

**MEMOIR ON THE
ISLAND OF NAVASSA,
(WEST INDIES)**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649199853

Memoir on the island of Navassa, (West Indies) by Eugene Gaussoin

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EUGENE GAUSSOIN

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ON
THE ISLAND OF NAVASSA,
(WEST INDIES.)

BY EUGENE GAUSSOIN,
MINING ENGINEER AND METALLURGIST.

BALTIMORE:
PRINTED BY J. B. ROSE & CO.
No. 5 S. CALVERT STREET.
1866.

MEMOIR ON THE ISLAND OF NAVASSA.

*To the Corporation of the
Navassa Phosphate Company of New York:*

WALTER E. LAWTON, Esq., *Treasurer.*

SIRS:

I beg leave to present you my memoir on the Island of Navassa, property of your Company.

The vast importance of the interests involved in this concern, the scientific questions connected with it, and their bearing on the development of agricultural wealth, will, I hope, be considered as an apology for the length of this paper.

With great respect,

Sirs,

Your most obed't serv't,

EUG. GAUSSOIN.

BALTIMORE, *May*, 1866.

MEMOIR.

I.—INTRODUCTION.

On the 8th of November, 1865, with the Vice President of the Navassa Phosphate Company, John C. Grafflin, Esq., I sailed from Baltimore in the Company's Brig Romance, Captain P. Duncan, to visit the Island of Navassa.

The objects of our visit were manifold.

All the different departments of the management of the Island had to be investigated for the introduction of such ameliorations that might be found useful to the general interests of the concern.

To the Vice President, Mr. Grafflin, it belongs to give to the officers of the Company, on the Island, what credit they deserve for their services.

As it was to be expected from the relative short space of time elapsed since the organization of the Company in September, 1864, many improvements were required for a more effective and economical working of the property.

The storage of provisions and culinary arrangements; the distillation of salt water; the erection of convenient buildings for residence and offices of the Superintendent and Medical Officer; for workshops, stores, and railroad sheds; the railroad construction and equipment; the enlarging and building of wharf facilities; the boating by lighters and other points of minor importance have already been the subject of propositions which have been approved and sanctioned by the action of the Company.

The pressing necessity of enlarging the facilities for working and shipping were most evident during the six weeks we spent on the Island. From four to six vessels were constantly and at the same time in the harbor. During that time two ships, three barks, six brigs, and three schooners were

loaded and left with full cargoes. This activity has been increasing since we left, requiring a corresponding increase in the number of the laborers, and in all the other branches of the service. To-day the population on the Island consists of 30 white men, officers and mechanics, and 180 black laborers.

After the payment of two semi-annual dividends, out of the earnings of the Company during the first year of its existence, a sum of fifty thousand dollars has been appropriated to carry our propositions into immediate execution.

This large investment of capital will at once, and without injurious delays, allow the Company to follow in the development of its property, the continually rising demand for this most valuable fertilizer, the Phosphatic Guano or Phosphate of Lime found in such vast deposits on the Island of Navassa, situated in the Caribbean Sea, $18^{\circ} 25'$ North latitude, and $75^{\circ} 5'$ longitude West of Greenwich; 33 miles South-west of Hayti, and 72 miles East of Jamaica.

It is an upraised coral Island, with all the cavities in the rock filled with Phosphate of Lime.

All questions connected with the geological character of this formation have such a bearing on the economy of the works, and the real value of the property, that I could not ignore their importance. In recording in the present paper my incomplete observations and the result of my studies, I can but express my deep regret at my want of ability for treating a subject so interesting in its scientific speculations, and so vital to the interests of agriculture.

Fully aware of the importance for the progress of Natural Sciences, of collecting the largest possible number of facts, to elicit more perfect theories, I have endeavored to record in this paper the facts which, at Navassa, came under my observation. They are mostly a confirmation of the conclusions of the eminent geologists, Sir Ch. Lyell, J. D. Dana, Ch. Darwin, R. J. Nelson, and others who have, during the last years, so minutely described, and so satisfactorily explained the wonders of those immense structures in course of building, in the tropical seas, under our eyes by agglomerations of minute coral zoophytes.

I will not entirely have missed my object, if I have succeeded

in attracting the scientific attention to this most interesting field of observations presented at the Island of Navassa, or if, from the discussion of the principles established by those great observers, I have deducted some application useful to the development and economy of practical works.

II.—DESCRIPTION OF THE ISLAND.

Rising abruptly from the depth of the sea, without sand beach, the lower rocky bluff of the Island of Navassa stands conspicuous as a perpendicular wall. Its foot incessantly battered by the waves which have undermined in it a deep cut, several feet high, would necessarily tumble down if it was not protected against further erosion by a fringing reef of living corals, forming a breaker several feet wide, very distinct from the white limestone of the bluff by its dull red color, shining under the emerald green waves.

