tomb construction dated at 1800 B.C. suggesting that in this case it is at least 4000 years old. Boekschoten (1962) says that some of the Cretan beachrock at Limani Chersonisos contains man-made green glass and concludes that as glass only came into general use in Roman times on Crete, and as Chersonisos became a rather important town in these times, as witnessed by many ruins not far from the beach, a terminus post quem of around 2000 years can be accepted for the beachrock formation. He writes, "Apparently nowadays the beachrock is eroded only; no phenomena could be observed which could be interpreted as accretion."

In this connection it is interesting that both Boekschoten (1962) and Bloch and Trichet (1966) state that the beachrock that they describe is bonded by a calcitic rather than aragonitic cement. Stoddart and Cann (1965) on the other hand suggest that true beachrock is initially cemented by aragonite. It is possible, therefore, that this calcitic bonding is a result of a formation in the past followed by subsequent alteration, for as Chilingar et al. (1967) write: "Diagenesis of modern carbonates is rapid if they are exposed to fresh water. Thus beachrock cements that are several thousand years old are converted to calcite."

Even the earliest investigators of beachrock were concerned with its age, and most of the earliest references to beachrock come from the Mediterranean's shores and from the Canary Islands. Darwin (1841) was not the first person to describe beachrock as was assumed by Russell and McIntire (1965). Joseph Woods (1824), for instance, wrote that in Attica "A conglomerate still more recent appears to be at present in the progress of formation in some places on the shore." Other early references to beachrock include Von Buch's (1825) description of the still-continued formation of conglomerates on the seashore near Las Palmas, and other mentions of similar deposits on the Sicilian coast near Messina by de Saussure, Spallanzani and others as mentioned by Bischof (1854).

However, the best early account of beachrock is that of Sir Francis Beaufort, the Admiralty hydrographer. His account of the "petrified beaches" of Karamania was published in 1817, and was based on laborious surveys during the Napoleonic War. He wrote (p. 174): "The shore bounding the plain was once a gravel beach; but from the upper part of the slope to some distance into the sea, it is now a solid crust of pudding stone, from one to two feet in thickness. The petrified beach is not peculiar to the Plain of Selinty: many instances of it on a smaller scale had been already observed on the coasts of Asia Minor, and a few in some parts of Greece; and I have been informed that an example of it also occurs in Sicily. Being generally covered with loose sand and pebbles, it presents to the eye no extraordinary appearance; but the unwary boat that should mistake it for a common beach of

yielding materials and should run upon it before a following surf, might be fatally apprized of its error."

Beaufort also describes the nature of the Turkish specimens and remarks that they "Differ but little from each other; gravel predominates in some, coarse sand in others; or they lie in alternate layers of each; the pebbles in all are more or less rounded....the cement or paste by which they are united are likewise calcareous, and so tenacious that a blow sufficient to break the mass, more frequently fractures even the quartz pebbles than dislodges them from their bed." He goes on to give an indication of their mode of formation in association with streams flowing from a small range of calcareous hills: "Perhaps the calcareous particles thus washed down may point out the source from whence the cement for this recently formed rock has been derived; and perhaps, wherever this petrified beach occurs, a similar mode of accounting for it might be furnished by an alternative investigation of the adjacent strata." This view is little different from that of Boekschoten (1962) who says that Cretan beachrock is linked in its occurrence with the two coastal outcrops of limnic neogene sediments, and that, "The ground-water, saturated with Calcium Carbonate from the freshwater limestone seeps out of the sands along the edge of the beach and causes cementation there...."

Of no less importance is Beaufort's assessment of the date of the beachrock from archaeological evidence. This is of particular interest because the beaches he deals with, like those of Taillefer (1964) mentioned earlier in this note, are very close to the ancient city of Pompeiopolis. His observations tie in well with those at Arsuz. He talks of a Roman port installation and says: "Several of the square blocks of stone which had fallen down from the piers, were buried in the crust; and though firmly fixed there, their original positions were still obvious, and had a freshness of appearance that proved how recent and rapid had been the petrifying process." At another point along the coast, "This rock contains a large proportion of broken tiles both red and yellow, of shells, bits of wood, and of such rubbish as might be expected in the vicinity of a town. It is uncommonly hard." These observations conflict with those of Taillefer (1964).

