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PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

VOL. I.

1866 TO 1869.

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PREFACE.

The Scientific Association of Trinidad was founded in January, 1863, "for the cultivation of Scientific Knowledge in the West Indies." How far the Association has fulfilled its object, may, in some measure, be judged of by its published papers, of which the present volume forms the second instalment. From 1863 to 1866 the papers read at the meetings were only in part printed, and at irregular intervals, in a somewhat unconnected form. In 1866 the Association determined upon issuing its proceedings in the form of a half-yearly journal, eight numbers of which have now appeared, forming the first volume of the "Proceedings," the previous publications having been issued under the title of "Transactions."

The somewhat mixed character of the papers included in the "Proceedings" has arisen from the desire of the Association to give an equal place to original communications of every kind which may tend to advance the object of its foundation.

Having now existed for upwards of seven years, and achieved an amount of success fully equal to the anticipations of its founders, and to the circumstances of a West-Indian Colony, it may be hoped that the Association will not fail of further support, and that it has yet a future before it, if not of glory, yet of very considerable usefulness. It is earnestly to be desired, therefore, that all who wish well to the objects of the Association will lend their help towards its continuance and improvement.

R. J. L. G.

June, 1871.

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART I. — DECEMBER 1866.

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ORIGINAL PAPERS.

PORT-OF-SPAIN:
THE CHRONICLE PUBLISHING OFFICE.

1866.

Academies
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PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART I.] [DECEMBER 1866.

Tuesday, 13th February, 1866.

The Association met at Mr. H. Guppy's house.

HORACE DEIGHTON, Esq., M.A., F.R.A.S., President, in the Chair.

The following donation was announced :—

"On the Terrestrial and Fluviatile Mollusca of Trinidad." By R. J. Lechmere Guppy, Esq. Presented by the Author.

Copies of Mr. Law's paper on the cultivation of Cacao were laid on the table.

BRITISH MUSEUM

Tuesday, 13*th March*, 1866.

The Association met at Mr. Deighton's house.

Horace Deighton, Esq., M.A., F.R.A.S., President, in the Chair.

Specimens of clay and other rocks from the Tramroad Cutting at San Fernando were exhibited.

Monday, 9*th April*, 1866.

The Association met at Mr. Guppy's house, La Falaise, San Fernando.

Horace Deighton, Esq., M.A., F.R.A.S., President, in the Chair.

A proposition was made and agreed to, that the members should proceed on the following day to examine the borings made for mineral oil and also the great cutting of the San Fernando Tramroad.

Tuesday, 22*nd May*, 1866.

The Association met at Mr. Deighton's house.

Horace Deighton, Esq., M.A., F.R.A.S., President, in the Chair.

A discussion ensued on the visit made by the Association to the cutting of the San Fernando Tramroad and to the works for boring for mineral oil.

Notice was given of a Special General Meeting, at which the following resolutions were to be discussed :—

1. That each new resident member shall pay an entrance fee of £1.

2. That in addition to the subscription of three dollars per annum each member shall be liable to a subscription of one dollar and eighty cents payable when called for by a Resolution of the Association.

3. That in future the Minutes of the Meetings and the Papers read before the Association shall be printed in a half-yearly form.

Tuesday, 12*th June*, 1866.

The Association met at Mr. Caird's house, Edward-street.

Horace Deighton, Esq., M.A., F.R.A.S., President, in the Chair.

Mr. Lechmere Guppy moved the following Resolutions :—

1. That the Transactions of the Association be in future published half-yearly.

2. That in addition to the proceedings of the Association such Transactions may contain Notices and Abstracts of Memoirs published elsewhere on scientific subjects of interest in the West Indies.

The Resolutions were seconded by Mr. Caird and carried unanimously.

Mr. Lechmere Guppy, F.G.S., exhibited specimens of Galena from the lead-mines of Carupano, presented to him by Mr. P. [illegible] André, and read extracts from a letter from the latter gentleman stating that the mineral had been analysed [illegible]lin, and found to contain 8 per cent of silver and 1 per cent of nickel.

Mr. Caird exhibited specimens of the jaws of the Tintorero (Carcharias vulgaris) and Black-finned Shark (Carcharias obscurus) showing the difference in the shape of the teeth.

Mr. Lechmere Guppy communicated a notice of papers published in the Geological Magazine on the origin of Petroleum.

Tuesday, 10*th July*, 1866.

The Association met at Mr. H. Guppy's house, Laventille Circular.

Henry William Caird, Esq., M.A., in the Chair.

In consequence of the small attendance all business was postponed until the next meeting.

Tuesday, 7*th August*, 1866.

The Association met at Mr. Caird's house, Edward-street.

Henry William Caird, Esq., M.A., in the Chair.

The following gentlemen were elected Members:—John Persse Lambert, Esq., B.A., Queen's Collegiate School; Pierre Emile André, Esq., Clarence-street; John Percy, Esq., M.D., M.R.C.S.L., San Fernando; and Octavius Harley, Esq., Queen's-Park.

Mr. Lechmere Guppy communicated notices of papers respecting Petroleum and Oil-fields.

Mr. Lechmere Guppy exhibited a copy of Dr. Leotaud's recently-published work on the Ornithology of Trinidad; and gave a sketch of the results arrived at therein as to the distribution of the Birds common to Trinidad and elsewhere.

The following motion was moved by Mr. Lechmere Guppy, seconded by Mr. Caird and carried:—That this Association desire to express to Dr. Leotaud their highest admiration of his book just published, entitled, "Oiseaux de l'isle de Trinidad," and their warmest hopes that he may long be spared to illustrate the natural history of the island. The Association further wishes to express their deep regret at the severe illness of Dr. Leotaud, which has so unhappily deprived them of the pleasure of his presence.

The Secretary was desired to communicate the motion to Dr. Leotaud.

Tuesday, 11*th September*, 1866.

The Association met at Mr. Lechmere Guppy's house, St. Ann Road.

HORACE DEIGHTON, Esq., M.A., F.R.A.S., President, in the Chair.

The Secretary read a letter from Mr. Thomas Law, conveying his resignation as a Member of the Association.

The following donation was announced:—"Sugar Making in the West Indies." By Alexander William Anderson. Presented by the Author.

The following communications were read:—

1. *On the Use of Sulphites in Medicine.*

By the Hon. Henry Mitchell, M.D., Ph.D.

Mr. President and Gentlemen,

The paper I am about to read is perhaps more exclusively professional than is usual at the meetings of our Association, and I should not have introduced it to your attention now, but at the request of a fellow-member who seemed to think its subject-matter might interest some of you in a sanitary point of view. The remarks will be short and devoid of technical obscurity. They refer to the use of alkaline sulphites, both as prophylactic and curative of those maladies usually termed zymotic, arising, or supposed to arise, from peculiar ferments acting on one or more elements of the blood. Of the nature of these ferments we know little or nothing except through their result, with which you are all more or less familiar. Typhus, Typhoid, and Paludal fevers, Small-pox, Scarlet fever, Cholera, &c., are some of the well-known features under which zymotic poisons, where latent, reveal themselves. Their nature, as you are aware, becomes more virulent according to certain local accidents of filth, overcrowding, deficient nourishment, &c. Over those accessories we can exercise efficient control to a certain point by sanitary regulations, stringently carried out ; but the essence of the maladies escapes our powers of investigation. Although they may be limited in their ravages by judicious and sometimes expensive precautions, they still claim annually their holocausts from every rank.

It would be premature to say that chemistry applied has enabled us to get rid of, or more correctly speaking, to neutralise such evil agencies, but I shall attempt shortly to show that a great step appears to have been made in this direction. So far back as May 1862 a paper was read in Dublin on the action of alkaline sulphites, in which it was affirmed that Tolli of Milan had not only shown practically that they, equally with sulphurous acid, possessed the power of immediately crushing all fermenting or putrefaction processes in the blood of animals, but that their exhibition in large doses was unaccompanied by injurious results. In his experiments Tolli showed that when two dogs in equal conditions were taken and poisoned by the injection of ½ ounce or larger doses into their femoral veins, of pus, putrid blood, glandered matter, &c., the dog recovered who had been protected either by previous or immediately subsequent dosing with the alkaline sulphites, while the other died in a typhoid state. It is unnecessary to enter into these experiments further. In 1863 or 64 Ricci, a Physician, practising in Dublin, probably a countryman of Tolli brought these facts again before the profession accompanied by three or four remarkable cases of recovery from absorption of [illegible]al poisons where the patients were to all appearance in a helpless typhoid state, like the poor dogs who died. I then took the liberty of suggesting to some of the planters of the Eastern District a similar treatment both prophylactic and curative for their mules, which were dying apparently of some blood disease, but probably neither the medicine nor the advice were sufficiently costly for adoption. In May last year, on the arrival of the "Newcastle" with ship-fever on board, the Compounder, who of course had been much exposed to whatever influences generated and fed this fever, was taken seriously ill. The Surgeon-Superintendent had the courage to depart from routine treatment and dosed the patient liberally with sulphite of soda, and he recovered without passing through any stage of convalescence. It was my fate also, having been much on board the ship and in the camp, to contract a similar fever which vanished under similar treatment, one fact connected with which, although perhaps merely a coincidence, I may particularise, viz., that an intense headache disappeared within a few minutes after swallowing the first dose of sulphite. The next case to which your attention may be directed was that of the house-dog, a big fellow of such evil antecedents, that when he lay kicking out his hindlegs on the fourth day of sickness, with frequent dysenteric evacuations I suspected the agency of strychnine. It was however an aggravated case of distemper, which at the time was prevalent in the neighbourhood and very generally fatal. He was dosed with sulphite in raw beef and in 24 hours was out of all danger. It is unnecessary to pass in review the cats and the children who were alternately medicated. Sore throats, which among the latter were common enough with the changeable winds so prevalent all last year, were arrested at once, as well as intermittents in their incipient stage. Two months back after rather prolonged exposure to sun and rain, I felt rather uncomfortable on rising, and after breakfast symptoms of remittent fever showed themselves unmistakeably in cold, nausea, vomiting, headache with bounding pulse. Three doses of sulphite taken between twelve and two o'clock relieved me from every febrile symptom, and before 5 p.m., the system was in its normal condition. One or two more illustrations and I close the case for the sulphites. A mare suckling a foal of four months, had suffered for more than two years from an obstinate cutaneous eruption against which almost every external application had been directed unsuccessfully from the "Poor Man's Friend" to Pitch Oil; after a few days' exhibition of the Sulphite of Soda, the smaller patches healed and the larger ones showed great improvement. The external treatment however was in this instance continued and may have caused the amendment. Again, a gentleman who had suffered for six weeks from an angry boil on the calf, was unpleasantly surprised by the very common incident of its healing being followed by the appearance of two or three others; one of which when shown to me involved the whole calf in a fiery flush, hot and hard to the touch, the cuticle, over the apex of the boil, was cracked and discharging a little serum, while down to the ankle the skin pitted deeply on pressure. Under ½ dram doses of sulphite of soda, the skin resumed its normal appearance in four days, the swelling and its contents having rapidly disappeared without any further opening in the skin. To this last case I venture particularly to call your attention. It is the counterpart of one given by Ricci and unmistakeably proves the powers of the alkaline sulphites in arresting the deposition of pus from the blood and allowing its subsequent absorption and elimination without injury to the system. Those of you who have suffered from furuncular abcess in this climate can appreciate the boon that Tollli's discovery holds out in this particular malady. It is to be hoped that further experience will confirm Ricci's statement and my own. Before leaving the subject I should mention that a gentleman who has used the sulphite of soda very extensively during the last six months on his Estate, coincides with what has been stated as to its efficiency in the ordinary fevers of Indians, but has remarked that its exhibition for a prolonged period causes both debility and a tendency to looseness of the bowels. This is a serious inconvenience when the medicine has to be given for weeks together, but it can fortunately be obviated by substituting one base for another, and using sulphite of lime or the bisulphite, an article now much applied in Demerara to the manufacture of sugar, and prepared there on a large scale by Mr. Sidney Lambert.

In cases of pernicious remittent fever, common enough here in some of the swampy districts, the sulphite or bisulphite of ammonia would probably be an invaluable prescription. It should be remembered that these preparations do not stand exposure to the atmosphere, but gradually absorb its oxygen and become sulphites, thus losing their antizymotic virtue. The mare mentioned above has not been cured of her skin disease, but she has been freed from worms, and the foal at her foot has been freed from them also, apparently through the means of the mother's milk.

2. *Catalogue of the Land and Freshwater Mollusca of Trinidad.*

By R. J. Lechmere Guppy, F.G.S.

Few of the terrestrial or fluviatile shells of Trinidad seem to have been noticed before 1864. Some years previously Mr. Theodore Gill visited this island and collected the Mollusca, which were determined by Mr. Bland of New York, who, in a paper on the geographical distribution of the West Indian land-shells, gave a list of all the terrestrial mollusca, thirteen in number, known from this island. None of these were regarded as peculiar. Two of the shells enumerated I have not found in the island, and one *(Plekocheilus auris-sciuri)* I have regarded as distinct from the species to which it was referred. But I have obtained nineteen species not mentioned by Mr. Bland, making a total including two freshwater gasteropoda alluded to by Mr. Bland of thirty-two species.*

In 1864 I published in the "Annals and Magazine of Natural History" an account of some of the new species of operculate land and freshwater shells, and in the number of the "Annals" for January 1866, I gave a list of all the species known to me, accompanied by descriptions of a few species of inoperculata which were new, and by remarks on the lingual dentition of the species. On this latter part of malacology a paper by Mr. Jabez Hogg and myself was read to the Linnean Society on the 21st June last.

As it is one of the principal objects of this Association to place on record whatever is known of the natural productions of the island, I make it my duty in the present communication to lay before it a list of all the land and fresh-

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* Besides three species of *Auriculida* included in the present catalogue.

water mollusca I have found in the island, and which have been enumerated and partly described in the memoirs previously alluded to. In compiling this catalogue it has been my aim to present not merely a dry list of names, but to give also such details that the species may readily be identified, even by persons who have little opportunity for the determination of shells. Some of the principal synonyms and authorities are also added.

One of the most obvious distinctions to be noticed amongst the terrestrial and fluviatile mollusca is the presence or absence of the operculum or shelly plate closing the aperture of the shell. As it has been found that the presence or absence of this organ is of great importance in classification, and indicates very precisely the group to which the animal belongs, we shall use that character to divide the species into two groups; and in the second place we shall divide each of these groups into two by their "station," that is, as to whether they inhabit the land or the water. We shall thus, leaving out of view the single bivalve of the collection, have four main groups to which to refer our shells.

The characters of the genera and species are drawn from the shells as being the part of the organism most accessible to observation. The study of the soft parts is of course just as necessary to enable us to understand the true affinities of the animals, but where the characters afforded by the shell are sufficient for identification they seem to be preferable for use in diagnosis.

The few shells afforded by our island, of which some are difficult to be found, can of course give no idea of the immense number and exquisite beauty and variety of form of the terrestrial mollusca of some countries, such for example as Jamaica, San Domingo and Cuba in the West Indies, and many parts of the East Indies. For a knowledge of these the student must consult collections and the systematic works on Conchology. Much information may however be obtained from the text-books, among which I may recommend Chenu's well and amply illustrated "Manuel de Conchyliologie," although in that work the arrangement and definition of the groups is not always to be depended upon. A copy of that work may be obtained at an extremely moderate price. Woodward's "Manual of the Mollusca" is a work which may be most strongly recommended as containing much valuable information, its only fault being perhaps that its account of many of the minor groups proposed by Zoologists is somewhat limited. This however is not always a disadvantage to the beginner. It will of course be necessary that the student of Trinidad malacology should make himself acquainted with the mollusca of other countries in order that he may understand the affinities and relations of those found in Trinidad.

The Inoperculata form a great group which is composed of members obviously closely related; but the operculate division consists of genera not nearly akin, and the circumstance of station is almost their only connecting link. This is the case to an extent not acknowledged in any books that I have met with; but that it is a fact my researches into the lingual dentition has fully convinced me. Thus among the terrestrial operculata (confining our attention to those of Trinidad) *Adamsiella* and *Helicina* belong to a division by no means closely allied to *Cyclotus*. Among the fluviatile operculata we have three principal genera, *Neritina*, *Paludestrina*, and *Ampullaria*, scarcely more nearly related to each other than almost any three genera of gasteropoda taken at random. Otto Mörch has perceived what I demonstrated in 1864, namely that *Neritina* is related to the family *Helicinidæ* among terrestrial operculata; and in the paper by Mr. Hogg and myself read to the Linnean Society we have shown that *Adamsiella* (possibly with all the *Cyclostomidæ*) belongs to the same group. *Paludestrina* seems to be most nearly akin to the group containing *Melania*; but *Skenea*, a marine genus, must come under the same head.

But few other remarks remain for me to make. I have altered the name *Vaginulus Sloanei* to *Veronicella lævis*, because the figures and descriptions of the latter seem to be most applicable to our Trinidad form. The dimensions of the different shells are given in millimètres, and they are taken from good examples.

The following are the families, according to Woodward's arrangement, represented in Trinidad :—

A. Inoperculata.

Terrestrial
- Onciliadæ *(Veronicella)* 1 species.
- Helicidæ *(Succinea, Bulimus, Bulimulus, Plekocheilus, Tornatellina, Stenogyra, Cylindrella, Ennea, Vertigo, Streptaxis, Simpulopsis, Conulus)* 18 species.

Amphibious—Auriculidæ *(Melampus, Pedipes)* 3 species.
Fluviatile—Limnæidæ *(Planorbis, Physa)* 2 species.

B. Operculata.

Terrestrial
- Cyclophoridæ *(Cyclotus)* 2 species.
- Hellicinidæ *(Helicina)* 2 species.
- Cyclostomidæ *(Adamsiella)* 1 species.

Fluviatile
- Neretidæ *(Neritina)* 1 species.
- Paludinidæ *(Ampullaria, Marisa)* 3 species.
- Melaniadæ *(Paludestrina)* 1 species.

C. Lamellibranchiata.

Unionidæ *(Anodon)* 1 species.

I take the present opportunity of acknowledging my obligations to Mr. Robert Swift, of St. Thomas, a gentleman whose great knowledge of the mollusca of the West Indies is well-known, and whose assistance has been on several occasions of the greatest service to me.

Subkingdom MOLLUSCA.

Class Gasteropoda.

