and in the past between continents and islands which are separated by deep oceanic barriers. If the ridges of the ocean represent submerged land bridges, it is highly probable that dredging their walls, which are proving to be very steep, will bring to light evidence of their former emergent condition. If, on the other hand, the continental drift hypothesis has caused the formation of parts of the ocean in recent times, no ancient formations should be revealed on the ocean floor in these places. In the same connection the nature of deep oceanic lavas has been the subject of much speculation.

The accumulated evidence in regard to submarine canyons has made it difficult to avoid the conclusion that these canyons were cut as a result of a lowering of sea level of at least 6,000 feet in not very remote times. If this sea level lowering has actually occurred, it should have left its imprint on the rock of at least the upper mile of the ocean floor. Dredging rock from various parts of the ocean remote from the localities where submarine canyons have been discovered will probably check this interpretation. Such things as weathered formation surfaces, the presence of pholad borings and the presence of shallow water incrustations would be evidence in favor of the general lowering.

These possibilities represent only a few of the results which may be expected from a program of intensive geological research in this new field. The time is ripe for geologists to join the oceanographers in the exploration of the seas.

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## THE MAYA BREADNUT IN SOUTHERN FLORIDA

THE native flora of southern Florida is distinctly tropical, comprising hundreds of genera of forest trees, epiphytes and undergrowth plants that are shared with the West Indies and with the land of the ancient Maya civilization in southern Mexico and eastern Guatemala. Some of the Maya country is much like southern Florida, a succession of limestone reef formations, with swamps or sandy stretches between, though mostly covered now with dense continuous forest. Much of the interior of Florida is denuded and in the winter becomes very dry and frosty, but the need of restoring the forest cover is being recognized, and some of the Maya trees may contribute to the tropical reclamation. The Maya architecture is being imitated in northern cities, but in Florida could have a natural setting of palms and other stately trees, the same as in Mayaland.

One of the Maya trees that may be useful in Florida is *Brosimum alicastrum,* related to the true breadfruit of the Pacific Islands, *Artocarpus communis.* Though most of the breadfruits are seedless, other varieties have large starchy seeds that are boiled or roasted and taste like Spanish chestnuts. The seeded breadfruits are called "breadnuts," and Brosimum shares this name in British Honduras and Jamaica, because the seeds are similar in texture and taste to those of the seed-bearing varieties of Artocarpus. The Brosimum fruits are single-seeded, but the trees bear well and the nuts are gathered by the Mayas for making their native bread when stocks of maize run low. The Maya name of the Brosimum tree is *ox* or *osh,* the same word being applied to the primitive taro-like root-crop, Xanthosoma, and to stocks of shelled maize kernels, although the general name for maize is *ixim.* An age of root-crops probably preceded maize culture, and an original use of *osh* for Xanthosoma may explain why this word also designates the numeral 3, the large "elephant ear" leaves of Xanthosoma being conspicuously 3-cornered.

Another outstanding Maya tree is *Achras sapota* or *Achras chicle,* hardly to be distinguished from the well-known sapodilla tree of the West Indies, that thrives in southern Florida and even escapes from cultivation, especially on the Keys. The chicle fruits are the same as sapodillas, russet-skinned, juicy and delicious, with the texture of high-quality pears. The chicle latex is the principal source of chewing-gum, and the wood has amazing durability, as shown by many chicle-wood lintels still in place over the ancient temple doorways, dating centuries back.

The chicle and breadnut trees are found in special abundance among the ruins of the Maya cities, and are largely responsible for the archeological discoveries of the last half-century. The chicle gum provided the inducement for exploring and cutting trails through the forests, while the breadnut foliage foddered the mules that carried the *chicleros,* and later the archeologists. At every forest camp breadnut trees are felled and the branches lopped for the animals to browse on the leaves and twigs. Such fodder is called *ramon* in Spanish, and this name is applied to Brosimum and to several fodder trees in other regions.

The ancient Mayas had no livestock, but may have gathered and stored the breadnuts, like breadfruits and taro in the Pacific Islands. The Maya cities were equipped with great numbers of subterranean storehouses, sometimes taken for water-cisterns, but small and flat-bottomed like primitive food cellars in other parts of the world. These are the so-called "chultunes," bottle-shaped, smooth-walled chambers eight to ten feet deep and nearly as wide, entered by a small central opening through the hard surface rock, fitted with a stone lid and sealed with clay.