Thus Sir Francis Beaufort gave a remarkably penetrating account of these interesting littoral conglomerates. His work was referred to by Bischof (1854) and others, but otherwise has been rather neglected by coastal geomorphologists in comparison with later investigators like Darwin. He put forward useful ideas as to the age and origin of the beachrock, and gave some indication of its extent in the northern Mediterranean - an extent which only now is being fully realized. Beachrock is far from being a purely tropical phenomenon.

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Publications

Wodzicki, K., An ecological survey of rats and other vertebrates of the Tokelau Islands. 1-89, 1-6, 1-4, 1, 1-4, 1-9, 1, 1-6, 1-12, Wellington, 1968. This duplicated report contains a remarkable amount of information about a previously poorly known group of atolls. The work was principally centered on rats, and was eminently practical in its objectives. It differs from many earlier investigations on rat problems in that its approach is primarily ecological, based on the premise that effective control is much more probable if based on an understanding of the ecology and population dynamics of the rats. In addition to the work on rats, birds and reptiles were studied to some extent, land invertebrates were collected and are being identified, parasites on rats were collected and a collection of plants prepared. A list of plants and brief description of the vegetation forms appendix VIII. Unfortunately there are some unexplained discrepancies between plants mentioned

in the text and those listed. This paper is a welcome addition to ecological literature on atolls.

Laird, M., A coral island experiment. WHO Chron. 21(1):18-26, [1967?].
We recently received this interesting article (also published in Danish, in Naturens Verden, Sept. 1967, 274-281) from the author, now of the Department of Biology of Memorial University of Newfoundland, St. Johns, Newfoundland, Canada. The experiments described concerned proposed methods of control of Aedes mosquitoes by chemical and biological agents on Nukunono and Atafu atolls, Tokelau group. Fakaofo Atoll was left untouched as a control.

Doumenge, F., L'Homme dans le Pacifique Sud. Etude géographique. Publ. Société des Océanistes No. 19, i-xxviii, 1-633 + 1, Paris, 1966.
After the great French scientific expeditions of the first half of the 19th century, with their extensive publications, rather little attention was paid by the French to the Pacific Ocean, or even to their own islands of French Polynesia and New Caledonia, until World War II. There has been a profound change in this respect in recent decades, and the present volume is an example of it. It is itself a study of change in the Pacific Islands populations under the impact of 20th Century accelerated economic evolution. The author's "Pacific Sud" includes the tropical archipelagoes of the Southern Hemisphere, from the Solomon Islands to Easter Island. A few atolls of the Northern Hemisphere are included, where the Gilbert, Phoenix and Line groups straddle the Equator. As is usually the case with works of vast coverage, there is great unevenness in the treatment of various areas and topics. The French island groups are discussed in much greater and surer detail than those under English-speaking administrations and topics such as fisheries, industrialization, and migration and evolution of populations under the pressure of economic change are best developed, reflecting the author's particular interests and expertise. In the introductory section on the physical background, by contrast, the treatment of the biota is weak, and perhaps would have been better omitted altogether. The number of spelling errors in botanical names is staggering and cannot be entirely attributed to the vicissitudes encountered by this volume at the time of proofreading. They must be eliminated in a later edition or in the English version which has been mentioned as a possibility.

Coral atolls, of course, are not very important economically and much of this volume naturally does not pertain to them. Atoll students, however, will find here much information of value, especially on the Tuamotus. There is an account of the French atomic testing grounds and one of the first, if not the first, discussions in print of the tremendous impact of this enterprise on the people of the Tuamotus as well as other populations in French Polynesia, with some sober considerations for the future. The volume includes many tables, drawings, maps and photos, an extensive bibliography arranged by chapters and sections, and several indices. It is a most important addition to the literature of the 20th Century South Pacific Islands and few Pacific specialists will want to be without it.

Cahiers du Pacifique, the handsome journal sponsored by the French "Fondation Singer-Polignac" continues its valuable contribution to Pacific science with bibliographies, reviews and news, in addition to scientific papers. Nos. 10 (May 1967) and 11 (December 1967, received in 1968) include articles (some based on Mururoa surveys) on atoll molluscs and other invertebrates, as well as reports on fish-poisoning or "Ciguatera."

Journal de la Société des Océanistes. Some articles on atolls appear also in the latest issues of this journal, 22 (December 1966) and 23 (December 1967, received in mid-1968). The Journal regularly includes reviews and a continuing bibliography of Oceania. The series of "Publications" of the Society (of which no. 19 is described above) includes (no. 14, 1967) a "Bibliographie de Tahiti et de la Polynésie française," by P. O'Reilly and E. Reitman, which we have not yet seen. Its price (400 Francs) will no doubt limit its distribution despite the habitual high quality of works prepared by Father O'Reilly or under his guidance.