This class includes all the Mollusca in which the under surface of the body is formed into a single muscular foot or creeping disk. The shell is usually a single spiral tube, as in the land-shells. In the slugs the shell is rudimentary or quite wanting, and one large subclass (Nudibranchiata) of sea-slugs is not furnished with a shell except in the larval condition. The limpets have a shield-shaped shell, and *Chiton* is provided with one composed of eight imbricating plates, while the tooth-shells *(Dentalium)* are tubular and straight or slightly curved.

Most of the shell-bearing *Gasteropoda* are furnished with an operculum or lid which closes the aperture of the shell when the animal is retracted. In some genera and one whole subclass this appendage is wholly wanting.

Subclass Inoperculata.

Shell generally completely covering the animal, or sometimes rudimentary or wanting. Operculum wanting.

Animal breathing air ; lingual teeth very numerous, similar, on a broad dental ribbon.*

* Cylindrella *(trinitaria)* has a long and narrow dental membrane with few teeth in each row.

Order Geophila.

Animal terrestrial, with 4 tentacles, the upper and longer pair bearing eyes at their summits.

VERONICELLA Blainville 1817.

Terrestrial Inoperculata without shells but having a coriaceous cuirass covering the upper surface of the body and separated from the foot by a fissure or groove.

Veronicella lœvis Férussac.

Sloane, Jamaica.

Férussac, Mollusques, t. 7, f. 8, 9.

Vaginulus Sloanei, *Guppy, Ann. & Mag. Nat. Hist.* 3 ser. vol. 17, p. 47.

A slug with a narrow smooth dark-grey body common in cultivations, under stones and pieces of wood. Its eggs are oval-oblong united in chains of ten or twelve. I am not sure whether this species is identical with *V. Sloanei* to which I formerly referred it, or whether it may not be a distinct species from either, if these two names really indicate two species.

Length about 60 millimètres.

SUCCINEA Draparnaud 1801.

Terrestrial Inoperculata with thin imperforate oblong or ovate shells having a small spire, a very large oval aperture and a simple peristome.

Succinea approximans Shuttleworth.

A small oval-oblong thin brownish horn-colored shell found on the ground in damp places in most parts of the island.

Length 11 millimètres.

Bulimus Scopoli 1777.

Terrestrial Inoperculata with solid oval-oblong shells and an entire columella.

Bulimus oblongus Müller.

Helix oblongus *Müller, Verm. Hist.* II., p. 86, no. 284.

Bulimus hœmastomus, *Scopoli, Delect. insubr.* t. 25, f. 1, 2.

" " *Lamarck, Animaux sans Vertèbres,* t. 6, p. 117, no. 2.

Bulimus oblongus, *Pfeiffer, Helic.* II., p. 21, no. 55.

" " *Wood, Ind. Test. Helix* 102. pl. 34, f. 101.

" " *D'Orbigny, Voy. Amer. Merid. Mollusques,* p. 297, pl. 37, f. 1, 2.

This is the largest of our terrestrial Mollusca. The shell is oval, of a pinkish color and the peristome is thickened and, when in perfection, of a beautiful rose-color, as also is the columella. The animal is remarkable for the tentacular appendages of the head which were noticed by d'Orbigny in the place above cited. It lays eggs about 25 millimètres in length having a white granular calcareous shell.

Found in many parts of the island: abundantly on pieces of land allowed to run into bush in the town of Port-of-Spain. Its foreign distribution is very wide, ranging over a very great part of the South American continent.

Height 92 mill., diameter 39 mill.

Bulimus zebra Müller.

Buccinum zebra, *Müller, Verm. Hist.* II., p. 138, no. 331.

Orthalicus zebra, *Pfeiffer, Helic.* IV., p. 588, no. 3.

Bulimus zebra, *d'Orbigny, Mollusques de Cuba,* t. 1, p. 174, pl. VI., f 9, 10.

Bulimus undatus, *Brugière, Dict. des Vers*, no. 38.
„ „ *d'Orbigny, Voy. Amer. Mérid. Mollusques*, p. 264.

Bulimus princeps, *Sowerby, Conchological Illust.* no. 18.
„ ziczac, *Broderip.*

An oblong-conic shell, smaller than the last and decorated with irregular longitudinal stripes of plum-color and fuscous on a yellowish ground. The peristome is simple, and of a dark color, nearly black.

Its distribution both in Trinidad and out of it is nearly if not quite as wide as that of *B. oblongus.*

Height 57 mill., diameter 31 mill.

BULIMULUS Leach 1814.

Terrestrial Inoperculata with oblong thin shells, an acute peristome often expanded but never thickened, an entire columella and an aperture without teeth or plaits.

Bulimulus multifasciatus Lamarck.

Bulimus multifasciatus, *Lamarck, Animaux sans Vertèbres*, vol. VI., 2. p. 123, no. 24.

Bulimus multifasciatus, *Pfieffer, Helic.* II., p. 108, no. 282.

A shell with a broadly expanded lip and five chestnut bands on the whorls. It lives in trees and is found throughout the Colony, being perhaps more common at Monos Island along with *Bulimus zebra* than in any other locality I know of. It is also found in Guiana (Drouët) and in several of the Antilles (Bland).

Height 27 mill., diameter 12 mill.

Var. *imperfectus* Guppy Ann. & Mag. Nat. Hist. 3 ser. vol. 17, p. 49.

This variety, which seems to be confined to the Southern parts of the island, resembles the young of the type-form. Its outer lip is not expanded.

Bulimulus immaculatus C. B. Adams.

Bulimus flavidus *Menke.*

" stramineus *(part) Guilding.*

" immaculatus *Reeve, Conch. Icon. Bul.* 85.

A shell similar to the last, but distinguished by its yellowish-white color and the complete absence of color-bands. It is a very abundant shell in some localities, particularly in some gardens at Port-of-Spain. It is found also on the tops of trees in the forests over a great part of the island. It occurs in St. Vincent, Jamaica, and others of the Antilles, and seems to have been confounded by Guilding with his *B. stramineus*, which differs in the angle of the spire being greater and in other particulars. These differences are not in my opinion varietal, but probably specific.

Height 35 millimètres, diameter 13 millimètres.

Bulimulus aureolus Guppy.

Bulimus aureolus *Guppy, Ann. & Mag. Nat. Hist.* 3 ser. vol. xvii, p. 49.

This is a rare species of which I have as yet only found a few examples on trees at Savana Grande. It is remarkable for the singularly beautiful transparent yellow color of the shell, and the brighter yellow of the mantle of the animal. It is a shell of the same general character as the last species, and resembles *B. stramineus* of Guilding. The specimens found by me have not occurred with an expanded lip, but I am not sure when the shell is quite adult that it does not in this respect resemble the two foregoing species.

Height 15 millimètres, diameter 7 millimètres.

Bulimulus fraterculus Férussac.

Helix fraterculus, *Fér. Prodrome* no. 395.

Bulimus fraterculus, *Pfeiffer, Helic.* II., p. 220, no. 601.

An oblong-conic thin colorless shell about 0·7 inch in length found amongst decaying wood and leaves. The peristome is simple and straight.

Beyond the island this species is found in Porto Rico and the Antilles south of it, and it also occurs in Guiana.

Height 15 mill., diameter 6 mill.

PLEKOCHEILUS Guilding 1828.

Terrestrial Inoperculata with ovate-fusiform solid shells, an expanded and thickened peristome and a callous columella with stout plaits or teeth.

Plekocheilus auris-sciuri Guppy.

Plekocheilus auris-sciuri, *Guppy, Ann. & Mag. Nat. Hist.* 3 ser. vol. xvii, p. 51.

An oblong-conic solid shell usually spotted or striped with reddish-brown or chestnut and having an aperture somewhat constricted by the thickened and toothed columella and peristome.

This species is very near to *P. glaber*, the name under which it is given in Bland's list. That species seems to be very variable, and although the examples with which I originally compared my shell differed very considerably from the Trinidad form, I have since seen other specimens from Brazil which approach our species so closely that there might be some difficulty in separating them. I therefore leave it an open question whether these are to be considered species or only varieties. The Trinidad shell varies little as to size or form; its coloring being the least constant point. It is found on trees in many parts of the island.

Height 37 mill., diameter 16 mill.

TORNATELLINA Beck 1837.

Terrestrial Inoperculata with ovate-oblong thin hyaline shells, an aperture with parietal plaits or teeth, a simple peristome and a truncate columella.

Tornatellina lamellata Potiez & Michaud.

Achatina lamellata, *Pot. & Mich. Gal. Moll.* I., p. 128, t. 11, f. 7, 8.

Achatina lamellata, *Pfeiffer, Helic.* II., p. 272, no. 85.

" " *Drouët, Moll. Guy. Franç.* p. 70, pl. 2, f. 21, 22.

Leptinaria antillarum, *Shuttleworth.*

Bulimus unilamellatus, *D'Orbigny, Voy. Amér. Mérid. Moll.* p. 257.

An elongate-ovate diaphanous colorless shell with a truncate columella, a simple peristome, and a lamellar parietal tooth or plait.

This mollusc is viviparous. It lives amongst decaying wood.

Height 13 mill., diameter 6 mill.

STENOGYRA Shuttleworth 1850.

Terrestrial Inoperculata with thin turreted hyaline shells of many slowly increasing whorls having a simple aperture and an acute peristome.

I have on the present occasion included in this genus two species, which in my previous memoir I excluded from it, taking the truncate columella of *Stenogyra* as the ground of that exclusion. But although this character is used as a distinction between the genera *Bulimus* and *Achatina*, it is a question whether we may not be allowed, at least provisionally, to consider this with Albers a distinction of less importance in some groups. And I am decided to take this course by the apparent characters of the lingual dentition, though it is with some considerable hesitation that I do so, and I trust to future investigation to elucidate the true position of these molluscs.

Stenogyra octona Chemnitz.

Helix octona, *Chemnitz, Conch. Cal.* ix, 2, p. 190, t. 136, f. 1264.

Bulimus octonus, *D'Orb. Voy. Amér. Mérid. Moll.* p. 260.

Achatina octona, *Pfeiffer, Helic.* II., p. 266, no. 65.

A small cylindrical many-whorled colorless shell very commonly found in the cultivated ground and among decaying wood and leaves. It is distinguished from the two following species by its columella being truncate.

The eggs are subspherical and have a white testaceous envelope.

This species is widely distributed in the West Indies, and it is also found in Guiana and other parts of South America.

Height 15 mill., diameter 3 mill.

Stenogyra octonoides C. A. Adams.

Bulimus octonoides, *D'Orbigny, Moll. de Cuba,* t. 1, p. 177, pl. xi bis, f. 23, 24.

A shell something like the last, but with more rapidly increasing somewhat flattened whorls and a more elongate aperture. The columella is not truncate. It is found in the same situations as the last, but it is not so common. It is also found in some of the Antilles.

This species bears so strong a resemblance to the figure given by D'Orbigny of his *Bulimus bacterionides,* in the "Voyage dans l'Amérique méridionale," that I should consider it identical were it not that in the description he includes it among the species with a truncate columella.

Height 12 mill., diameter 3 mill. It is rather variable as to its height and breadth.

Stenogyra caracasensis Reeve.

Bulimus caracasensis, *Reeve Conch. Icon.* Bul. 580.

Pfeiffer, *Helicidæ.* III., *Bulimus no.* 634.

A shorter shell than the last with about 8 slowly increasing narrow whorls and an obtuse apex.

It is found with the two last. It occurs also in Venezuela and certain of the Antilles.

Height 10 mill., diameter 2½ mill.

CYLINDRELLA Pfeiffer 1840.

Terrestrial Inoperculata with cylindrical shells generally striate or costate-striate and having a truncate apex and a subcircular aperture without teeth or plaits.

Cylindrella trinitaria Pfeiffer.

A slender cylindrical turreted costulate-striate dark-brown shell with about fifteen whorls, the last one partly free and produced in front beyond the others; a truncate apex, and a subquadrate aperture with an expanded peristome. It is found on the Laventille Hills.

Height 11 mill., diameter 2½ mill.

ENNEA H. & A. Adams 1855.

Terrestrial Inoperculata with shining cylindrical shells having an obtuse apex, a crenulate suture and a thickened peristome with teeth and a strong parietal fold.

The Molluscs classed in this and the next group are united by some authors with the genus *Pupa*, characterised as having shells generally of a cylindrical shape with many slowly increasing whorls; the last whorl is often no larger than the preceding or even the two or three preceding ones, and the apex is generally obtuse owing to the increase of the whorls being much greater at first than afterwards. The assemblage of species thus distinguished are usually separated into subgenera; and the differences in the lingual dentition incline me to the belief that the two groups of *Ennea* and *Vertigo*, each represented by one species in Trinidad, have claims to generic rank.

Ennea bicolor Hutton.

Pfeiffer, Helic. Pupa no. 119.

Gould, Proc. Nat. Hist. Soc. Boston.

A small cylindrical shell with a somewhat obtuse spire and having an aperture furnished with three teeth or plaits. The peristome and columella are expanded and somewhat reflected.

It is rare, and occurs in the crevices of rocks near streams in the neighbourhood of Port-of-Spain. The presence of this species in Trinidad and St. Thomas is as, Mr. Bland has remarked, very curious, because it is an East Indian species.

Height 7 mill., diameter 2 mill.

VERTIGO Müller 1774.

Terrestrial Inoperculata with oval-cylindrical shells having an obtuse apex and a thickened peristome.

Vertigo Eyriesi Drouët.

Pupa Eyriesii, *Drouët Moll. Guy. Franç.* p. 71, pl. II, f. 16, 17.

Vertigo Eyriesi, *Guppy, Ann. and Mag. Nat. Hist.* 3 *ser. vol.* xvii, p. 52.

A very minute short and obtusely cylindrical shell with a toothed aperture, a narrowly expanded peristome and a very obtuse apex.

Height $1\frac{1}{2}$ mill. diameter 1 mill.

This species was first described by Drouët from French Guiana where it is said to be abundant. I have only found two examples in Trinidad; on ferns at San Fernando. Drouët says it is found on the trunk of the mombin (hog-plum).

STREPTAXIS Gray 1837.

Terrestrial Inoperculata with subglobose (helix-shaped) shells having the last whorl receding from the axis of the upper whorls.

Streptaxis deformis Férussac.

Helix deformis, *Fér. Mollusques*, pl. 32A, f. 1.

" " *Wood, Ind. Test. Suppl.*, *Helix* no. 40.

Streptaxis deformis, *Philippi, Abbildimgen*, ii.

" " *Pfeiffer, Hel.* i, 7.

A small species, colorless or with a slight tinge of pink or yellow. The peristome is thickened, but without teeth; there is a lamellar parietal tooth. Height 4 mill. diameter 6 mill.

This is not a very abundant shell, but it may be found on the Laventille Hills, especially on limestone ridges. It also occurs on the Cotoras and other islands in the Gulf of Paria, and in Venezuela and Guiana.

Simpulopsis Beck 1837.

Terrestrial Inoperculata with thin membranaceous imperforate globose shells having a wide round aperture and a simple peristome.

The genera *Streptaxis* and *Simpulopsis* are eminently Brazilian as regards their distribution in the western hemisphere, to which indeed the latter is peculiar. We have no account of any species of *Simpulopsis* from Guiana; but these shells occur only on trees in the forests, and their rarity and delicacy render it possible that they may have been overlooked by collectors.

Simpulopsis corrugatus Guppy.

Ann. and Mag. Nat. Hist. 3 ser. vol. xvii, p. 53.

A greenish-hyaline membranaceous shell corrugated by relatively stout ribs and having a small spire and a large body-whorl.

Height 10 mill. diameter 8 mill.

It occurs in the forest near Savana Grande.

CONULUS (Fitzinger) Moquin-Tandon 1850.

Terrestrial Inoperculata with conic subtrochiform (heliciform) thin hyaline shining shells having a simple peristome.

Conulus vacans Guppy.

Ann. and Mag. Nat. Hist. 3 ser. vol. xvii, p. 53.

A small brownish-horn-colored helix-shaped shell found chiefly on ferns and epiphytes. It is not a common species, but it has occurred to me near Port-of-Spain and at San Fernando.

Height 2½ mill. diameter 4 mill.

Order Limnophila.

Animal amphibious or fluviatile. Tentacles 2, the eyes sessile behind them.

The *Auriculidæ (Pedipes, Melampus)* are only included in the present catalogue on account of their close relation to the other Inoperculata. Their distribution is similar to that of the marine mollusca; their zoological characters placing them in close proximity to the terrestrial Inoperculata.

PEDIPES (Adanson) Férussac 1821.

Amphibious Inoperculata with imperforate globose-conic spirally striate shells with an aperture constricted by plaits of which the upper (parietal) one is larger and lamelliform, the others dentiform, placed on the flattened columellar lip; and with a sharp peristome, callous or toothed within.

Pedipes mirabilis Megerle.

Turbo mirabilis, *Megerle von Muhlfeldt.*

Pedipes mirabilis, *Férussac, Prodrome,* p. 109, n. 2.

" " *Pfeiffer, Mon. Auric.* p. 70, n. 197.

Pedipes quadridens, *Pfeiffer.*

„ globulosus, *C. B. Adams.*

A small globose-conic solid brownish-fulvous shell, striated by fine spiral ridges and having an aperture furnished with four plaits or teeth.

Length 5 mill., breadth 4 mill.

It is found on the shore near high-water mark under stones in sheltered places ; within the Gulf of Paria, and probably also on the other coasts. It is somewhat widely distributed in the West Indies.

MELAMPUS Montfort 1810.

Amphibious Inoperculata with solid ovate-obconoidal shells, having a short spire, a narrow elongate aperture, a plaited columella and a straight peristome.

Melampus coffea Linné.

Bulla coffea, *Linn. Syst. Nat. ed.* 10, p. 729.

Voluta coffea, *Linn. Syst. Nat. ed.* 12, p. 1187.

„ minuta, *Gmel.*

Ellobium barbadense, *Bolten.*

Bulimus coniformis, *Brug.*

Melampus coniformis, *Montfort.*

Auricula ovula, *D'Orb. Moll. de Cuba,* pl. 13, f. 4, 7.

Conovulus coniformis, *Lam.*

„ „ *Woodward, Man. Moll.* pl. 12, f.37.

An obconic solid three-banded shell with parietal and columellar plaits and having an acute peristome furnished internally with many (14-18) entering ridges. Length (of a large example) 25, breadth 12 mill.

Found abundantly on the stems and roots of trees within reach of the spray of the sea on the Eastern and other coasts. It is also found in most of the West Indian Islands.

Melampus pusillus Gmelin.

Voluta pusilla, *Gmel. Syst.* p. 3436.

„ triplicata, *Donovan, Brit. Shells.* iv, pl. 138.

„ „ *Wood, Ind. Test.* pl. 29, f. 19.