In view of Brosimum being related to the bread-

fruit, and of the remarkable long-period storage of fermented breadfruit paste in the Pacific Islands, a study of food values and storage behavior of the Maya breadnut would be of agricultural and historical interest. The question naturally arises whether the early Maya civilization, that built so many large cities and occupied them for the long periods shown by the dated monuments, could have been supported by a migratory "milpa" agriculture like that of the present day, calling for a new forest clearing every year to grow the family maize crop. A use of long-lived, hardwood tree-crops would render the ancient Maya agriculture somewhat similar to that of the archaic "Golden Age" in the Mediterranean countries, where olives, figs, grapevines and pear trees were chiefly relied upon.

Forage or fodder may prove more important than food uses, if Brosimum becomes established in southern Florida, where, as in other tropical regions, dairies are difficult to maintain. Groves of large *ramon* trees are considered in the Maya country as the best pastures, the cattle being greedy for the fallen leaves as well as for the nuts. Also the trees may be tapped and the latex mixed with chicle or drunk like cow's milk, the natives reporting it good for nursing mothers and asthmatics. A related species, *Brosimum utile*, is the "cow-tree" of Venezuela, made famous by Humboldt as furnishing a potable latex, not to mention "cow trees" of other countries and of other botanical families. The Maya breadnut trees now growing in Florida, at the Plant Introduction Garden near Coconut Grove, were raised from seeds collected in April, 1922, in the district of Tikal and Uaxactun in northern Guatemala, and brought to Washington.[1]

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## SOME EUGENICAL ASPECTS OF THE INDIANS OF PISTE, YUCATAN

PISTE is a typical Maya village, located in the center of the political state of Yucatan. It is Indian in culture, modern medical science is practically unknown and nature is allowed complete freedom. In 1935 there were 415 inhabitants, of whom 207 were males and 208 females. The birthrate, calculated over a 17-year period, was 60.1 per M, and the deathrate 31.7 per M. The secondary sex ratio of 513 children born in this town was 108.5 males to 100 females. Births are attended by native midwives, and native medicinal practises are used. The average interval between births for 147 infants from 51 mothers was 28 months. Birth control is not practised in this community, and comparatively few abortions and stillbirths occur. The average number of children from 33 completed families was 6.69. The average age of mothers at the birth of the first child was found to be 18 years. This figure is based on exact birth dates. In this town there is only one woman over 25 years of age who is unmarried, and this is probably due to the fact that she is blind. Of the 513 children born into 109 families, 17.2 per cent. died before 2 years of age; of these 56 per cent. were males and 44 per cent. females. Not much can be said at present as to the life span of these people, since the birth dates of the older members of the population are not accurately known. It is the author's impression, however, that the older members do not live much longer than 60 years.

Since 1800 there have been two general migrations from the town. Before 1847 Piste was a thriving mestizo (Spanish-Maya cross) town. From that date to 1880 the town was completely unoccupied. This was during the War of the Castes. After 1880 it was reinhabited, increasing in population until in 1918 there were 474 inhabitants. About 1920 there was a political revolution which caused another exodus of 200 or more people, after which the population began to increase in numbers until in 1935 there were 415 inhabitants.

Naturally in these interior towns there is considerable inbreeding, and these 415 people can mostly be catalogued in the leading family pedigrees, *e.g.*, Tun, Mex, Dzib, Ceme, Mis and Cauich. There are, however, no obviously feebleminded people in this town.

In Piste during the 17-year period there were seven pairs of twins born and one set of triplets.

The diseases of the Maya Indians of Yucatan are considered at length in Publication 431 of the Carnegie Institution of Washington, and the social customs in Publication 448 of the same institution.

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## TACONIC THRUSTING AND PALEOGEOGRAPHIC BASE MAPS

THE original position of early Paleozoic sediments in eastern North America has been altered by later folding and thrusting so that the present map gives a foreshortened base relative to ancient geography. This was recognized by Schuchert[1] in his spreading seaways to their interpreted original width on the present base. In this method, the position of early Paleozoic outcrops becomes anomalous with respect to the mapped distribution of the seas in which they formed. The writer has prepared a paleogeographic base map in which each of the principal Taconic thrust sheets in western New England has been stretched to overcome the foreshortening in its width. Then each slice has been moved back from the foreland

[1] See *Official Record*, U. S. Department of Agriculture, May 17, 1922.

[1] C. Schuchert, *Bull. Geol. Soc. America*, 41: 704, 1930.