Dr. I. Eibl-Eibesfeldt's book on the Maldive atolls (see ARB 112: 9-10, 1965) has now been translated into English from the German original edition and is available in the U.S. as "Land of a Thousand Atolls," World Publishing Library, 1966.

Nelson, J. B. The biology and conservation of Abbott's Booby on Christmas Island. IUCN Bull. 2: 59, 1968. A brief account of Christmas Island (Indian Ocean) with the dismal prospects for its future, since phosphate exploitation is being stepped up, and remarks on status and future prospects of the endemic Abbott's Booby and other endemic birds.

Lundsgaarde, H. P. Social changes in the southern Gilbert Islands: 1938-1964. 1-51 + 8, Eugene, Oregon, undated, (mimeographed). This is a very informative account of present-day Gilbert Island life, well written and interesting. It is the fifth in a series of reports emanating from a project of the University of Oregon on "A comparative study of cultural change and stability in displaced communities in the Pacific" (see ARB 108, p. 1).

Lieber, M. D. Porakiet: a Kapingamarangi colony on Ponape. 1-228, Eugene, Oregon, 1968. This is an extremely informative monograph of this transplanted community of Polynesian atoll dwellers. Some background of history and geography of Kapingamarangi Atoll is included, largely borrowed from other sources. Comparisons between the two environments and between the human communities are very instructive. Of especial interest is an account of attempts to colonize Oroluk Atoll by the Kapingans. It did not work out very well. This document is the sixth in the University of Oregon series (see Lundsgaarde, above).

South Pacific Commission, Technical Meetings on Coconut Production, Rangiroa....Report. 1-31 + appendices, Noumea, 1967. This is an account of the discussions and list of papers presented at a meeting sponsored by the South Pacific Commission in August 1967. The papers were agricultural, phytopathological, physiological, and economic. Their texts were not published. Numerous recommendations were passed.

Zaiger, D. and Zentmyer, G. A. A new lethal disease of breadfruit in the Pacific Islands. Plant Disease Reporter 50 (12): 5 unnumbered pp., 1966. This paper and a report of subsequent work, P.A.Q.R.S. Cir. 36: 1-4, 1968, describe and give some data on the distribution of the Pingelap Disease, a serious threat to the breadfruit groves of the entire tropical Pacific, and other areas, too, for that matter. No cause for the disease has been established, though it seems highly infectious. Several fungi are associated with diseased plants, but cross inoculation was not successful.

Zipser, E. J., and Taylor, R. C. A catalogue of meteorological data obtained during the Line Islands experiment, February-April 1967. NCAR-TN-35, 1-362, 1968. A massive presentation of raw data, with a description of the experiment, maps, photos, and a very thorough bibliography of scientific publications on the northern Line Islands. It would be indispensable to anyone working on the meteorology or climatology of the Central Pacific. This document is also referred to as Hawaii Institute of Geophysics, University of Hawaii, HIG-67-19, apparently just to confuse bibliographers and librarians.

Sauer, J. D. Plants and man on the Seychelles Coast. 1-132, University of Wisconsin Press, Madison, Milwaukee and London, 1967. $5.00. This is a fine little book that deals in a most interesting manner with the history of the coastal vegetation (i.e., strand vegetation) of a fascinating group of islands in the western Indian Ocean. He treats the effect of 200 years of human influence, advances a theory of local origin for the coconut varieties cultivated in the Seychelles and elsewhere in the Indian Ocean, and lists the plants that make up the vegetation. The book is, in many ways, a model for reconstructions of vegetation from meager historical documentation.

Klausewitz, W., Die physiographische Zonierung der Saumriffe von Sarso. Meteor Forschungserg. D, 2: 44-68, 1967. A detailed and well illustrated consideration of reef zonation in the Sarso Islands in the Red Sea. Geomorphology, changes in sea level, and the biota are all presented in some detail, with excellent diagrams. This paper brings closer the day when we will have enough careful studies of reef zonation and geomorphology to yield some valid generalizations from a comparative study.

Maes, V. O., The littoral marine mollusks of Cocos-Keeling Islands (Indian Ocean). Proc. Acad. Nat. Sci. Phila. 119: 93-217, 1967. This is a handsomely illustrated account of a collection of shells made in 1963. In addition to a systematic enumeration of the collection the authors present a short account of the zoogeography and description of the atoll.