Bulimus ovulus, *Brug.*

Auricula ovula, *Fér.*

„ nitens, *Lam.*

Melampus ovulum, *Lowe.*

„ pusillus, *Adams.*

„ „ *Pfeiffer, Mon. Auric.* p. 46.

Tralia pusilla, *Gray.*

An ovate-obconic solid smooth dark-fuscous shining shell with three plaits on the inner margin of the aperture, and a single internal transverse rib on the outer lip. Length (of a fine example) 14, breadth 8 mill.

Found on the north coast of Trinidad, and in most of the West Indian Islands.

PLANORBIS Geoffroy 1767.

Fluviatile Inoperculata with discoid shells, generally biconcave, having an aperture without teeth, the peristome simple or somewhat expanded with the upper margin projecting.

Planorbis terversanus D'Orbigny.

D'Orbigny, Moll. de Cuba, pl. xiii, f. 20, 23.

A small discoidal shell generally subdiaphanous with whorls flattened above and rather rounded beneath. The spire presents a concavity above as well as below. The peristome, usually simple, is occasionally expanded in old examples which are often black and thickened.

Diameter 10 millimètres, height (thickness) 3 mill.

It is found in small streams among the Laventille Hills, and in Naparima. It also exists in Cuba and probably in other islands of the West Indies.

PHYSA Draparnaud 1801.

Fluviatile Inoperculata with smooth thin oval sinistral shells having a large body-whorl and a small spire.

Physa rivalis Maton and Rackett.

Physa rivalis, *Mat. and Rack. Linn. Trans.* viii, p. 126, pl. 4, f. 2.

Limnea rivalis, *Sowerby.*

Aplexus rivalis, *Gray.*

Physa rivalis, *Wood, Ind. Test. Bulla* 38.

Physa Sowerbiana, *D'Orb. Moll. de Cuba*, t. 1, p. 190, pl. xiii, f. 11, 13.

A small oval transparent brownish-amber-colored shell distinguished from all other Trinidad species by being sinistral. When alive it resembles *Succinea approximans* (a land shell of somewhat similar shape) in being adorned with stripes and patches of black which are on the mantle of the animal, but are seen through the shell.

Height 8 mill., diameter 4 mill.*

Inhabits the Laventille streams with the *Planorbis*.

The eggs of *P. rivalis* are extremely pellucid and are deposited in jelly-like masses, containing from twenty to forty eggs, on objects beneath the surface. This mollusk is very fond of gliding along the surface of the water shell downwards, a habit common to most if not all our freshwater gasteropoda, not excepting so large a species as *Ampullaria effusa*. *Physa rivalis* also possesses the power of rising suddenly from the bottom to the surface of the water.

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* Since my paper in the "Annals" was printed I have obtained examples of *Physa rivalis* of 12 mill. long and 7 mill. in diameter, which bear out the identification with the Cuban shell.

Subclass Prosobranchiata.

This subclass includes the greater portion of the marine gasteropoda. I am by no means confident of the correctness of the classification of the mollusca here referred to that subclass, but as I am unable at present to bring forward a better arrangement, I have adopted the present one provisionally.

Order Phaneropneumona.

Operculate terrestrial Mollusca with seven-ranked teeth.

Cyclotus Guilding 1840.

Terrestrial Operculata with solid depressed widely-umbilicated shells having a circular aperture closed by an orbicular operculum externally concave with a central nucleus and numerous whorls having raised margins.

Cyclotus translucidus Sowerby.

Cyclostoma translucidum *Sowerby, Proc. Zool. Soc.* 1843, p. 29.

„ „ *ib. Thes. Conch.* p. 106, no. 46. t. 23, f. 4.

Aperostoma translucidum, *Pfeiffer, Teitschr. f. Mall.* 1847. p. 104.

Cyclotus translucidus, *Pfeiffer, Mon. Phanerop.* p. 20.

„ „ „ *Cat. Phanerop. B.M.* p. 9.

„ trinitensis, *Guppy, Ann. & Mag. Nat. Hist.* 3 *ser*, *vol.* xiv, p. 245.

A smooth light straw-colored opaque shell with a large nearly circular operculum of seven whorls found in abundance on one of the Cotoras Islets, and near Savana Grande. It occurs more sparingly in many other districts.

This species is found in Venezuela.

Height 15 mill., greatest diameter 22 mill.

Cyclotus rugatus Guppy.

Ann. and Mag. Nat. Hist. 3 ser. vol. xiv. p. 246.

This species is more depressed than the last and is readily distinguished by its numerous angular fold-like striæ and its dark reddish-brown color. Its operculum is of somewhat more numerous and narrower whorls than that of *C. translucidus*. Its habitat is in the northern range of hills where it is found up to 2000 feet.

Height 8 millimètres, greatest diameter 17 mill.

Order Scutibranchiata — (Rhipidoglossa).

Operculate Mollusca with numerous marginal teeth (uncini) on the dental band.

HELICINA Lamarck 1822.

Terrestrial Operculata with depressed subglobose shells having a semiovate or triangular aperture, a thickened peristome and a semiovate membranaceous (or shelly) operculum without distinct whorls.

Helicina nemoralis Guppy.

Helicina zonata, *Guppy Ann. & Mag. Nat. Hist.* 3 ser. vol. xiv, p. 347.

Helicina nemoralis, *ib. Ann. & Mag. Nat. Hist.* 3 ser. vol. xvii, p. 46.

A smooth pinkish or yellowish species with a broad band of chestnut following the suture to the apex which is of the same color. The operculum is dark blood-red except at the submarginal nucleus which is yellowish-brown. The under surface of the shell is white.

This shell is undoubtedly very nearly allied to Helicina jamaicensis, but I consider it distinct. It is found in the forests.

Height $8\frac{1}{2}$ mill., greatest diameter 10 mill.

Helicina barbata Guppy.

Annals & Magazine Natural History, 3 ser. vol. xiv, p. 237.

A smaller and more depressed species than the preceding, dark colored and zoned with three or four indistinct bands of color. When alive it has a dark-colored hairy periostraca. It is found on all parts of the island where the ground is somewhat open ; it rarely occurs in the forest.

Height 5 mill., greatest diameter 6½ mill.

The nearest relation of this species seems to be *H. Dysoni* of Honduras. The same or a closely-allied species occurs in some of the Antilles, but I have been unable to ascertain if it has been specifically determined.

ADAMSIELLA Pfeiffer 1851.

Terrestrial Operculata with pupiform or oblong turreted shells having a small circular or subcircular aperture with a double or expanded continuous peristome and a thin pancispiral operculum with a subcentral nucleus and the outer edge detached.

Adamsiella aripensis Guppy.

Annals & Mag. of Nat. Hist. 4 ser. vol. xiv, p. 246.

An oblong-turreted shell, longitudinally striate, of a reddish-brown color with several more or less interrupted dark bands and an oval aperture having an expanded or double peristome of an orange or whitish color concentrically striate. Operculum paucispiral, whorls increasing rapidly, nucleus transparent. Height 13 mill., diameter 8 mill.

This species differs very considerably from any other *Adamsiella* that I have seen; and it approaches *Cyclostomus* in many of its characters. It is found on the Cerros of Aripo at a height of 2000—2500 feet where it lives amongst the dead leaves in the forest, frequently suspending itself by glutinous threads from branches or the under surface of leaves at the height of a foot or so from the earth.

NERITINA Lamarck 1809.

Fluviatile (rarely marine) Operculata with semiglobose rather flattened shells, having a scarcely prominent spire and a semicircular aperture without teeth on the outer lip and furnished with a shelly paucispiral operculum having a marginal nucleus and an apophysis.

This genus is a fluviatile form of the marine genus *Nerita*. Two marine species of *Neritina* are found on the shores of Trinidad; *Neritina viridis*, commonly known as the "green-pea shell;" and *N. meleagris*, a species very abundant in the harbor of Port-of-Spain and in mangrove swamps. This last species resembles our only fluviatile species *(N. microstoma)*; but it is more varied in color besides being different in shape, &c.

Neritina microstoma D'Orbigny.

D'Orbigny, Moll. de Cuba, pl. xvii, f. 36.

A dark olive-green Neritine marked with black lines giving the appearance of scales. It is found at the Governor's Fountain near Port-of-Spain, and I have received examples from Moruga and other parts of the island. It occurs in Cuba.

Diameter 14 mill., height 12 mill.

Order Pectinibranchiata (Tænioglossata).

AMPULLARIA Lamarck 1799.

Fluviatile Operculata with globular umbilicated shells having a large entire aperture and a short spire, and furnished with a stout horny suboval operculum having its nucleus near its inner margin.

Ampullaria urceus Müller.

Nerita urceus, *Müller*.

Helix urceus, *Dillwyn, Recnt Shells*, 918.

Ampullaria rugosa, *Lamarck*.

Ampullaria rugosa, *Brug. Enc. Meth*, *Vers*, pl. 457, f. 2.
„ urceus, *Wood*, *Ind. Test.*, *Helix*. 72.

A large black globular *Ampullaria* found in our larger rivers and swamps. It is most abundant in the Caroni and its tributaries, but it is not rare in the streams of Naparima. It is eaten in great numbers by the Africans and the savage squatters of the inland districts, and it is sometimes brought into town. It inhabits South America and is also found in Tobago (Bland).

Height 84 mill., diameter 86 mill.

Var. *purpurascens*. Smaller, thinner, and with a somewhat more elevated spire.

Ampullaria effusa Müller.

Nerita effusa, *Müller*.
Helix effusa, *Chemn. Conc. Cab. vol.* ix, f. 1144.
Helix glauca, *Linné* (in part).
Ampullaria effusa, *Lamarck*.
„ glauca, *Wood*, *Ind. Test. Helix* 73.

A smaller species than the last, very common in all our streams and ponds. There are several varieties, two of which I have distinguished as *conica* and *tristis*. The usual form is decorated with several dark bands.

This species is also found in South America.

Height 28 mill., diameter 38 mill.

Var. *conica*. — Spire more elevated and umbilicus narrower than in the type. Shell generally smaller and usually adorned with dark bands. Allied to *A. crocostoma* Phil., of Venezuela.

Var. *tristis*. Spire more elevated, peristome prominent, color-bands obsolete.

MARISA Gray 1824.

Fluviatile Operculata with depressed or discoid widely umbilicated shells having a simple aperture furnished with a thin horny suboval operculum with a submarginal nucleus.

Marisa cornu-arietis Linné.

Helix cornu-arietis, *Linn.*

Planorbis cornu-arietis, *Lam.*

Ampullaria cornu-arietis, *Sowerby, Genera. Amp. f.* 3.

" " *Wood, Ind. Test. Helix* 55.

Marisa Knorrli *Phillippi.*

Ceratodes fasciatus *Guilding.*

This discoid planorbiform type of *Ampullaria* will readily be recognised. It occurs in most of our streams, and visitors to the Botanic Garden may observe numbers of the molluscs of this species in the basins of the fountains. It prefers still waters and ponds, to which the form of its shell is adapted.

It is found in various parts of South America and in St. Vincent.

Diameter 35 mill, height 12 mill.

The var. *Swifti* is smaller and the spire is somewhat above the last whorl.

PALUDESTRINA D'Orbiguy 1841.

Fluviatile Operculata with turreted or subglobose opaque shells without umbilicus or canal, having a thin horny paucispiral operculum with a sub-central nucleus.

Paludestrina spiralis Guppy.

Bithinia spiralis *Guppy, Ann. & Mag. Nat. Hist.* 3 *ser. vol.* xiv, p. 244.

Paludestrina spiralis, *ib, Ann. & Mag. N. H.* 3 *ser. vol.* xvii, p. 43.

A small dark-brown or reddish-brown opaque turreted shell with spiral lines and sometimes a row of low spines on the angle of the whorls. It is common in many of our northern streams.

Height 4 mill, diameter 2½ mill.

Class CONCHIFERA.

Acephalous Mollusca with two lateral plates or valves.

Subclass Asiphonida.

Pallial line simple : animal without respiratory siphons.

Order Unionacea.

Bivalve shells, pearly within, and having a hard dark periostraca.

Anodon Cuvier 1798.

Fluviatile Conchifera with oval inequilateral somewhat auriculated close shells, an external ligament, a simple pallial impression and a hinge without teeth.

Anodon Leotaudi Guppy.

Ann. & Mag. Nat. Hist. 3 *ser.* vol. 17, p. 54.

This is the only fluviatile bivalve known to be found in this island. It is of an oval-oblong shape, and it is covered with a dark olive-brown epidermis; the interior is finely iridescent. Length 82 mill., height 45 mill., thickness 30 mill.

It is found in some of the streams flowing into the Caroni.

The preceding paper was illustrated by diagrams and specimens ; and the Author gave a general sketch of the organic world, pointing out the position and characters of the Mollusca, of the principal groups of which he gave a succinct account.

Tuesday, 9th October, 1866.

The Association met at Mr. Deighton's house, Queen's Collegiate School.

HORACE DEIGHTON, Esq., M.A., F.R.A.S., President, in the Chair.

ANNUAL MEETING.

The Ballot for Officers having been taken, Dr. Mitchell was declared duly elected as President, and Mr. Henry F. J. Guppy, F.A.S.L., as Secretary.

ORDINARY MEETING.

The following donation was announced :—"Estudio Seismologico. Consideraciones sobre la Revolucion seismica del año 1865-66, por Lino J. Revenga." Caracas 1866. Presented by the Scientific Society of Caracas.

The Secretary stated that he had been applied to by the donors of the pamphlet acknowledged above for information as to the Earthquakes which had occurred here in 1865-66.

The following communication was read :—

Note on the Earthquake of 26th September.

By R. J. Lechmere Guppy, F.G.S.

On Wednesday the 26th ultimo, a shock of an earthquake passed through the town of Port-of-Spain; and having been in peculiarly favorable circumstances at the time for observing the nature of the shock, I take the opportunity of communicating a note on the subject.

I was reclining in a chair with my feet towards the East when the shock took place. It distinctly lifted the left side of the chair before the right side, and as the direction of my body was East and West the wave must have been in a line nearly North and South. Although the movement was so slight that no article on the table by my side was disturbed, there was a most distinct rumbling noise which seemed simultaneous with the passing of the wave. The shock took place at 5.37 p.m., as nearly as I could ascertain.

Mr. Lechmere Guppy communicated an abstract of a paper published in the "Annals and Magazine of Natural History," by Professor Karston, "*On Rhynchoprion penetrans.*"

Tuesday, 13*th November*, 1866.

The Association met at Mr. Lambert's house, Edward Street.

The Hon. HENRY STUART MITCHELL, M.D., Ph. D., President, in the Chair.

The following Visitor was introduced:—Mr. Göring, by Mr. Prestoe.

The following communication was read:—

On the Petroleum or "Green-Tar" and the "Manjack" of Barbados.

By the Hon. Francis Goding, M.D., Corresponding Member of the Scientific Association of Trinidad.

Looking to the recent experiments of Mr. C. J. Richardson at Woolwich Dockyard, and his very successful results in generating steam for machinery by the employment of Petroleum in lieu of coal, and also to the grave question lately agitated as to the future supply of the latter fuel from the Coal-fields of Great Britain, the mineral products of Trinidad and Barbados allied to Petroleum, suddenly start up into significance beyond our ordinary estimation of them in their present economic use. However valuable they may be for other purposes, the one they are probably called upon to fulfil seems to outweigh all the rest; for whatever may be the upshot of the Royal Commission to inquire into the capability of the British coal deposits to meet a continuance of the present enormous consumption of coal and the future exigencies of the mother-country, there can be little doubt that, irrespective of any conclusion to which the inquiry may come, the Admiralty trials at Woolwich with petroleum as a steam fuel, must considerably enhance the value and importance of the bituminous products of these Colonies; assuming that they can be made available for a similar purpose.

The paper which I have the honor to submit to the Scientific Association of Trinidad does not profess to offer any thing very original; and beyond the foregoing reflection with its incentive for further investigation into the capabilities of their own mineral resources, which seem to give so fair a promise of being remunerative, I must limit my remarks exclusively to Barbados, from not having satisfactory data upon which to treat of the vast accumulation of the bituminous deposit of Trinidad; besides it may be presumption on my part to occupy myself with matter upon which there is no lack of talent and power of scientific research on thes pot to prosecute the necessary inquiries as to the use of the Trinidad asphalts and their adaptation to the purpose of superseding coal as a steam fuel.

A concise sketch of the geological structure of Barbados as introductory to the subject of this paper will not be irrelevant, for reasons which will hereafter appear.

The island exhibits two well-defined regions varying in aspect, the nature of the materials of which they respectively consist, and the manner of their formation. These geological divisions are called the Coralline and the Scotland formations.

The Coralline formation, occupying by far the greater portion of the superficial area of the island, rises from the sea-coast in several and successive lines of terraces, which as seen from the Westward, very generally present mural or precipitous faces to the observer. These heights and the intervening lands are here and there intersected by deep ravines or gullies, and the table lands, either flat or gently undulating, which crown the terraces, not unfrequently show considerable hollows or depressions, favoring the supposition of the action of currents and eddies of the ocean, while the land lay submerged at various periods under its waters. The rocks composing the coralline formation are essentially limestone and consist of a vast accumulation of whitish calcareous matter gradually formed, however modified in character and density they may have been, while subjected to the alternations of upheaval and submergence they have undergone during periods prior to the present elevation of the land. The calcareous mass varies much in thickness ; and as ascertained by the heights of the deeper ravines, and the depths of the many wells sunk in various parts of the country for the supply of water, it must in many places exceed two, or even three hundred feet. In other localities the thickness diminishes to a thin layer merely and gives place to the outcropping of some of the Scotland series of stratified rocks, upon which the great bulk of the coral limestone rests. The material of this formation is chiefly made up of hard and compact limestone consolidated probably by pressure—beds of conglomerate formed of the exuviæ and the fabrics of the coral animals — beds of sand and of marls — calcareous sandstone *(dripstone)* an excellent material for building purposes. Marine shells everywhere abound, probably of existing species, but in some instances they are of larger development than their congeners of the present day. Differences of ages among the shells unmistakably occur too — their casts are frequent in the higher elevations, while others, found in lower localities, retain vividly their colors, thus further confirming the belief of a gradual production or growth of the island through separate and remote periods of elevation. The coralline formation superimposed on the Scotland series of chalk clays and sandstones, is evidently of a more recent age than the latter.