A man could easily walk around the whole Island, following the foot of the bluff on the flat top of this reef, if the sea did not break constantly over it, and roll at many points into deep recesses, where the air, compressed by the rush of the waves, soon dilates again, and blows off with great violence the water in a fine spray, covering the surface of the sea, for a distance of several yards, with a snowy foam.

Those "air holes" are important records for the history of the elevation of the Island.

On the summit of this first bluff, forming a terrace, varying from a few chains to about half a mile in width, rises a second bluff, less abrupt. The rocks successively rolling down from its sides, have in some places formed a declivity of about 45° , when in other places its summit still stands nearly perpendicular. The top of this second bluff forms the summit of the Island where it is designated as the "Upper Flat," when the first terrace is called the "Lower Flat."

This upper summit is at the highest point 310 feet above the level of the sea, inclining from south-east to north-west. Heavily timbered by gum and palm trees, it is intersected by several reefs forming annular depressions filled by deposits of Phosphate of Lime, which I will describe hereafter.

Those reefs present a very rough surface; rugous, pointed and in many places seem to be long piles of rocks, broken and

heaped by the action of the waves; when in other places they are solid, and form continuous undulations, varying much in direction but not in form, which has always a tendency to be ring-like. This annular disposition is the most remarkable at the north-western extremity of the Island, where the vegetation has been destroyed for the digging of the Phosphate; there the edges of the bluff towards the sea, and the reef traversing the summit assume the form of a basin depressed towards its centre, in the shape of ellipse, the great axis being about a mile long, and the small axis not quite half a mile.

The whole summit of the Island itself has a similar shape, the form of an atoll. All around it, the edges of the upper bluff are raised in the shape of an immense brim, followed at variable distance by a second elevation of the same character, inclosing between the two, a depression where the vegetation grows more luxuriantly between the irregular masses of limestone, with all its cavities filled by Phosphate of Lime.

Many caves or holes of different sizes are found on this upper summit of the Island, principally near those reefs that I have just described. The deepest that I visited was 45 feet deep perpendicularly, forming an irregular room of about 30 feet diameter. The bottom was covered by a deep deposit of Phosphate, probably carried down by the flow of the rains, and increasing rapidly. I base my supposition on the rapid increase of the deposits in those caves on the fact that although they present many stalactites, no stalagmites are found except in some crevices where the water drips down above the actual level of the Phosphate. Those crystallizations, although generally made of Carbonate of Lime as usual, sometimes present strips of Phosphate in their layers of successive deposition.

Except at the north point of the Island, where the bluff descends without interruption down to the sea, all this upper structure is encircled by the terrace or shore platform. The height of this terrace, from an elevation of only 15 to 20 feet above the level of the sea at its extremity west of North Point, rises at Lulu Bay, the shipping point of the Island, to 60 feet; at the south-eastern end to 65 feet; and on the north side forms a low rocky beach, in some places sloping down to the level of the sea, till it terminates against the north side of the cliff of North Point.

The lithological character of this shore platform and of the top of the Island are similar. The edges above the sea also present the form of a brim; the surface is intersected by several reefs running with the same irregularity, and all the cavities in the masses of limestone are filled with the Phosphate of Lime.

The limestone is hard, compact, clicks under the hammer, and takes a polish like a secondary white marble.

Nevertheless, in breaking some of those hard masses, I found in the interior, in several instances, small blue specks of Phosphate of Iron, and more commonly nests of Phosphate of Lime. This intermixture of Carbonate and Phosphate of Lime is also found in the corals now built by the Zoophites; and I even found a mass of coral entirely made of Phosphate of Lime, a pseudomorph of the ordinary Carbonate of Lime of the corals. I found again a very interesting specimen of this intermixture of corals made of Carbonate and Phosphate of Lime, in the interior of a small sponge taken from the sea.

Everywhere on the two flats, and on the sides of the Island, are found on the surface of the limestone the forms of corals, mostly of the species *astræas* and *madreporas*. I may say that at every place that I have examined, there is hardly a space of a few yards square where those marks are not found more or less obliterated, showing evidently the organic origin of the limestone. In breaking some pieces of limestone from the reefs, I found cavities filled with branches of coral. It is well to say that those marks of corals are not found on the rocks forming the brim of the upper and lower bluffs. There the limestone is smooth as if polished by the action of the waves.

It is important to remark here that the Island of Navassa having been, as it seems, upraised from the depth of the sea, without beach, no sand or debris of shells have been accumulated by the joint action of the winds and waves, to fill and cement the cavities existing between the branches or masses of coral rock. Those cavities which might be described by every word conveying the meaning of hollowness, run from the top to the bottom of the Island through the different strata, and the openings so left have become the recipients of the deposits of Phosphate of Lime.