Lewis, A. G., Copepod crustaceans parasitic on fishes of Eniwetok Atoll. Proc. U.S. Nat. Mus. 125: 1-77, 1968. A descriptive systematic account with host records.

Menzies, R. J. and Frankenberg, D. Handbook on the common marine isopod crustacea of Georgia. 1-93, Univ. Georgia Press. Athens, Ga., 1966. This attractive booklet may be of help in identifying some of the isopods of the Caribbean reefs. It is largely based on collections made on Sapelo Island, Georgia, which, of course, is too far north to have coral reefs.

Mason, L. (ed.). The Laura report. 1-XXII, 1-83 + 2, 1-44 + 20, 1-58 + 6, 1-44 + 1, 1-30, I-VI. Honolulu, 1967. This is a series of reports resulting from a field training project based in Majuro Atoll, planned and conducted by Leonard Mason. The work was done and written up by teams composed of a graduate student and a Marshallese trainee. The four main reports are strictly sociological, despite the word "ecological" in the title of one of them. Interesting and valuable information was collected and is well presented. The background of experience gained by the participants must be regarded as extremely good training. The last of the five reports is one by Professor Mason, himself, on his project of providing a map of the Laura section of Majuro Islet, and is accompanied by a copy of the excellent and detailed map produced.

King, W. B. Seabirds of the Tropical Pacific Ocean. 1-126, Washington, D.C., 1967. Another in the series of Preliminary Smithsonian Identification Manuals (see ARB 100, p. 8), and it is, indeed, a valuable work. The main body of the book is a species identification guide, with keys, descriptions, and statements on flight, food, habitat and distribution. This material is presented in a succinct and eminently usable manner. In addition there are directions for recording observations and preserving specimens, a valuable bibliography, range maps, illustrations of silhouettes, and faunistic lists for the principal island groups in the Tropical Pacific. A complete index of species is provided. Although the manual is said to be preliminary, many people would be proud to produce a book of this quality and usefulness as the final product of long years of work.

Numata, M. Island Ecosystems of the Pacific Basin. Micronesica 3: 1-54, 1967. This interesting symposium was held at the 11th Pacific Science Congress, in Tokyo, in 1966, and the papers are here published. The papers are quite varied, but all in some way deal with the ecology of islands. Several deal specifically with atolls.

Fairbridge, R. W. (ed.) The Encyclopedia of Oceanography. 1-1021 Reinhold, N. Y., 1966. This is a magnificent volume--seldom has so much valuable scientific information been included in one book. Oceanographers, geologists, geographers, geochemists, geophysicists, and geomorphologists will find a wealth of material of interest. Biologists will fare less well, but there are some ecological articles, most of them not outstanding. The geographical articles are particularly extensive and valuable. Our more strictly atoll- and reef-oriented readers will be disappointed, especially since in a book edited by Rhodes Fairbridge they will naturally expect important writing on these subjects. There is no article on atolls, none on coral reefs, nor on any of the kinds or features of reefs, nor on any of the groups of organisms found on or making up these structures. We heartily recommend the book,

but not for its contribution to atoll or reef ecology. Why this is omitted from the scope of oceanography is puzzling.

Pimentel, R. A. Invertebrate Identification Manual. 1-151, Reinhold Publ. Corp., N. Y., Amsterdam, London, 1967. One of the difficulties encountered in any study or even casual observation of coral reefs and other littoral communities, is getting a working knowledge of the common animals seen there. These are so numerous and so varied, and modern zoology courses are so badly oriented, that most people do not have any idea even of the orders to which these animals belong. This book is an attempt toward remedying this situation. It does not pretend to be exhaustive, or to enable the user to determine species, or even genera. But it will help to give him an idea of where any animal fits in the animal kingdom, a prerequisite to finding out anything further. It is a very fully and effectively illustrated synopsis of the invertebrates and should be on the shelves even of competent invertebrate zoologists, as well as of the rest of us who like to know what we are looking at.

Hoyt, M. Jewels from the ocean deep. 1-258, G. P. Putnam's Sons, New York, 1967. $5.95. This is not a scientific book, but a hobbyist's guide to collecting marine shells. It is not intended for conchologists or malacologists, but would be extremely useful for anyone else who happened to need to know something about mollusks and their shells. It is a first-class job of writing and makes amazingly few errors, either factual or typographic. The abundant photos are good and very useful, though the reproduction leaves something to be desired.

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