The Scotland formation, one of the Tertiaries—but which is yet undetermined — presents a very different aspect to the preceding ; being a mountainous region in miniature, hence its name. It inclines to the Eastward in bold and often rugged outlines of ridge and hill with parallel valleys and plains intervening, while its broken and often highly contorted strata bearing upon their surface massive and scattered boulders of the coral rock disrupted from the cliffs above, attest to the suddenness and violence of the action from beneath by which it has been lifted up from the sea and carried with it the broken fragments from the upper heights of the coralline formation. The series of rocks of which it consists is very different from the other formation. Strata of chalky matter, having 94 per cent of carbonate of lime (the chalk) — of siliceous sandstones of various hues, these alternating in some places with clay iron-stone —deep beds of dark and colored clays — seams of bituminous coal *(Manjack)* chiefly compose what originally was the bed of the sea. Iron ore, Gypsum in its crystallized form of selenite, pyrites, calc-tufa, and other mineral substances are frequently found either on the surface or imbedded in the strata. Several mineral springs exist, and also in this district is the so-called "Boiling Spring" of Turner's-Hall-Wood, which is the result of the action upon water of an impure carburetted hydrogen — a jet of that gas issuing from a small hole in the ground in that locality and producing ebullition when water is thrown into the hole.

If we except the siliceous shields of the microscopical animaculæ *(infusoria)* abounding in the chalk and some of the sandstones, and a few sharks' teeth and spines of echini found in sandstone on Bissex Hill, organic remains are wanting here. It is true, a few shells described by Sir Robert Schomburgk and mentioned as coming from this region were obtained with great difficulty from a hard water-worn boulder on Springfield estate; but the boulder itself is alien to, and differs from any rock either of this or the preceding formation. How, or by what agency the boulder came here, I do not presume to say.

The Petroleum or Green Tar, the more important subject of this paper, exudes from the strata of this district, and is found floating on the surface of its rills, and on stagnant pools of water. Its easily vaporisable nature causes it every where to impregnate the atmosphere of the district with its pungent, bituminous, but not unpleasant odour.

There is a very general impression that the Green Tar is to be found, and can only be collected within the boundaries of the Scotland formation, but this limit to the supply of the tar is not I think at all probable; for it has been found as a supernatant fluid on the water of a well in the parish of Christ-Church, and it is sometimes seen floating on the sea at Ostin's Bay in the same parish; and in sinking the cylinders of the new Bridge now in course of erection in Bridgetown, logs of wood undergoing transformation into lignite and highly impregnated with this substance were excavated 40 feet below the surface. Now these occurrences, while they indicate that the Tar is of a very penetrating nature and comes up to the surface from beneath by the infiltration of water, which being the heavier fluid, naturally replaces and causes it to ascend upwards, go also to shew that the Tar or Petroleum, using them as synonymous terms, may be discovered under any part of the island. Of course, the Scotland formation being denuded of the coralline superstructure, renders the Tar more accessible there; and he who would seek for it elsewhere must have first to penetrate the coral rock ere he attain with equal facility the same favorable stand-point for boring for Tar, as in the Scotland formation. At the same time, another fact remains to be considered in relation to boring for Tar, and the unequal distribution, as to its thickness, of the coral rock; namely, that while the Scotland formation extends in an almost semicircular line between the extreme points of the Cove Bay in St. Lucy's parish, and Skeet's Bay in St. Philip, the chalk of the Scotland series again makes its appearance at Cluff's Bay at the northern end of the island with a few feet only of the coral superimposed; and also that some of the sandstones of the same series of rocks are observed to "crop out" on several estates in St. Lucy—at Springhall, for instance; where they actually form part of the cultivated soil of that property. Here then, in this locality and in others similarly circumstanced, the indications for boring may probably be found to be as favourable as others in the Scotland formation.

That there are affinities between the Asphalts of Trinidad and Barbados, there can be no question; but differences of composition exist I am aware. In what these differences consist I am not prepared to say; but as it will serve to invest with greater interest any forthcoming inquiry of their several adaptations for economic purposes, I here subjoin what little is as yet known of the Barbados mineral products.

The Green Tar is not a true Petroleum, having as the Oil refiners say, "no spirit"; but is a liquid substance of somewhat thicker consistence than ordinary treacle, of a greenish-black colour and penetrating odour. It contains certain liquid and solid hydro-carbons, the chief of which appears to be napthaline, paraffine, benzine and asphaltum. Its specific gravity is 0.950. When subjected to distillation a *crude* oil results, having a specific gravity of 0.910. The distillation yields—

Water	....	.06
Coke	....	.06
Crude Oil....	....	.88
		100

It may be stated that 100 barrels of green tar give on an average 80 per cent: of the crude oil. The Tar itself is a good lubricator, but when distilled, the resulting oil, of a transparent and rich brown colour, has that property in greater perfection, and is found by parties in England and in the United States to be equal to, or even to excel as a lubricator, all other British and American oils, the sperm oil not excepted. When further subjected to a refining process by chemical treatment, and the elimination of its paraffine, the oil so treated yields a product of an amber or straw-color without smell or loss of its lubricating property. As regards the illuminating power of the oils from the tar, this is said to be less than that of other oils. In this respect then, the oils from the tar do not rank very high, in the opinion of some oil refiners who have tested the capabilities of the petroleum; but Mr. Cooper, a skilful Chemist of Bridgetown, asserts on the contrary, that by a process of refining to which he has subjected the tar, its oil may be made to produce a more brilliant light than any foreign oil imported into the island.

In passing, we may observe, that although for many years past the surface oil or tar as it oozes out of the rocks of the Scotland formation, has been collected both for exportation and domestic purposes, a solitary instance only exists of *boring* for oil. This has been undertaken on Springfield Estate, in St. Joseph, and the operation is still going on. The machinery employed is that used for Artesian wells, and the depth attained is about 150 feet. At the present moment an oil of less consistency and of a lighter color than the surface oil is pumped up; but in consequence of the boring instruments coming in contact with a very hard shifting boulder consisting chiefly of quartz (greywacke), which has injured the implements and otherwise impeded the progress of the operation, it is likely that the present boring will be discontinued and another commenced—the indications being so favorable as to render the enterprising gentleman who is prosecuting his search for oil very sanguine as to the ultimate success of his scheme. The strata already traversed are as follows:—clay bed, loose sand, silicious sandstone, alternating with clays; water has also been met with, and an evolution of gas, (carburetted hydrogen).

The Manjack occurs in seams or beds in many parts of the Scotland formation. There are several varieties of this deposit, depending upon the cohesion of the asphaltum which composes them. In some places the Manjack is pliable, in others more compact. It is indeed found in intermediate states of coherency between a soft bitumen (an excellent varnish) and a hard compact asphaltum, or bituminous coal, which is sometimes used in conjunction with megass as a fuel in the furnaces. Mr. Andrew Fife, of Edinburgh, many years ago analysed some of the latter description of manjack; and his results correspond with the analysis subsequently made by Mr. Wm. Herepath of Bristol. According to the latter gentleman it contains in 100 parts—

Bitumen resolvable by heat into tar and gas	61.6
Coke	36.9
Ashes	1.5
Sulphur, none	....
	100

He further adds: "I should think it could be advantageously employed in the *production of gas*, of which it would furnish a large quantity and of rich quality, even exceeding that of cannel coal, the best for that purpose hitherto known."

I have now, Gentlemen, laid before you some thoughts as they have presented themselves to my mind while reflecting upon a great national question, and connecting with it our own mineral products as suggestive of further considerations. I have brought my grist to the mill, in the hope of our deriving mutual advantage from any labours which may continue to be bestowed on the subject.

Mr. Lechmere Guppy stated that Dr. Goding had mentioned the two formations which were exhibited in Barbados, namely, the Coral formation and the Scotland formation. He would present a few remarks on the correlation of these rocks with the tertiaries of Trinidad. The tertiaries of Trinidad were divisible into three groups : the Pliocene, of which the speaker had on a former occasion given an account to the Association : the Upper Miocene, containing the tertiary coal-beds, the greatest development of asphalt, and an abundance of gypsum in the form of selenite ; and lastly, the beds designated by the speaker as Lower Miocene, but which may very probably have to be classified as Eocene. Now the newest fossiliferous strata in Trinidad, the Pliocene before mentioned, contain a few extinct species some of which have been found in the Miocene of San Domingo and Jamaica, and are therefore probably older than the Coral formation of Barbados in which all the Shells and Corals are of existing species. The older of the two formations of Barbados (the Scotland formation) had yielded between three and four hundred species of minute siliceous organisms which had been described by Ehrenberg, but which afforded no clue to the age of the deposit because no similar organisms had ever been found elsewhere. Sir Robert Schomburgk had found some shells in an isolated rock or boulder in the Scotland formation, and the only three identifiable species were described by Professor Forbes. The speaker had recently discovered one of these shells, a *Nucula* of a peculiar type, allied to *N. divaricata* of the Pacific, and to *N. Cobboldiæ* of the English Crag, in the lower Miocene beds of San Fernando. Therefore he presumed that the Scotland formation was newer than the lower Miocene of Trinidad, the boulder in which the fossils were found having probably been derived from a pre-existing rock of that age. Then as far as the mineralogical evidence goes it is unquestionably in favor of the correlation of these petroleum-bearing rocks of Barbados with the upper Miocene of Trinidad, which they resemble in their included minerals. Mr. Guppy concluded by remarking in reference to the allusion made by Dr. Goding to the probable utility of the petroleum for the production of gas that it was not unlikely that the asphalt of Trinidad would be available for a similar purpose.

It was then moved and carried: That the Secretary be requested to communicate to Dr. Goding the best thanks of the Association for his very valuable and interesting paper on the Petroleum of Barbados; and to inform him that his paper will be printed in the forthcoming part of the proceedings of the Association.

A resolution was also moved and carried to the effect: That it is the opinion of the members present that it is expedient that the Subscription be raised to £1 0 10 per annum, payable half-yearly and on election.

Tuesday, 11*th December,* 1866.

The Association met at Mr. Harley's house, Queen's Park.

The Hon. Henry Stuart Mitchell, M.D , Ph. D.,
President, in the Chair.

Louis Alexander Le Roy, Esqre., Mount Pleasant, Savanetta, was elected a Member.

Dr. Mitchell moved, that this Association congratulate Dr. Leotaud on his receiving the Gold Medal of the Societé Medico-pratique of Paris for his recent treatise.

It was moved and carried unanimously: That his Excellency The Hon. Mr. Gordon be requested to become an Honorary Member of this Association; and that the President be requested to communicate the request of the Association to his Excellency.

CONTRIBUTIONS TOWARDS A BIBLIOGRAPHY OF TRINIDAD.

Part I.

On the 9th December 1863, a Resolution to the following effect was passed at a Meeting of the Association :—

"It was resolved that the Members of the Association "should use their utmost endeavors to contribute towards "the compilation of a complete Bibliography of the Lite-"rature of every kind relating to the Island of Trinidad."

The following is intended as a first instalment of the Bibliography compiled in pursuance of the above Resolution. Some of the works have remarks attached to enable those not acquainted with them to obtain some idea of their contents. In other cases the title alone has been deemed to be a sufficient description ; and a few works have not been so accessible to the compiler as to enable him to give more than the titles.

The compiler would feel obliged for any information which it may be in the power of others to contribute as to works and papers relating to Trinidad not included in this Part. It is proposed to compile a second Part out of such information as may come to hand.

The number of works relating to Trinidad which have appeared, especially of late years, has rendered it essential that some index to them should be prepared ; and such an index will doubtless be of great value to all who seek information respecting the Colony as well as to any one who should undertake to write a truly philosophical account of the island. Such an account, excepting only perhaps the work of Dr. deVerteuil, does not yet exist, for although our literature cannot be said to be deficient as to quantity, it is lamentably wanting in the essential element of quality. These remarks do not apply to the scientific portion of the catalogue, for, excepting Dr. Leotaud's volume on the Birds, we have no complete account of any department of natural science. Most of the works enumerated in that section of the catalogue are pamphlets or memoirs published in scientific journals.

R. J. L. G.

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§ 1. *Historical, Political, Statistical and General Works.*

BURNLEY, (WILLIAM HARDIN). Observations on the present Condition of the Island of Trinidad.

Evidence collected by the Sub-Committee of the Agricultural and Immigration Society in favor of Immigration.

CARMICHAEL (Mrs.) Domestic Manners and Social Condition of the White, Colored, and Negro Population of the West Indies. London, 1833. 2 vols. 8vo.

A popular account of the state of society in and of the people of the British West Indies previous to the Emancipation. The part which treats especially of Trinidad will be found in vol. 2, pp. 32—338.

COKE, (THOMAS, L.L D.) History of the West Indies, containing the Natural, Civil and Ecclesiastical History of each Island, with an Account of the Missions, but more especially of the Missions established by the Wesleyan Society. 8vo. 3 vols, London, 1810. vol. 2, pp. 33—46.

Contains a short account of the Island and especially of its Indian inhabitants.

Davy, (John, M.D.) The West Indies before and since Slave Emancipation. 8vo., London, 1854. pp. 293—337.

Notices of the physical structure, population, &c., of the Island.

Day, (C. W.) Five Years' Residence in the West Indies. 8vo., London, 1852. 2 vols. vol. 1, pp. 168—335.

A lively account of the island and its population, occasionally rather caustic and not always to be relied on, but frequently very applicable.

DeVerteuil, (Louis Antoine Aime, M.D.) Trinidad : Its Geography, Natural Resources, Administration, Present Condition and Prospects. 8vo., London, 1858.

The most important and complete work yet published on the subjects named in the title, and although the statistics and some of the remarks are no longer applicable, the book is still the best source of information extant on Trinidad. The Appendices, by Drs. Leotaud and Court and Mr. Crüger, contain notices of the Mammalia, Birds, Reptiles, Fishes, and Plants of the Island.

Fortune, (Carme T.) An Introduction to the Geography of Trinidad ; compiled on a perfectly easy plan. London, 12mo., 1861.

A detailed elementary account of the geography of the Island intended for schools.

Gamble, (W. H.) Trinidad, Historical and Descriptive. London, 8vo. 1866. pp. 120.

Remarks on the History, Geography, People, Climate, &c., and on the Missions, &c., from a Baptist Missionary point of view.

GREY, (EARL.) The Colonial Policy of Lord John Russell's Administration. 2 vols., 8vo. London, 1853. vol. 1, pp. 128—142.

An account of the Policy of the Government in the years 1846—52.

HART, (DANIEL.) Trinidad and the other West India Colonies and Islands. 2nd ed. Port-of-Spain, 1866.

A collection of statistical and miscellaneous matter chiefly relating to Trinidad.

HORSFORD, (JOHN.) A Voice from the West Indies. 1 vol. 8vo. London, 1856., pp. 394—399.

Contains a short account of Trinidad chiefly in reference to the Wesleyan Missionary Society; with some remarks on State Aid to Religion.

JOHNSTON, (LEWIS F. C.) Institutes of the Civil Law of Spain. 8vo. London, 1825.

A summary of the Law of Spain for the use of the inhabitants of Trinidad.

JOSEPH, (EDWARD LANZER.) History of Trinidad. Port-of-Spain, 1838. 12mo.

Part 1st contains an account of the Island and of its productions, and Part 2nd, a history of the Island. There are many interesting and valuable details in the second part, which must be separated from the doubtful stories.

JOSEPH, (E. L.) Warner Arundell, the Adventures of a Creole. 8vo., London, 1838.

A work of fiction, noticed here because it presents a good picture of West Indian life before Emancipation and contains most of the stories current in West Indian Society.

LAVAYSEE, (DAUXION.) Reise nach Trinidad, Tobago und Venezuela.

Long, (Professor) Porter, (George R.) and Tucker, (G.) America and the West Indies. London. 1845, p. 16. (Library of Useful Knowledge.)

Martin, (Robert Montgomery.) Statistics of the Colonies of the British Empire. 1 vol. London, 1839, pp. 23—25 and Appendix.

Contains a sketch of the History of Trinidad prior to 1797. There is also an account of the topography and geology, the latter very inaccurate. The statistical part of this work is useful and is mainly compiled from the Blue Books and official papers.

Martin, (Robert Montgomery.) The British Colonies. 12 Divisions. No date. Div. 8, p. 136.

Martin, (Robert Montgomery.) History of the West Indies. 2 vols. London, 1836, vol. i. p. 171.

Mills, (Arthur.) Colonial Constitutions. 8vo. London, 1856. pp. 264—271.

Contains a short account of the constitution of the Government of the Colony, with lists of Orders in Council and Parliamentary Papers.

Raynal, (Abbé.) A Philosophical and Political History of the Settlements and Trade of the Europeans in the East and West Indies. 3 vols. 8vo. Glasgow, 1811. vol. 2, pp. 337—341 and p. 424.

A sketch of some circumstances connected with the discovery, position, &c., of Trinidad, and of its first colonization.

Robinson, (H. B.) Memoirs of Lieut.-General Sir Thomas Picton, G.C.B. 2nd edit. 8vo. 2 vols., London, 1836. vol. 1, pp. 41—227.

Contains an account of some transactions during the administration of Governor Picton, and also of the trial of the latter.

[SANDERSON, (JOHN, M.D.)] A Political Account of the Island of Trinidad from its Conquest by Sir Ralph Abercrombie in the year 1797 to the present time, in a letter to His Grace the Duke of Portland. By a Gentleman of the Island. London, 1807.

Much information as to the condition of the Colony in the years 1797—1805 may be gleaned from this book. As an Appendix are added some letters written in support of the prosecution of Governor Picton.

SEWELL, (W. G.) The Ordeal of Free Labor in the British West Indies. 2nd edit. London & New York, 1862. pp. 96—140.

Remarks on the results of Emancipation and discusses the question of Asiatic Immigration.

SOUTHEY, (Capt. THOMAS.) Chronological History of the West Indies. 3 vols. 8vo. London, 1827. vol. 3, *passim.*

An account of the chief events of interest in connection with Trinidad from 1797 to 1816.

TROLLOPE, (ANTHONY.) The West Indies and the Spanish Main. 8vo. London, 1860. pp. 206—222.

An account of a short visit to Port-of-Spain.

UNDERHILL, (EDWARD BEAN.) The West Indies; their social and religious condition. London, 8vo. 1862. pp. 13—91.

General remarks on the population and condition of the Island, mostly from a Baptist Missionary point of view.

§ 2. *Natural and Economical Science.*

ANDERSON, (ALEXANDER WILLIAMS.) Essay on the Cultivation of the Sugar-Cane in Trinidad. Port-of-Spain, 1848.

CAIRD, (HENRY WILLIAM, M.A.) On Earthquakes. Transsactions of the Scientific Association of Trinidad, p. 13.

CRUGER, (HERMAN.) Die Entwickelung der Blume von *Napoleona imperialis* Beauv. Botanische Zeitung 1860. pp. 361—366.

On the flower-organs and on the affinities of *Napoleona*.

CRUGER, (H.) Zur Kenntniss der Hymenophyllaceen von H. Crüger. Botanische Zeitung. 9 Nov. 1860.

Observations, accompanied by figures, on the fructification of the genera *Trichomanes* and *Hymenophyllum*.

CRUGER, (H.) Notes on the Fecundation of Orchids and their Morphology. Linnean Transactions, 1864.

Refers more particularly to the agency of Insects in the fertilisation of *Catasetum* and *Coryanthes*.

CRUGER, (H.) On the Meteorology of Trinidad. A Paper read before the Scientific Association of Trinidad. Illustrated by Diagrams. With an Obituary Notice of the Author, by Alexander Williams Anderson. London, 8vo. 1864.

CRUGER, (H.) A Descriptive Catalogue of the Collection sent from the Island of Trinidad to the International Exhibition of 1862. London, 1862.

Contains much useful information on the vegetable products of Trinidad.

DEVERTEUIL, (LOUIS ANTOINE AIME, M.D.) Essay on the Cultivation of the Sugar-Cane in Trinidad. Port-of-Spain. 1848.

DUNCAN, (PETER MARTIN, M.B., F.G.S.) On the Fossil Corals of the West Indies. Quarterly Journal of the Geological Society, vol. xix, p. 412.

Descriptions of the fossil corals of the West Indies, chiefly of Antigua. Reference is made to the Trinidad species at the page cited.

DUNCAN, (P. M., M.B , F.G.S.) On the Miocene Beds of the West Indies, the Chert Formation of Antigua, and the lowest Limestone of Malta. Geological Magazine, vol. 1 (1864) p. 97.

DUNDONALD, (EARL). Brief Extracts from the Memoranda of Lord Dundonald on the Uses, Properties, and Products of the Bitumen and Petroleum of Trinidad. London 1857 Folio.

DUNDONALD, (ADMIRAL LORD.) Notes on the West Indies. London 1851.

GRISEBACH, (A.H.R., M.D., F.L.S.) Flora of the British West-Indian Islands. London 8vo. 1864.

Descriptions of the Genera and Species of West-Indian Plants, including those of Trinidad.

GUPPY, (ROBERT JOHN LECHMERE.) On the Older Parian Formation in Trinidad. Proc. Geologists' Association vol. 1, p. 267, and 'Geologist' 1863, p. 204 and 363.

This paper contains evidence to show that the "Older Parian" strata in Trinidad belong to the same formation as that exposed at Cumana in Venezuela, and that they are of Neocomian age as previously supposed.

GUPPY, (R. J. L.) On some Foraminifera from the Tertiaries of Trinidad. Transactions of the Scientific Association of Trinidad, p. 11. 'Geologist' 1864 p. 160.

Announces the discovery of *Nummulites* and *Orbitoides* in strata at San Fernando.

GUPPY, (R. J. L.) On Acclimatization. Trans. Scientific Association, p. 19.

GUPPY, (R. J. L.) On later Tertiary Deposits at Matura on the East Coast of Trinidad. Trans. Scientific Association, p. 33. Geological Magazine, vol. 2 (1865) p. 256.

GUPPY, (R. J. L.) Descriptions of New Species of Fluviatile and Terrestrial Mollusca from Trinidad. Ann. and Mag. of Natural History, 3 ser. vol. xiv, p. 244.

GUPPY, (R. J. L.) On the Terrestrial and Fluviatile Mollusca of Trinidad. Ann. and Mag. of Natural History. 3 ser. vol. xvii, p. 42.

GUPPY, (R. J. L., F.G.S.) On Tertiary Brachiopoda from Trinidad. Quart. Journ. Geol. Soc. vol. 22, p.

GUPPY, (R. J. L., F.G.S.) On Tertiary Echinoderms from the West Indies. Quart. Journ. Geol. Soc. vol. 22, p.

These two last papers include descriptions and figures of one new species of Echinoderm and three of *Terebratula* from Trinidad.

GUPPY, (R. J. L., F.G.S.) On the Relations of the Tertiary Formations of the West Indies. Quart. Journ. Geol. Soc. vol. 22, p.

Contains lists of all the Middle Tertiary Mollusca determined from Trinidad and the other West Indian Islands.

GUPPY, (R. J. L.) and HOGG (JABEZ, F.L.S.) On the Lingual Dentition of some West-Indian Gasteropoda. Linnean Transactions. 1867.

GUPPY, (HENRY FRANCIS JEUNE, F.A.S.L.) Notes on the consumption of Spirituous Liquors in Trinidad. Trans. Scientific Association, p. 81.

JONES, (PROFESSOR THOMAS RUPERT, F.G.S.) The Relationship of certain West-Indian and Maltese Strata as shown by some *Orbitoides* and other Foraminifera. Geological Magazine, vol. 1 (1864) p. 102.

KERNAHAN. See SWIFT.

LAW, (THOMAS) Suggestions how to establish and cultivate an Estate of one square Mile of Land in Cacao. Trans. Scientific Association, p. 65.

LEOTAUD, (ANTOINE, M.D.) Du Chocolat. Trans. Scientific Association, p. 25.

LEOTAUD, (ANTOINE, M.D.) Oiseaux de l'Isle de la Trinidad. Port-of-Spain, 1866.

Contains systematic descriptions of all the species of birds, 297 in number, which the author has found in Trinidad.

MITCHELL, (HENRY STUART, M.D., Ph. D.) Suggestions for increasing the Quantity and improving the Quality of Trinidad Sugar. Port-of-Spain. 1848.

MITCHELL, (The Hon. HENRY S., M.D., Ph. D.) On the Megassicator of Mr. H. Warner. Trans. Scientific Association, p. 53.

NUGENT, (Dr.) On the Pitch Lake of Trinidad. Transactions of the Geological Society, 1 ser. vol. i, p. 63.

PURDIE, (WILLIAM.) Report on the Porto-Rico Exhibition, the Agriculture of that Island, &c. Port-of-Spain, 1854.

Contains some good remarks on the state of Porto-Rico, chiefly in reference to Agriculture.

REINHARDT (J.) and LUTKEN (C. F.) Bidrag til det Vestindiske Oeriges og Navnligen de Dansk-Vestindiske Oeers Herpetologie (West Indian Herpetology.)
Reviewed in the Natural History Review, vol. 3, p. 521.
Reference is made to the Trinidad species.

SWIFT (FREDERICK JENNEY) and KERNAHAN (WILLIAM.) Essay on the cultivation of the Sugar-Cane in Trinidad. Port-of-Spain, 1848.

WALL (GEORGE PARKES) and SAWKINS (JAMES G., F.G.S.) Report on the Geology of Trinidad. London. Royal 8vo. 1860.

The Report of the Government Survey on the Geology of Trinidad. The descriptive, stratigraphical, and economical geology is treated in detail. The appendices give details of some of the strata, and accounts of the salses and bituminous deposits. Mr. Crüger's paper on the Flora, originally published in Dr. DeVerteuil's work, is here reprinted; and there are some insufficient and inexact notices of the fossils.

NOTICES AND ABSTRACTS OF SCIENTIFIC MEMOIRS.

Petroleum and Oil-Fields.

In the March number of the "Geological Magazine" we find a review of some recent books on Petroleum and Oil-Fields. In the course of this review the writer takes occasion to remark on the absence of satisfactory information as to the geological history of bitumen and bituminous fluids. Differing in this respect from coal, which usually occurs in a definite manner in certain formations, petroleum has been obtained from nearly all of the formations. So multitudinous are the modes of its occurrence, so concealed are its hidden sources, if apparently of recent origin, or so utterly lost, if of ancient date, that it is scarcely a wonder that geologists have allowed it to retain a known but an unexplained existence; that, at the best, but hazy ideas of the truth have been thrown out amongst a host of unnatural theories. Two theories have met with more favor than others. These seem to be "special mineralization" and "distillation."

The reviewer then goes on to remark that the best evidence in favor of the first-mentioned theory, that of Mr. G. P. Wall, appears to be defective in that it does not supply the necessary connection in the series of phenomena alleged to take place on the conversion of vegetable matter into asphalte.

Having examined and explained the distillation theory which in his view is the more plausible, and which ascribes the origin of asphaltic deposits to pre-existing bituminous formations (such as coal, &c.) the reviewer sums up the evidence in favor of each of those theories, very much in favor of that of distillation.

It may be said, at first sight, that both the given theories are equally inadequate to assist the practical man: that, according to either, bituminous substances may be found impregnating the earth in any formation. But reflection will show that if the geologist makes himself thoroughly acquainted with the structure of a district he will probably acquire some means of judging as to the probability of the occurrence of hydro-carbons therein.

In the May number of the "Geological Magazine" Mr. George P. Wall F.G.S. replies to the remarks on his views contained in the review just noticed. Mr. Wall details briefly the proofs on which the origin of bitumen by direct conversion from wood is founded, and shows from geological evidence the probability of this theory, and the improbability of the view that the bitumen is derived from pre-existing carbonized vegetables.

The mineralization of vegetable substances, whether tending to the production of coal and lignite or bitumens, is accompanied by the production of gases and especially of hydro-carbons. Over the whole bituminous area in Trinidad and Venezuela, wherever the liquid petroleums are issuing from the surface they are accompanied with an emission of gas more or less inflammable and frequently associated with water and mud. It is evident that the pressure of the gases generated in the production of the bitumens is the active agent in the delivery of the oil and water, which arrive at the surface perfectly cool. These oils and pitchy substances rapidly lose their volatile and solvent principles and consolidate; where exposed to the solar action a further evaporation takes place and a hard brownish-black bitumen remains, possessing a considerable proportion of earthy impurity. Wherever the surface is favorable for the accumulation of the pitchy discharges, the bitumens, still plastic, flow together from various centres of emission and coalesce into a more or less extensive aggregation of the substance. The "Pitch Lake" of Trinidad is merely an instance of this coalescence on a larger scale than usual.

Mr. Wall then shows that this view of the production of bitumen, (namely, by direct conversion) is not new, having been expounded by Bischof twenty years ago.

Some remarks follow as to the production of bitumen from animal remains for which there are many well-known evidences, among which is the mountain limestone (of Derbyshire &c.) which, where highly fossiliferous, contains bitumen in the cracks and joints, evidently derived from the animal substance of the fossil remains.

R. J. L. G.

At the Academy of Sciences (Paris,) on April 23, Mr. Berthelot presented a note "On the Origin of Carbides and combustible Minerals," in which the author, starting with the hypothesis of Mr. Daubrée that free alkaline metals may possibly exist in the interior of the globe, supposes that carbonic acid comes into contact with these metals, and passes through a series of chemical changes resulting in bitumen, petroleum, &c. Thus the author conceives a purely mineral origin for these natural carbides. (See the *Chemical News*, 5th May.)

R. J. L. G.

The Origin of Petroleum.

In a lecture recently given by Professor Ansted, at the Royal Institution, "On the Mud Volcanoes of the Crimea," an attempt was made to show a connection between this peculiar form of volcanic action and the existence of petroleum, and the relationship of both to great lines of geological disturbance. In Sicily, during the commencement of the late eruption in the Bay of Santorin, a jet of muddy water at a high temperature was thrown out on the flanks of Etna, containing a slight quantity of petroleum, or naphtha. This was an instance of the outburst or first stage of the mud vulcano. The great district of the Crimea, extending over 2,000 square miles, was next described, some of the mud volcanoes being of considerable age and of great size; one near Kertch, described by Strabo, and in eruption 70 years since, being a mile and a-half round at the base, and 250 feet high. Although no organic deposits were certainly known in the Crimea, the rocks were such as to indicate the likelihood of their existence. Those of Java were also noticed as running into connection with the same line as the petroleum springs of Rangoon. In Mexico and Trinidad the association was also pointed out; the same was the case in the Appennines, and on the flanks of the Alps were the famous asphalte beds of Seyssel. The lecturer considered the rock oils to be the result of slow volcanic distillation from beds of organic matter, and endeavoured to draw the inference that the particular conditions of the mud volcanoes should prove a clue to the presence, in the subterranean rocks, of petroleum.

The Bamboo as a Paper Material.

The bamboo, which grows abundantly in most of the West India Islands, has been for some time past largely exported from Jamaica to New York in bales and bundles for the purpose of being manufactured into paper, and has proved quite as valuable as rags. The value of the bamboos growing in Jamaica has been estimated as high as £150,000. The bulk of the article stood hitherto, however, in the way of shipment. Made up into bundles of large dimensions, the hold of a vessel was soon filled, and captains did not care to take it as freight, any vessels so laden becoming top-heavy. To prevent this, the vessel had first to be stored with heavy cargo on her ground tier, thus allowing less space for bamboo. To obviate this, efforts have lately been made with success in the island to crush the bamboo between mill-rollers, and, by screw pressing, pack it into bales, as is now done with esparto and other bulky fibres.

On *Rhynchoprion penetrans*. By Prof. H. Karsten.

In the "Annals and Magazine of Natural History" (3 ser. vol. xv, p. 293) Professor Karsten gives an account of the Nigua or Chigo, *Rhynchoprion penetrans*, (*Pulex penetrans* Linn.) After remarking upon the imperfect knowledge we still possess of this curious parasite and giving its synonymy and a list of the authors who have described it, Prof. Karsten shows that the species is confined to tropical and subtropical America, ranging from Virginia in about 30° N. to Paraguay in 29° S. The insect is always met with in the vicinity of human habitations. Occupied or deserted leaf huts made by field-laborers or travellers for temporary shelter usually become the dwelling-places of small mammalia, which seek shelter from the rains, and these animals then serve for the preservation and increase of any progeny of the Nigua that may have been left behind by the travellers: hence it is that such places often particularly abound in Niguas, which attack new-comers in great numbers.

After accounting for the greater liability of newly-arrived strangers to the attack of this insect the author states that the Nigua is a parasite during one period only of its life; for the impregnated female alone bores into the skin of warm-blooded animals: the unfecundated females and the males do not live parasitically. The dark brown color of the contents of the stomach in the animals which are found running about indicates that, like the allied fleas, they live on blood.

The consequences of the parasitism of the Nigua are then considered and it is admitted that these may, in bad constitutions, amount to the destructive effects cited by various writers. He also remarks on the swelling of the inguinal glands observed by Ulloa and Jussieu, and states that it occurred in his own person at La Guayra. This swelling of the inguinal glands led the authors mentioned to believe that a second species exists, but Prof. Karsten is doubtful on this point.*

When the animal has become quiescent in its dwelling-place under the skin it produces little uneasiness unless the spot be irritated by pressure or friction, in which case

* The compiler of this notice can add his testimony as to the swelling of the inguinal glands produced by the Nigua; but it was his impression that the swelling was aided by the pressure of the boot on the wound caused by the Nigua. The animal was extracted, and is now in the possession of Mr. Jabez Hogg, F.L.S.—R. J. L. G.

inflammation supervenes just as in a frozen limb. The increased heat and softness of the skin in consequence of the inflammation attract other Niguas and facilitate their penetration in the vicinity of the first one. This is the cause of the juxta-position of several Niguas described by various writers, and not, as stated by all authors since the time of Oviedo, the exclusion of the larvæ from the eggs in the wound or in the uninjured body of the mother. The author supports this conclusion by showing that the eggs are excluded singly and that the female never contains larvæ.

"The extraction of the parasite from the skin is, as stated by Gurnilla, far more easily effected at a later period than in the first hours and during the penetration, because then the animal which is working briskly, only increases its efforts by the aid of its mandibles, which are peculiarly adapted for the purpose, and indeed fastens these so firmly in the skin that they are not unfrequently torn away from the body of the flea, and remain sticking in the skin when the animal is removed with violence. As early as the next day the voluntary activity of the animal is much diminished, and then, but with still more certainty after the lapse of a few days, with a little care the epidermis may readily be pushed aside with a blunt knife or needle all round the flea, without injuring the latter, and thus the globular animal may be so far exposed that these instruments, or a fine pair of forceps, may be got under its body, and it may then be removed without much resistance and by slight pressure with all the buccal organs which project far into the true skin (the roots or filaments of Sloane, Ulloa and Swhartz). But if in removing the dilated and delicate body, which adheres more or less closely to the surrounding cellular tissue of the skin, we proceed so clumsily as to tear it, so that a portion of it, with the piercing-apparatus imbedded

in the corium, is left behind in the skin, lymph flows continually from the wound, and a purulent condition soon setting in converts the originally small wound into a more or less extensive sore."

The author then discusses the question as to whether there are two species of Nigua or only one, and decides in favor of the latter opinion. He next gives a very complete account of the anatomy of the animal, which is illustrated by two well-executed plates. He concludes with some remarks on the propriety of the separation of *Rhynchoprion* as a distinct genus from *Pulex*.

R. J. L. G.

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Price: Five Shillings.

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

Part II. — JUNE 1867.

BRITISH MUSEUM NATURAL HISTORY

CONTENTS.

PORT-OF-SPAIN:
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1867.

Part I. may be had of the Secretary; price to Members, 2/6, to non-Members, 5/.

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

Part II.] [June 1867.

Friday, 4th January, 1867.

The Association met at Dr. Kelaart's, Colombo House, San Fernando.

William Casper Kelaart, M.R.C.S.L., &c., in the Chair.

John Herbert Trollope, Esq., Port-of-Spain, was elected a Member.

The following donations were announced :—

1. " On the Tertiary Mollusca of Jamaica ; On Tertiary Brachiopoda from Trinidad ; and On Tertiary Eclimoderm

from the West Indies." By R. J. Lechmere Guppy, Esq., Presented by the Author.

2. "On the Relations of the Tertiary Formations of the West Indies. By R. J. Lechmere Guppy, Esq., F.G.S. With a Note on a new Species of *Ranina*, by Henry Woodward, Esq., F.G.S., and on the *Orbitoides* and *Nummulinæ*, by Prof. T. Rupert Jones, F.G.S." Presented by R. J. Lechmere Guppy, Esq., F.G.S.

The following communication was read :—

On Earth Closets. By the Hon. Henry Mitchell, M.D., Ph.D.—Mr. James of Halton, Weston Furville near Triny, in writing to the *Times* says : "The process of deodorisation by earth referred to in Dr. Hawkesly's letter in the *Times* of Friday last may be seen in full operation on Baron Rothschild's estate here. Any one taking an interest in the improvement of the condition of the poor and the state of our rivers, would do well to satisfy himself of the truth of Dr. Hawkesly's views by a personal inspection of the whole process.

In the earth-sheds here he may see excrementitious matter on its first removal from the closets, and in barrels dried and ready for the corn and turnip drills, in all its stages perfectly inodorous, even when subjected to the fiercest summer heat. The deodorisation may be effected either by the rough and ready application of a shovelful of garden earth every day, or by the more refined and perfect apparatus patented by the Revd. Mr. Moule. It is with this little machine that the Halton closets are fitted; they are cheap, self-acting, and cannot get out of repair. To the benefit conferred by them on the poor, the cottagers themselves will speak. There are yet enough of the old cesspools remaining to enable a visitor to appreciate at a glance the perfection of the earth-closet system. I can see no reason why this system cannot be adopted by towns; it is inexpensive and most efficacious, requiring no better engineer than a journeyman carpenter. The earth may be taken in at long intervals and stored like coals, while the cesspools may remain unemptied for 3, 6 or 12 months according to their size, or the convenience of the tenant, without causing the smallest annoyance. With rare exceptions, existing water-closets and cesspools are available for the earth method, and are readily adopted at a very trifling expense."

The preceding is extracted from a late *Times* paper.

In confirmation of the advantages offered by adopting the above system, I would draw attention to the fact that the water-closet on my own premises has never been in use for the last ten years, and although the inmates of the house are numerous, above twelve, the substitution of the dry earth system has, during that time, given entire satisfaction; the deodorising influence is complete, and the receptacles are emptied without disgusting those employed. This is a matter of great consequence where the laboring classes exhibit, as they do here, such repugnance to removing night soil, and though last not least, the refuse, being inodorous, is a valuable manure, not only for the field farmer, but for the more fastidious florist. Why an application so long before the public and of such value in a sanitary as well as agricultural point of view should have been hitherto entirely neglected in this colony, it is difficult to understand. We have Liebig's assurance that the excreta from a single individual are sufficient to manure an acre of cereals; if so, the amount furnished by the laborers and stock on each estate in this colony would, with anything like due economy, suffice for its individual wants, and thus avoid the enormous annual outlay for imported mineral manures. As to the specific value of the manure, farming experience in England has already shown that the same portion of earth can be repeatedly used for absorbing and deodorising, and that when it has served for this application seven times in succession, it is still free from all unpleasant smell, and equal to superphosphates in the turnip-fields; its influence, however, being more durable and perceptible for three successive years. It may not be amiss to add that no manure is more useful in breaking up the tenacity of clay soils and reducing them to a rich and mellow loam. Late papers assure us that, besides the employment of Moule's patent earth-closets by individuals, companies are being formed in several localities for introducing what may be termed the dry conservative mode into towns. All true cultivators of sanitary laws must hail this adaptation with unfeigned satisfaction; for the earth-closet will not only free the inhabitants of towns from the evils inseparable from the best-executed system of water-closets, such as regurgitation, bursting of pipes, and the continuous exhalation of poisonous gases to which the Windsor epidemic of Typhoid fever was due, but present him with a system which can be carried out most inexpensively. The first cost is the supply of dried earth, and that I should think any agriculturist in the neighbourhood of our town would willingly supply, on condition of receiving it back when its absorbent and deodorising powers were exhausted. This system of dry conservation is no longer in its infancy, no longer confined to the brains or cabinets of theorists, but a matter realised in daily practice and admirably suited to tropical climates. The deodorisation of the closets is immediate and complete, as it was, no doubt, in the days of

Moses, when first recommended. It is scarcely necessary to adduce anything further in favor of a practice so sound that it is in general use by the feline tribe who most require it.

Tuesday, 12th February, 1867.

The Hon. Henry Stuart Mitchell, M.D., Ph.D., President, in the Chair.

Walter Darwent, Esq., C.E., was elected a Member.

Robert Swift, Esq., 1618 Locust-street, Philadelphia, U. S., was elected a Corresponding Member.

The following donations were announced:—

1. The Quarterly Journal of the Geological Society. No. 86. Presented by R. J. Lechmere Guppy, Esq., F.G.S.

2. The "Geologist" for December 1862. Presented by R. J. Lechmere Guppy, Esq., F.G.S.

Also the following, not previously announced:—

"A Week at Port-Royal." By the Hon. Richard Hill. Presented by the Author.

The President read the following Obituary Notice of Dr. Antoine Léotaud:—

It is with deep sorrow that I have to announce to the Association the death of one of its most respected members. You are all aware that it is Dr. Léotaud to whom I allude.

Dr. Léotaud was born in this Island in 1814. He was educated in France and studied medicine in Paris, where he took the degree of M.D. Since his return to his native country Dr. Léotaud's life was devoted to Science. For his medical works he received the gold medal of the Paris Society of Medicial Practice and that of the Medical Society of Ghent. His great love of the natural sciences was displayed by his pursuit of Ornithology, upon which subject he contributed an essay to Dr. de Vertenil's work, published in 1858. The magnificent collection of Birds, the work of his own hands during seventeen years, bears witness to his industry and his zeal for Ornithology. That collection was generously presented by Dr. Léotaud to the Colony, and is at present temporarily deposited in the Council Room, the Island not yet being in possession of a Museum. Last year Dr. Léotaud published a complete account of the Birds of the Colony, which has been noticed in our transactions, and which alone would be a monument of the ardor and success with which he had studied.

Dr. Léotaud also devoted some part of his time to Ichthyology, and he contributed a catalogue of the genera of Trinidad Fishes to Dr. de Verteuil's work before alluded to. The exposure to which he was subject in the pursuit of these branches of Science, doubtless contributed to that breaking up of his constitution which eventually resulted in his death.

Previous to his illness Dr. Léotaud had been a constant attendant at the Meetings of the Association, and on more than one occasion he favored us with his views on Scientific and Medical subjects; and at one of our Meetings he read a paper on Chocolate, which is printed in our Transactions. For the last fifteen months, however, the increasing ill-health of Dr. Léotaud has prevented him from attending our reunions. He died on the 23rd January last, after a long and severe illness borne with great patience and resignation.

The Secretary read the following Report for the past year:

ANNUAL REPORT FOR THE YEAR 1866.

I beg to present the following short report upon the condition, financial and otherwise, of the Scientific Association for the past twelve months.

With regard to our Members; we have lost one by resignation; we have elected five Members, one Honorary Member, and one Corresponding Member, leaving as the total number on the 31st December:

Members	18	
Honorary Member	1	
Corresponding do.	6	—Total..25

being an increase in all of 6 since the previous year.

The following is the balance sheet of the Association. I may remark that though the balance on the 1st January appears to be large, yet the whole of it is required for the expenses connected with the publication of the current part of the proceedings:—

The Treasurer in account with the Scientific Association.

RECEIPTS.	$	¢	PAYMENTS.	$	¢
Balance, 2nd Jan. 1866	29	72	Printing	27	90
Subscriptions received	46	50	Postage	4	98
Papers sold	1	40	Stationery	0	40
			Balance, 31st Dec. 1866	44	34
	$77	62		$77	62

The papers that have been read are but few in number, and were all contributed in the latter part of the year, their titles are as follows:—

The Hon. H. Mitchell, M.D., Ph.D.—On the Use of Sulphites in Medicine.

Mr. R. J. Lechmere Guppy, F.G.S.—Catalogue of the Land and Freshwater Mollusca of Trinidad.

Idem.—Note on the Earthquake of 26 Sept., 1866.

The Hon. F. Goding, M.D.—On the Petroleum and the Manjack of Barbados.

The Association is to be congratulated on the completion of the First Part of the Bibliography of Trinidad, which has appeared in the proceedings, and which cannot fail to be of great use to those in any way interested in the Colony.

One of our members having volunteered to give us a statement of the progress and condition of Science here, it is therefore unnecessary for me to extend this report to the subject.

HENRY F. J. GUPPY,
Secretary & Treasurer.

The following communications were read:—

1. *Remarks on the Cultivation of Scientific Knowledge in Trinidad.* By R. J. Lechmere Guppy, Esq., F.G.S.

The progress of Science within the last few decennia has been so great and so irresistible that I feel sure that I shall have the indulgence of the Association in beginning this communication, intended in some sort as a supplement to our Secretary's Report for the past year, with some remarks drawn from the works of one or two of the leading thinkers of the present day, whose inquiries serve to point out the direction in which Knowledge is tending.

The great distinction between man and brute is the possession by the former of the means and the ability to accumulate and classify Knowledge. Simple Knowledge is that slowly organized classification of elementary experiences forced upon man by his helpless state at his entrance into the world. But the preservation of his daily existence depends upon the accuracy with which he observes, classifies and infers the properties of objects, their order of co-existence and succession. He has to find his friends and his foes amid the multitude of forces which surround him. Each has to be carefully watched and tested; the dearest friend often proving the direst foe under trifling changes of conditions. The spontaneous activity of man's intellect urges him to the construction of schemes by which the various phenomena may be connected; he links the known and accessible to the unknown and inaccessible. Thus Philosophy emerged from Knowledge. As Civilization advanced, Knowledge became more extensive and precise, Philosophy took a wider range. Arts arose, which preserved and transmitted the common fund of knowledge. Those great nations which duly cherished this heirloom and increased its store, magnified their existence and became the glory of our race. Those nations which neglected it perished, or continued barbarous; that is, comparatively helpless and miserable.*

In placing before you some remarks on the character and aims of Science I feel that I cannot do better than again to quote the words of the writer from whom I have drawn the preceding sentences. Science, he says, acquires her dignity and power from her disinterestedness. Although her researches, even in the remotest regions, are always eventually beneficent among our daily uses, although the most abstract speculations ultimately contribute to the satisfaction of our vulgar needs, it is not with this view that researches are undertaken. It is well, indeed, that it should be so, for if Science did not possess an interest of its own,

* George Henry Lewes: Aristotle, a Chapter from the History of Science, pp. 24, 25.

who among mankind would undergo the laborious study and the utter self-denial which characterize the patient seeker after Knowledge. For Use is secondary and derivative, the primary object is elucidation of the Truth. All Truth is beneficent; but her seekers desire to behold the serene splendor of her face, and not themselves to reap the benefits which spring up on her track.*

This attitude was first assumed by the Greeks. Their philosophers were content to seek wisdom as the one great object without directly subordinating their search to Religion or to Use. In doing so they incurred serious peril. The bitter hostility of theologians has in all ages been directed against the scientific attitude as essentially irreligious, because it seems to exclude the constant agency of the gods, and apparently destroys the moral feelings connected with this agency. But that this is a mistaken view is shown to be the case by the fact that this hostility has gradually grown feebler and is now entirely restricted to narrow or imperfectly cultivated minds. The change has been effected partly by the irresistible progress of Science with her triumphant demonstrations, and partly by a deeper philosophy which has disclosed that Science can only destroy false explanations which it is for our welfare to have destroyed. No truth can be shaken by Science. If in her own path she detects certain truths, these must necessarily be harmonious with all other truths. We must learn to welcome all and to prove all.

Even those bigoted minds which still regard with alarm the steady advance of Science, must admit the fact of its advance, the greatness of its victories, the triumph of its

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* Lewes' Aristotle, p. 42.

method, and the certainty of its continuing to extend its empire. In minds of larger culture or of less jealous narrowness there is a complete cessation of the old antagonism; a gradual approximation is being made between theology and science, and a more candid recognition of their mutual claims in regard to the grand religious and moral ideas which must ever regulate the movements of society.*

Science, yet in its youth, tends constantly to free man from the chains in which he has been bound by superstition, by making known to him the conditions of his existence and enabling him to direct his aim towards those objects which aid him in securing happiness; relieving him from the unnecessary trammels which have been imposed by a dim perception only of what is good for him. Those who oppose or sneer at Science should recollect that the necessary consequence of their views being carried out would be the complete destruction of civilization and of its results. And in our day it is so certain that the progress of Science is so absolutely irresistible and so accelerated that it is merely a question with each community whether it shall help the stream or suffer itself to be borne by it. In the latter case it must perish or suffer itself to fall into a state of barbarism more or less complete.

Those who wish to pursue these views farther will find in the works of Lewes and Herbert Spencer the latest exposition of the principles which indicate the course of modern Science; and I may refer to the address of the President (Mr. Grove) to the British Association at their Meeting last year for an example of the mode of treatment adopted in scientific questions by modern philosophy. It is to the pro-

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* Lewes, *op. cit.* pp. 43, 44.

mulgation of the principles I have alluded to that we owe such works as those of Mill, Buckle and Lecky.

Aristotle found it necessary to defend Biology even among the Greeks, of whose high intellectual advancement we have so many proofs in their literature, their public and private life, and their works of art scarcely as yet surpassed by the most diligent efforts of moderns. The Greeks were the true founders of Science as distinguished from unclassified knowledge—a mere mass of experiences without shape or order. But it was reserved to the moderns to use the great instrument of induction, of which the Greeks had as yet only a perception, and which Bacon indicated as the true Method.

In the darkness of the mediœval period Science was almost entirely neglected. But even in our own days when Science has made so vast a stride, and when we obtain a glimpse of the glorious part it has to play in the development and advancement of mankind, such a defence as that of Aristotle is not wholly superfluous: for we hear from grave men, too facile in contempt of what they do not understand, protests against "a trivial curiosity respecting flies and tadpoles.*

Now, as to the limits of Knowledge. I have already stated in the words of Lewes that all Science is beneficent even among our daily uses. Even were it not so, the mere pecuniary advantages gained by the increased intelligence produced in mankind by its cultivation would pay for all the time and labor spent in its prosecution. But the fact is, there is no such thing as useless knowledge. People always inquire for the practical application of this and the other study, but not seeing any they often condemn such as useless. But God made nothing in vain. It is neces-

* Lewes, *op. cit.* p. 296.

sary for us, nay, our very existence depends upon our knowledge of the laws of nature; and to acquire this we must make use of every help to knowledge that we can obtain. I may be answered that hitherto the world has got on well enough. But is there not far too much misery and suffering in the world? Can any one deny that mankind, or by far the greater part of mankind, is really and truly in a state of abject slavery? And the more civilization advances the more this will be the case unless there is some counteracting tendency. This counteracting tendency can only be Science, man's sole hope for the future, his redemption in fact. I urge it now and in this Colony for our own sakes; for should this advice be rejected, and should we be content to shuffle on as hitherto without a ray of light to illumine our darkness, I do not fear for Science, in spite even of the number of those who ignorantly oppose her progress, but who should be the first to welcome her in consideration of the benefits to be received from her. I could, without difficulty, give you examples of the advantages to be derived from that knowledge so often called useless, but you will agree with me that our limits will not admit of it. Neither do I expect that any one who does not already agree with me is to be convinced by my feeble efforts; but I hope that I may in some measure be the means of directing their attention to these subjects, and no man can study Nature without perceiving the truth of what I say. And even the most casual observer, if he will try to trace out conscientiously the exact boundaries of what he may consider useful and useless knowledge, will find how hopeless is the task, and how ill-founded is the idea that any knowledge is useless.

Coming home to our own progress in matters of Science, we may congratulate ourselves that the Association has at last obtained some standing in respect to the publication of its papers. We have decided to publish our papers, together with a detail of the proceedings at the Meetings and Notices of Scientific Memoirs published elsewhere, in the form of a half-yearly Journal, of which the first number is already in your hands.

The first paper contained in the Journal is one by Dr. Mitchell on the Use of Sulphites in Medicine. As Dr. Mitchell has brought forward a subject which cannot but be of interest to all who value health in this island, having reference as it does to the proper remedies for the peculiar diseases of a tropical climate, I shall introduce some remarks on investigations of a similar tendency which have been made elsewhere. We learn from the researches of Dr. Salisbury in the United States that it is highly probable that intermittent fever is caused by the action on the system of microscopic vegetables which have their origin in swamps, (and particularly in those swamps it would seem which are formed by an admixture of fresh and salt water*). But it is further interesting on this point to notice the investigations made by Dr. Wood of Philadelphia, who has found that the air of large towns has a remarkable effect in destroying miasmata. It is suggested that the amount of combustion may be the cause. Of the fact itself we have some confirmation in the observations of M. de Tournon, Prefect of Rome at the commencement of the present century†, which have been brought forward by Dr. A. Tripier of Paris. According to these observations the liability of a

* De Verteuil, Trinidad, p. 152.

† Etudes Statistiques sur Rome et la partie occidentale des Etats Romains. Paris.

place to intermittent fever is less as the population is concentrated; the danger invariably diminishing in proportion to the density of the habitations. M. de Tournon shows from historical data that those parts of the Pontifical States which were unhealthy in 1810 (as they are now) were formerly densely peopled and covered with habitations and were salubrious. At a later date when the local population had been destroyed and the Romans had been drawn off in great numbers by incessant wars, unhealthiness began to arise from the depopulation and from the substitution of pasture for arable lands. By means of this hypothesis Dr. Tripier explains the continued exemption of Paris from intermittent fevers, in spite of the constant disturbance of the soil in that city in the course of the improvements going on there. These questions cannot yet be considered as approaching to a final settlement; for to take M. de Tournon's case, we know that there have been oscillations of level in Italy which may have increased the extent of swamp in that country. It would be interesting to learn from the medical men of these colonies how far the views expounded by Dr. Wood and M. Tournon are borne out here: and it would not be without importance to determine what the influence of trees may be in diminishing liability to fever.

The other papers printed in the "Proceedings" are enumerated in the Report of your Secretary. There is only one other I shall touch upon, and that is the interesting memoir by Dr. Goding on the Petroleum of Barbados. I may remark in reference to this paper that although the Scotland formation of Barbados differs much in composition from the Miocene beds of Trinidad, yet we have resemblances in the occurrence of petroleum and other carbonaceous deposits and of large quantities of selenite. More-over, as I stated to you on the reading of Dr. Goding's paper, I have recently discovered one of the fossils obtained by Sir Robert Schomburgk from that formation in the middle beds of the series at San Fernando designated by me as Lower Miocene. This shell, alluded to by Dr. Goding in his paper, the *Nucula Schomburgki* of Forbes, was found by Sir R. Schomburgk in an isolated mass of rock in the Scotland formation. This rock was described as being exceedingly fossiliferous, but the fossils were imperfect. At San Fernando this shell occurs in a greenish-grey shale associated with several very curious species of molluska, which unfortunately cannot be extracted owing to their excessive fragility. The species are, however, all extinct, like those from the other beds at San Fernando, some of which have been described by me in a recent communication to the Geological Society of London.

I shall now pass briefly in review the more important additions which have been made to the literature of the island within the last year or two. Since the publication of the Geological Survey of the island the most noteworthy work relating to Trinidad which has appeared is that on the Birds by Dr. Léotaud, member of this Association. At our meeting in August last I had the pleasure of exhibiting to you a copy of this work, and I took the opportunity to lay before you a few remarks on the results attained in that book, chiefly as to distribution of the birds. You were good enough on that occasion to ask me to draw up those remarks for publication in your Journal. I shall therefore ask your indulgence whilst I place them again before you. As I observed upon the occasion referred to, this book is one that does much honor to its lamented author, and through him to the community. Had even our fauna been much better known than it is, and were we even in the position in this respect of a province of a European State, Dr. Léotaud's work would still have been of great interest and utility; but when we consider that the present work is absolutely the first which has undertaken to treat systematically of the Birds of the island, it will be seen that we have in this respect risen suddenly from a state of almost entire want of information respecting our ornithological fauna to the possession of a work scarcely inferior in scientific treatment and in fulness of descriptive detail to those of more favored countries.

Dr. Léotaud has scarcely perhaps elaborated his synonymy to the extent which might have been desirable. More information as to the distribution of the species would have been very acceptable. By the tables given we find that 23 species are common to Trinidad, North-America, Jamaica and Cuba; 18 to Trinidad, North-America and Jamaica; 9 to Trinidad, North-America and Cuba; 23 to Trinidad and North-America; 10 to Trinidad and Jamaica; 6 to Trinidad and Cuba; and 6 to Trinidad, Cuba and Jamaica. By adding together the numbers for these places we find that 73 species are common to Trinidad and North-America, 57 to Trinidad and Jamaica, and 44 to Trinidad and Cuba. This shows a closer analogy between the ornithic faunas of North-America and Trinidad than between those of the latter place and the Antilles. We have also the interesting fact that while the Birds of Cuba number 129 and those of Jamaica 185, our own island furnishes the much greater number of 297. We have no information from Dr. Léotaud on the precise differences and affinities of our fauna compared with that of South-America as to Birds; but it may readily be inferred from his remarks that he considers Trinidad an essential part of the continent in this respect. Still a comparison instituted on the one hand with the northern part of Venezuela and the Antilles, and on the other hand with the vast region comprising the river-valleys of the Orinoko and the Amazons would probably have evolved some facts of interest. It is indeed most likely that the Doctor has omitted these points more from a want of trustworthy information on the Zoology of the countries referred to, than from an unwillingness to follow out that part of the subject. But having obtained a sure groundwork in the specific determinations here given, the rest will, as Dr. Léotaud truly says, readily follow, and indeed will be a comparatively easy and pleasant task. For the scientific man in Europe can scarcely form an idea of the difficulty of determining species in a Colony without Museums and without Libraries. As regards Ornithology, now that Dr. Léotaud has given us the results of his seventeen years' labor, his work is a host in itself. And his valuable collection, so liberally presented to the Island, will, so soon as the names are attached to the specimens, put us on a very high footing, and be ample illustration to his work.

The fauna of which Dr. Léotaud treats is so large that it may readily be anticipated that but few families are unrepresented. The *Corvidæ* are the only family at all remarkable by their absence; the other missing groups being generally of limited distribution. The tribe *Dentirostres* of the order *Passeres* is remarkably well represented, having no less than 54 species. The order of *Scansores*, not a large one, has 20 species in Trinidad. I append the following analysis of the families, the arrangement being that of Mr. G. R. Gray :—

I. Accipitres.

Vulturidæ......	3 species.	Strigidæ..........	5 species.
Falconidæ......	22 ,,		

II. Passeres.

A. *Fissirostres.*

Caprimulgidæ..	6 sp.	Trogonidæ.......	3 sp.
Hirundinidæ...	10 ,,	Alcedinidæ.......	6 ,,
Coraciadæ......	1 ,,		

B. *Tenuirostres.*

Promeropidæ...	5 sp.	Certhiadæ........	12 sp.
Trochilidæ.....	16 ,,		

C. *Dentirostres.*

Luscinidæ......	8 sp.	Ampelidæ.........	5 sp.
Turididæ......	10 ,,	Laniidæ..........	3 ,,
Muscicapidæ....	28 ,,		

D. *Conirostres.*

Sturnidæ.......	8 sp.	Fringillidæ.......	25 sp.

III. Scansores.

Ramphastidæ...	1 sp.	Picidæ...........	5 sp.
Psittacidæ......	5 ,,	Cuculidæ.........	9 ,,

IV. Columbæ.

Columbidæ....	9 sp.

V. Gallinæ.

Cracidæ........	1 sp.	Tinamidæ........	1 sp.

VI. Struthiones.

(Not represented.)

VII. Grallæ.

Charadridæ....	6 sp.	Palamedeidæ.....	2 sp.
Ardeidæ.......	18 ,,	Rallidæ..........	11 ,,
Scolopacidæ....	24 ,,		

VIII. Anseres.

Anatidæ.......10 species.	Laridæ...........10 species.
Colymbidæ..... 3 ,,	Pelecanidæ...... 6 ,,

The new species described by Dr. Léotaud are the following:—

Tachyphonus albispecularis	Dendrocolaptes altirostris
Cymindis Pucherani	Empidonax Cabanisi

The foregoing list shows us that out of 54 families included in Gray's arrangement 34 are represented in Trinidad. The 20 unrepresented families are either small or of very limited distribution. The missing order *Struthiones* for example, is chiefly confined to Africa and Australia, having but two species *(Rhea)* in South-America.

My own researches among the terrestrial molluska (on which subject I have contributed a paper to your Proceedings) have shown me some reason to place the boundary between the North Brazilian or Guianan and Columbian provinces as far north as the northern limit of the tertiary formations of the valley plain of the Orinoko. Even the Columbian region, thus restricted to the north-western part of South-America, has some strong affinities with the Brazilian region, as, for instance, in the occurrence of species of *Plekocheilus (P. glaber, P. distortus)*. But similar species (i. e. *P. undulatus, P. auris-Sileni)* are also found in the lesser Antilles. It must not be overlooked, however, that the latter depart from the type of *Plekocheilus* and approach the more typical *Bulimi*. There is also a species of *Simpulopsis*, an eminently Brazilian type, in Haiti, and another in Porto-Rico. On the other hand, the truly Antillian affinities of the Columbian region are marked by such shells as *Cyclotus stramineus, Cistula Tamsiana, Chrondopoma plicatulum* and *cumanense* and *Trochatella semilirata.*

The boundary line above indicated cuts the island of Trinidad into two divisions. In the north division we find *Adamsiella aripensis* and *Cyclotus rugatus*, species which remind us of the rich operculate fauna of Jamaica, Cuba and Haiti. In the southern division *Simpulopsis* calls to remembrance the Brazilian province, and these indications seem borne out when we take the fauna of each division as a whole, although, of course, we are prepared to expect numerous exceptions owing to the migration of the molluska from one region to another.

I have already devoted so much time to an examination of Dr. Léotaud's book that I can scarcely ask you to go with me further into the work, but I would call your attention to his description of the birds called "Cacao-eaters." One of these *(Nasica susurrans)* is more particularly the subject of Dr. Léotaud's remarks, and he gives it as his opinion notwithstanding the vulgar idea that this bird destroys the cocoa-trees, that it only frequents these trees for the purpose of eating the insects which bore into the trees, and which are the real enemies of the cacao-planter. In reference to this point you will not forget Mr. Law's allusion to the destruction of the cacao-trees by the larva of a beetle. Dr. Léotaud supports his opinion by a reference to the exclusively insectivorous habits of the bird in question.*

In his preface Dr. Léotaud alludes to the fine collection of Birds so liberally presented by him to the Colony. It is to be regretted that the names have not been attached to

* It is perhaps unnecessary for me to allude to the typographical execution of Dr. Léotaud's Book. But in order to avoid any supposition of having overlooked so important a point, I here place on record my testimony that that part of the work has been most ably handled, and is equal to European work. It reflects great credit on the *Chronicle Office.*

the specimens. There is also the very fine collection of shells offered by Governor Keate to the Colony, which, it is to be hoped, we shall not lose by tardiness in accepting it. It has several times been suggested that these collections, together with the geological specimens at present deposited in the Library, and the books, specimens and instruments of our lamented fellow-member Crüger, would form a good nucleus for a museum and scientific library, and to these might possibly be added the scientific works of Dr. Léotaud, if the Colony is disposed to purchase them as a testimony of respect to his memory.

I observe that Mr. Carr still continues his attention to meteorological subjects, and from time to time he gives us tables of rain-fall. We have also the usual quarterly abstracts of meteorological tables prepared by the Colonial Botanist; but since the publication of Mr. Crüger's memoir no one has attempted to generalize on the subject. Nor perhaps is it to be assumed that there are as yet sufficient data for even a moderate supply of fresh induction. This branch of Science is yet in a state of infancy in these countries.

In a paper read in April 1864 I brought the subject of acclimatization under the notice of this Association. I refer to the question now because in the growing scarceness of Beef, it becomes a question whether something might not be done for the introduction of the Eland, a ruminant of South Africa, which has been successfully introduced into England. The drawback to its utility in that country appears to be that hitherto it has taken six years to attain a proper condition for the butcher; but the climate of England is much colder than that of the native country of the Eland. Some of the other Antelopes might also do well here, and eventually save us part of the great expense to which we go in importing beef. What has struck me in the Eland and others of the Antelope tribe as being somewhat of a recommendation in the present state of our pastures, is that the animal acquires condition much more naturally and without the rich stimulants required for the production of the best beef. The meat of the Eland is exceedingly good. The first killed in England weighed 1176 lbs., with a much less proportion of bone than in the best-bred shorthorn. While on this question I would mention that it has been proposed to introduce the Secretary-bird, alluded to in my paper on Acclimatization before-cited, into Martinique for the destruction of the snakes which infest that island; and as both the bird and the antelope are inhabitants of the same country they might be introduced at the same time.

Before leaving the subject of our colonial literature I ought not to pass without notice the Almanack produced for the first time for the year 1866. I do so, therefore, not with the object of pointing out the utility of that compilation and the great advance made by it on our annual literature of that kind, but to remark that it will serve a very useful purpose in our social economy if it merely draws attention to our position as indicated by the statistics therein given, which are now for the first time brought under the eyes of every colonist in a sufficiently comprehensive form. While some of the statistics, such as those of acreage and of exports and imports, show unmistakeable signs of increasing prosperity, there are others that are well calculated to arouse our most serious misgivings as bearing upon social Science. In order to make the case more clear I shall supplement my present remarks by statistics drawn from various published documents chiefly referring to the year 1865.

In 1851 the population was given at 68,600, while the births were 2300, being 33 per 1000. In 1861 the population had increased to 84,500, while the births were only 2450 or 29 per 1000. I have heard it estimated that in 1865 the population amounted to over 90,000, which would give a birth-rate of about 34 per 1000 for that year, the births being 2955. These averages are not very different from those of Great Britain, but they are lower than in any of the greater continental States of Europe, except France, where the rate is 26 per 1000.

In 1851 there were 380 marriages, or 5½ for every 1000 inhabitants. The European proportion is about 7 per 1000, and that for the whole of Great Britain is 8 per 1000. Taking the average of the years 1860-61-62 we find the yearly number of marriages in Trinidad to be only 390, giving 4·6 per 1000 of the total population. If we take the proportions for 1865 we find them still less. The following statement will give a more lively idea of the true state of matters in this respect :—

In 1848	there were	52	births to	10	marriages.
,, 1850	,,	62	,,	10	,,
,, 1861	,,	63	,,	10	,,
,, 1865	,,	100	,,	10	,,

being on an average of all these years 69 births to ten marriages.* But the fluctuations from year to year are so great that it will be better that I should mention to you some of the extremes. During the last ten years the highest number of marriages in this Colony occurred in 1857; it was

* According to the Census of 1861 the number of married persons was 16,416, of unmarried, 68,022.

666. Since then there has been a gradual decline. In 1864 the number of marriages was so small that the births were 110 to 10 marriages. In 1863 the proportion was 67 to 10, and in 1858 the number of marriages was so proportionately large that the births stood in the relation of 48 to 10, a much lower rate than usual here. These two latter years (1863 and 1858) were exceptional as to the high marriage rate, and in 1858 the number of births was, in addition, below the average. In Great Britain the proportion for 1865 was 4 births to 1 marriage. The birth-rate of both countries being nearly the same, it would appear that the illegitimate births here are in the proportion of 3 to 4 legitimate births. And I have confirmation of this from good authority; for it has been estimated that the proportion of illegitimate births here is about one-half. This is perhaps a little better state of affairs in one respect than holds in the neighboring French colonies, where from statistics prepared by the French government, I find that the proportion of legitimate births in Martinique is scarcely more than one-third of the whole. But there can be no question that our own condition is one that may well give us ground for concern when it appears that it is becoming rather worse than better. The decline in the marriage-rate is no doubt partly due to the cessation of the great exertions made for some years after emancipation for the encouragement of marriage. In the earlier years of freedom very many persons were married upon Licenses granted without payment—and their numbers have gone to swell the returns. Exertions of the kind alluded to have become slack. A grave responsibility is thrown upon the instructors of the people in respect of all these matters, which can hardly be evaded by the plea that the social problems presented to us here

are of a different order to those met with in Europe and America.

But this brings us to another question of great importance; I mean education.

In 1858 the number of Scholars was			2300
,, 1859	,,	,,	3461
,, 1860	,,	,,	3408
,, 1863	,,	,,	3627
,, 1864	,,	,,	3060
,, 1865	,,	,,	3500

These figures exhibit but moderate fluctuations; although it would appear that the returns are not accurate and do not always include the same schools. As for the Ward-Schools it appears that their scholars have been falling off, and the explanation can only be that in the country the attendance is becoming more lax, whilst in the towns the schools are somewhat better kept up. These figures, however, show us that only about 4 in 100 of the population attend school. It is to be feared, therefore, that a considerable number of children, especially those of Asiatics, are growing up without that training which is requisite to make them good subjects, while at the same time we have no such social system as obtains in India or in most countries. There is a deficiency of means of binding together the heterogeneous elements of our population, and in consequence the problems presented to us here are of the gravest and most important kind, if we would seek to forecast the future of our island. I believe, however, that more than one of our proprietors have felt the magnitude of this subject and have endeavored to meet it by the establishment of schools. But some such measure must be general and not sporadic.

Considering the number of medical practitioners in the island it is somewhat remarkable how very little information we possess as to the causes of death in this Colony. The only evidence we have is that furnished by the returns published by the medical officers of the public hospitals. But that cannot be taken as a fair guide, because the greater number of their patients are Asiatic immigrants. We must perforce, therefore, confine our attention to the bare statistics. The average of deaths in 1850 and 1852 was 2200 per annum or 32 per 1000. In 1860-61 the deaths were at the rate of 2784 a year, giving 33 per 1000. These proportions approach so very closely those of the births that we naturally turn to the statistics of immigration to furnish us with a clue to the causes of the increase of our population. It is to be regretted that there are no published returns of the free emigration and immigration; but from remarks made by the Agent-General of Immigrants in his reports, the latter would average between 2000 and 3000 per annum. We have no means of arriving at the permanent gain or loss to our population from this source. The parliamentary returns of the Government immigration give us an insight into this part of the subject which is somewhat perplexing. About 50,000 immigrants have been imported at the public expense since the year 1838 when the first Immigration Ordinance was passed. From 1838 to 1843 the immigration was, I believe, chiefly from the Antilles. In 1844 the Asiatic immigration was inaugurated and conducted at first by means of loans, the principal and interest of which have been in course of payment from the public revenue since that time. From 1844 to 1865, inclusive, the number of Asiatic immigrants introduced has been about 30,000, being an average of 1363 per annum. In 1865 there were resident on estates 16,150 immigrants. There may then be, at the outside, altogether 18,000 Asiatic immigrants in the Colony. About 12,000 have, therefore, died or left the Colony, representing an annual average loss of 545 or about 40 per cent. on the number imported. The number who have returned to India is probably about 3000. It is more difficult to ascertain the number of those who have emigrated or escaped to Venezuela. But making every allowance for all these causes of decrease, the mortality must be somewhat high, and it is of little use to endeavor to venture upon an approximation which may range from 15 to 30 per cent. It might be interesting to acquire some information as to the expense of increasing our population. But I have been unable to find in any published returns the means of arriving at a true idea of the cost of immigration, and as a very rough approximation, based on imperfect returns without details or explanation, I have estimated that the cost of introducing the Asiatic immigrants cannot be less than £650,000, including the amount paid for interest and redemption of loans, of which £70,000 has still to be paid (but excluding, of course, the amounts advanced from these loans to the Wards for Roads). Thus it would appear that the increase of 18,000 to our population in 22 years has cost us at least £36 per head. And it is to be feared that this alone does not give a sufficient idea of the expense caused to the Colony and to the Planter by these people—for the statistics of our jails and hospitals exhibit a very large proportion of Asiatics as requiring the active interference of Government. While, on the other hand, the small amount of taxable commodities consumed by the coolie is well known.

As shown by the published returns, the increase by births in the years 1861-65, inclusive, is not more than 247. When we consider, however, how large a number of deaths must be unregistered, there is reason to fear that the mortality is really higher than the birth-rate. But however this may be, if we take the increase by Government immigration in those years at 4000, and that in 1851-61, as given by the Census Returns, at 10,000, we should have a total increase of 14,000 to the population by Government immigration in the last 14 years. As this appears to tally with the other statistics, it would seem by this that in the same period our population must have increased by about 8000, exclusively of the immigration on bounty.

It is greatly to be lamented that our registration system is so imperfect that but a faint idea of the real proportion between births and deaths can be gleaned from the returns furnished, while we have no account whatever of the causes of death nor of the ages and conditions of the deceased persons. Such statistics are absolutely necessary for the due carrying out of measures of social reform.

After these somewhat disheartening figures it may be more pleasant to glance at the advance of wealth as exhibited by the increase of cultivation and of production. The average export of sugar for the three years 1839-40-41 was 26,856,594 lbs. The average for the three years 1863-64-65 was nearly treble, namely, 72,223,187 lbs. Cacao exhibits quite as fair a progress. The crops of 1839 and 1840 do not seem to have been gathered, the total amount for those two years having been 277,000 lbs. The average for the years 1841-2-3 was 2,810,000 lbs., while for 1863-4-5 it was 6,226,500 lbs. As I fear that my remarks on these and other subjects, were I to pursue these comparisons, might run to too great a length, I refer you for further information on all these points to the "Trinidad Almanack and Official and Commercial Register," and to the "Statistical Abstract for the Colonial Possessions of Great Britain," where full details will be found for the later years. I shall conclude this portion of my remarks by pointing out that while our population has doubled since 1838, our production has increased in a greater degree. Were it not indeed for the steady and rapid advance of the cultivation of the beetroot as a sugar-producer, our position would be a subject for congratulation. As the case stands, however, it seems that we must look chiefly, if not solely, to great improvements in the cultivation and especially the manufacture of sugar to enable us even to hold our own.

An institution that deserves mention as a sign of our progress is the Agricultural Society. The continued existence of so large and influential a body augurs well for the agriculture of the Colony; and as Sugar-making includes not only Agriculture but Manufacture, we may hope that through the spirit infused into its members, attempts will be made to improve the production of Sugar to an extent which will enable us to compete with the Beet. The Agricultural Society deserves congratulation also on the success of its ploughing-matches and of its agricultural exhibitions. May we hope to see an Agricultural Society for the northern division of the Colony?

Before finishing a report which is intended in some degree to make both those improvements which have been made in the progress and application of Science, and those which it is desirable to make, I may be permitted to allude to some minor matters, in respect of which I feel that I shall be expressing the wishes of the Association in hoping that we shall be placed on a like footing with civilised countries. One of these is the inland book-post, the rate of which is prohibitive, and we are consequently unable to forward copies of our proceedings by post. Another matter relates to Alcohol used for natural-history purposes. Such Alcohol is, owing to the high duty it pays in common with all other Spirits, so expensive as to prevent the use of it for the transmission of specimens to Europe.

One word more. Living as we do in a country where Science is so little appreciated, and where it not only meets with a good deal of indifference but with some open hostility, it may be hoped that we shall always present a close front, and be always unanimous in the promotion of our objects. Some indeed among us, with the best intentions doubtless, have steadfastly opposed every measure which has been brought forward for the development of the Association. But I need scarcely remind you that this Association would not now have been in existence if we had not carried the measures referred to. Having now attained a certain position we must either advance or retrograde. The farther propositions which are laid before you this evening, and which have all been suggested and favorably received at former meetings, have for their end not merely the advancement and development of this Association, but even the securing of its existence on its present footing. It cannot be said that we in any way imperil the existence of the Association by taking those very steps which are necessary for its preservation and development.

In conclusion I may congratulate the Association on having completed the fourth year of its existence, and upon having passed through what I may term its stage of infancy. The dawn of a new era in its career is fitly inaugurated by the appearance of the first number of its Journal of Proceedings which, as I have already remarked, is intended to be issued half-yearly, and which will doubtless have the effect of greatly increasing the reputation of the Association and the interest felt in it by its members.

I feel that I should not do right in passing over without mention the earnest wish of this Association that its corresponding members and others interested in Science would favor us with papers. Many have it in their power to contribute much information on subjects of interest and importance to us all. This Association does not confine itself to any particular branch of Science. All that is required from authors is that their contributions shall be original either in subject-matter or in mode of treatment. We shall gladly accept papers on political, statistical, social and sanitary science and economy, as well as on natural and physical science. We anxiously desire on the one hand to contribute towards the extension of science, and on the other hand to promote the cultivation of knowledge as a means of elevating and advancing the inhabitants of this island and of the West-Indies.

Be it then still our duty and our pleasure to hold forth encouragement to seekers of the Truth, and to show that our Colony is not an unworthy offspring of the great nation whose nationality we bear and under whose ensign we live.

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2. *Hints on the Breeding and Rearing of Horses.*

By the Hon. Henry Mitchell, M.D., Ph.D.

Gentlemen, I know not whether the remarks about to be now read can be justly deemed within the limits of a Scientific Association, but of this I am well assured that some investigation of the subject on which they bear is indispensable to the well-being of the agriculture of this Colony in one of its most important phases. I allude to the Breeding of working stock, of Horses and Mules for farming and other operations.

It will save both time and argument to start at once with the opinion of Mayhew, whose experience may be taken as representing pretty fairly the present state of veterinary science on this important topic. He asserts on physiological grounds which are fully borne out by the statements of the soundest writers of the old school, such as Percival White, Nimrod, by Carson and Youatt among moderns, and by the latest French authorities "that the eager spirit "of gambling which keeps up the two-year-old stakes, has "done more than anything else to ruin the once famous "breed of English horses, because the speed exacted from "an immature animal and the severity of training impede "the development of the frame and originate chronic affec-"tions which are either incurable or take years of repose to "efface." It is unnecessary to enter into the arguments adduced in support of this statement, as every candid mind must admit the physiological facts on which they are based, to the most important of which your attention will be occasionally directed in the course of these remarks. I shall proceed then to state with regard to the horse's growth, that his permanent teeth which have been gradually replacing the milk set, are not fully formed till the animal has completed his fifth year; up to that period their presence is a constantly recurring source of irritation not unattended with danger; even when fully formed, these teeth only mark the age of adolescence which precedes that in which any animal can be fairly called upon to exert his expected powers. He is as far from being full-grown and capable of full endurance as the boy whose milk teeth have been just replaced by the permanent set. Common observation shows that the general ossification of the human frame is incomplete before the age of 17, while that portion which corresponds to the quarter in the horse and supports the frame-work which has been most appropriately termed "the strength of the loins" is not fitted for full exertion and the toils of manhood before the age of six or seven and twenty, notwithstanding the large amount of bone-forming food we consume from childhood. What period then should be allowed to the horse for building up his frame, seeing that his mouth is only full at five years of age? Give him at least another year, up to six, to consolidate his bony structure and then start him at seven for the full duties of his career. The English knights of what was perhaps rather doubtfully styled "the good old times" and whose casing emulated those of the modern iron-clads, never used a war horse till he was seven years old, and the hunting squire-archy who now represent the same blood, when they adhere to the old plan and give their horses the same age before submitting them to the exhausting labors of the hunt, find that in many instances they remain sound and able for twelve consecutive seasons. Can the same be said for the unfortunate thorough-breds who enter at two years old or even three years. By far the greater number break down in training, and of those who run even successfully nine-tenths are at an early period consigned to cabs for town work and rarely reach six years, that is to say, they seldom live to that maturity which alone could have fitted them for the work expected and required from a full grown horse. According to Collins, out of some 1500 thorough-breds raised annually for the turf, about one in fifty continues to run and about one in five hundred becomes distinguished, a distinction which every true lover of the horse must consider as too dearly bought. The importance of having attained this maturity is never more essential than in selecting animals for breeding purposes; they should have at least perfection in point of age, that is to say, the mare should be six years at least and the sire seven years old. There have been exceptions, and very remarkable ones, to this universal law, applicable to man as well as beast, viz.: that the offspring of immature animals is badly put together and shortlived, but these exceptions should act as beacons not as guides. The nourishment extracted by breeding animals from their food should go entirely to repair waste and the demands of offspring, but never to develop their own growth, as in the fourth and fifth years when the whole system is irritable from the enlarging of the jaws to accommodate the increasing number and size of the teeth. It must not be lost sight of that the system of breeding under consideration is entirely different from that followed in raising stock for food; the ends in view are dissimilar. In supplying meat for the market the breeder has no view to duration; on the contrary, he is better pleased, the more quickly he can build up the frame with fat and lean on the smallest amount of bony structure; his beast is intended for food, while the horse on the other hand, destined for labor, must possess a bony structure as large and as dense as possible; he must have both strength and endurance to the utmost, whether intended for draught or saddle. It follows from what has been said, that as like begets like, a horse under five years old is as yet unfit for a sire; the bones in his jaw being imperfect, he transmits this imperfection and probably some portion of the accompanying irritability to his offspring, at all events one thing is clear, his own frame requires for its completion those phosphatic elements of his daily food, which in a sire horse should be devoted to the elaboration of the germ. The same argument applies with greater force to the mare; if under five years of age, while her own growth is incomplete, she is expected to extract from food nourishment sufficient to complete her own structure and at the same time provide for the growing wants of the foal she carries, the expectation cannot end otherwise than in disappointment. An error of this kind is not, however, likely to occur here, as the generality of imported mares are already aged; the case is simply mentioned lest any one having a likely young mare should be tempted to realise premature results. But there is another error in breeding much more likely to occur, and having committed it on more than one occasion I can the more freely animadvert on its impropriety, and that is to have a mare covered within a few days after she has foaled. This practise is common everywhere and yet nothing can tend more rapidly to defeat all attempts at improvement; a little reflection must show that the foal at the mother's feet should, till old enough to feed freely at least, receive from her milk the whole amount of nourishment necessary to supply the wants of its rapid growth. But how can this be expected from an animal who, in addition to the foal at her foot, carries another inside? By this practise the health of the dam is impaired and the foal turns out a weed when compared with others raised on sounder principles. Whatever mode of feeding you adopt, let it be abundant during the early months, and on no account wean the foal as long as it thrives in the mother's company, as long as the latter gives milk freely, were it even for 10 or 11 months. It is true that the mare, during all that time, is only earning her keep, but no brood mare should do more; the end in view is to raise a valuable animal, and the result will be successful in proportion as the dictates of common sense are followed. The work of the fourth and fifth year should be light and barely pay the keep; the horse will then come up to steady work in his sixth year and serve you faithfully for at least twenty years longer. About 50 years ago, this was to a considerable extent the method of rearing hunters followed in Ireland, and some of the Counties could show their first-class fencers by the thousand; look for them now, they have disappeared, nor can a good hack be procured except at a fabulous price. As Mayhew justly observes, "this result is due to racing and carrying less weight daily, while the abundance of worthless bloods has contaminated our best breeds and prevents the raising of good animals except at heavy outlay." He states further, what is admitted by Carson and other sound physiological writers, "that a youth passed in running unfits the horse for propagating his species, as exemplified by the fact, that most blood mares and stallions become famous through their progeny only after years of repose have effaced the evils due to early training." This fact is also admitted by Maine, a modern French veterinarian, who states, without however assigning the reason, that stallions are not to be depended on as proof horses till they have reached the age of eleven or twelve years. It is unnecessary to illustrate this subject further from personal experience. I shall, therefore, conclude by observing that creole animals, whether of the horse or mule kind, are singularly hardy, gentle and pleasing in their paces.

His Excellency the Hon. Mr. Gordon having honored the Association by attending the present meeting then addressed the Members. He thanked the Association for the honor they had done him in electing him an honorary member of the

Association. He did not claim as a scientific man to be a member, but as an earnest admirer of every branch of science. His Excellency thought that the Association was one that was much required in the island, where there was so much to be done, and where so little had yet been done.

Special General Meeting.

The Association resolved itself into special general meeting, for the revision of the Rules.

An amendment of the 8th Rule, raising the subscription to £1 0s. 10d., was carried by a majority of 8 against 1.

It was resolved that a Council should be appointed for the general management of the affairs of the Association, and that such Council should consist of the President, the Secretary, and one other member to be elected annually.

Some other amendments were made in the Rules.

Tuesday, 12th March, 1867.

The Hon. Louis Antoine Aimé de Verteuil in the Chair.

The following communication was read:—

Hygienic Considerations on Port-of-Spain.

By the Hon. Louis Antoine Aimé de Verteuil, M.D.

According to the Geological Survey of Messrs. Wall and Sawkins, the Island of Trinidad is situated between 10° 50′ 20″ and 10° 4′ 6″ lat. N. and between 60° 56′ 35″ and 61° 59′ 30″ long. W. It belongs to the equatorial zone. The mean temperature is 76° to 80°; maxima, 93°; minima, 73°; greatest range, 16°. Atmospherical pressure, 29·870 to 29·872 inches; maxima, 29·907; minima, 29·775. Quantity of rain per year, 70 to 71 inches; maxima, 88 to 90;

minima, 57 to 58; average number of rainy days, 200; maximum, 206; minimum, 157; mean monthly quantity, from January to June, 3·10 inches; from June to January, 8·60. Humidity, 0·797 to 0·800; during the driest months, viz.: January, February, March, April and May, the tension of the vapour is 0·723, and as low as 0.677 and 0·625 in April and May; it is 0·807 during the wet months, and as high as 0·827 in July and August.

The wind may be said to prevail, during seven months, from E. to S.E.; during three months and-a-half, from N. to N.E.; and during only a month and-a-half, from W. to S.S.W.; almost never from N.W.

Only 6·57 of the whole surface of the Island is under cultivation, the remaining 93·43 being still covered with copse wood and virgin forests.

Trinidad is traversed from E. to W. by three ranges. The Northern range which is parallel and adjacent to the Coast, stretches out westwards for about 10 miles, forming with the western side of the mainland nearly a right angle. The average elevation of that portion is from 1500 to 2000 feet. Two spurs running out southwards encircle an irregularly-shaped plain, from 1 to 2 miles broad, and about 3·41 miles along the sea shore. The area of that plain may be calculated at about 2500 acres. It has towards the sea a gentle slope of about 60 feet per mile, and is traversed on the E. by the St. Ann ravine, or "Dry River;" and about its centre, by the Mucurapo river which drains the valley of Maraval. There are along the sea shore, especially at the mouth of the Mucurapo, several small swamps. In fact, a narrow belt of the coast, from the eastern to the western spur is very low and more or less marshy.

The river Caroni has its mouth about 2 miles southwards of Port-of-Spain. It meanders through an extensive mangrove swamp which reaches close to the town. There is another extensive swamp at the mouth of the river Diego Martin, westwards of the western spur, and 4½ miles from the town.

The above plain is sheltered E. to N.W. by the surrounding mountains and hills: it is, however, open to the southerly, but partly only to the S. E., S. W. and W. winds. The northerly wind is chilly. The easterly and south-easterly winds are cool and pleasant; but having swept over the great Caroni swamp, they are saturated with marsh effluvia, as also the westerly and south-westerly winds, but to a much lesser extent. These and the southerly winds are hot, and the latter generally accompanied with heavy showers. That section of the plain which lies at the corner of the western spur and the range is exposed to the south-easterly winds; and in the same manner is the portion, which lies at the corner of the eastern spur and the range, exposed to the south-westerly wind. And it is a fact that these two portions are less salubrious than the rest of the plain.

The harbor of Port-of-Spain, which is exposed to the full force of the easterly breeze, may be said to be exceptionally healthy, and this may be easily explained. When no obstacle occurs, marsh effluvia may be carried very far off by winds, and any intermediate level ground over which they sweep may remain comparatively healthy. But where the winds, carriers of the effluvia, meet with any obstacle, as, for instance, a range of mountains or high hills, then the effluvia accumulate on the flanks of those high grounds to a height of 600 to 800 feet which may thereby become uninhabitable. Of this we have a striking illustration at our own door. The southern slope of the northern range, for a distance of nearly five miles to the eastward of Port-of-Spain, is rendered remarkably unhealthy from its proximity to the Caroni swamp, whilst Port-of-Spain and the plain on which it stands, being protected by the eastern spur, are comparatively healthy.

The northern range is formed of micaschists, sandstones, limestones and shales. The plain below is composed of alluvial deposits which have been washed down by rain from the adjacent hills or carried by the rivers St. Ann's and Mucurapo.

Port-of-Spain, the chief town of the Island, has been laid out by the sea-side, at the foot of the hills forming the eastern spur. It measures a mile from N. to S., and its greater breadth, from E. to W., is nearly a mile ; its area may be calculated at about 448 acres.

As a means of rendering description easier, I will divide Port-of-Spain into four sections. 1st. The main town comprised between the sea, Oxford-street to the N., the St. Ann's or Dry River to the E., and Richmond-street and part of First East-street to the W. 2nd. Corbeau-town, between the sea, Richmond-street and the Ariapita lands. 3rd. New-town, comprised between First East-street, the St. James' road, Maraval road and the Queen's park. 4th. All that portion which lies E. of the Dry River and the St. Ann's road, N. of Oxford-street and E. of First East-street.

The direction of the streets of the Borough is N. and S. and E. and W. ; they cross each other at right angles, and are from 26 to 40 feet wide, round-ridged with gutters on each side, and foot-paths from only 2 to 6 feet wide. In New-town and the outskirts only part of the gutters is paved: in many places the pavement is of the worst kind, being made of small irregular stones: the streets are macadamized, but in bad repair. There are in Port-of-Spain two promenades or shaded walks, and three squares: however, Brunswick Square only is worth the name, the two other being open spaces with a few trees. The Ariapita lands between Corbeau-town and St. James' road and the Queen's park, to the N. of the town, are enclosed spaces used as pasture grounds. The cemetery or burial ground is to the westward, and formerly formed part of the Ariapita lands.

Two thousand five hundred and thirty-six houses were assessed, this year, to the house tax: annual value $385,000; average value of each house $152 45c. Those houses may be divided into three classes: 1st. Those in the town itself, especially in the commercial part. They are built of stones or bricks, with two stories and well ventilated: the outbuildings, however, are not sufficiently open to the free access of air, and may be said to be damp. 2nd. Houses in the upper part of the town, generally occupied by the owners, with good open yards and flower gardens. They consist of one or two stories, the lower story being generally built of mason work, and the upper story of wood, or of wood covered with *tapia* or plaster. They are well ventilated and healthy, and the outbuildings comfortable. These two classes of houses may be said to represent nearly the whole value of real property in Port-of-Spain. The total annual value of houses being $385,000, the annual value of these two classes of houses may be estimated at $313,600. 3rd. The third class of houses consist of mere huts, mostly built of wood and roofed with shingles. Nearly the whole of Corbeau-town and New-town, and a large proportion of the 4th section are crowded with such structures. It is, in many respects, a matter of regret that the erection of such unsightly, miserable constructions was not discouraged, and that the regulations concerning buildings were not, and are not, enforced. It was about the time of emancipation that these constructions began to rise on almost every disposable lot in town. Part of the Woodbrook estate was then laid out into parcels to suit purchasers; but many of the houses erected on those plots are now in a state of decay, and but few of the owners are in a position to repair them. Some speculators taking advantage of the unfortunate disposition of the freedmen to retire from rural occupations, undertook to erect, even in the centre of the town, barracks for their accommodation. These barracks generally consist of one or two rows of rooms separated by board partitions, the upper part being of lattice work, so that a communication is established between all the rooms. To each room there is a door and window opening on the court-yard: no common kitchen, and but one privy or cesspools for the inmates. The cooking is carried on in small fire-pots placed at the entrance of each room. Nothing can be more at variance with hygienic rules than such constructions; overcrowding, foul air and filth are the result.

Port-of-Spain is abundantly supplied with water from the Maraval river and the St. Ann's ravine. The daily quantity delivered from the former is 2,000,000 gallons, and 800,000 from the latter. From these two springs 1498 private houses, besides the Governor's residence, get their supply, as also the Colonial Hospital, Royal Gaol and other public establishments. In addition to the foregoing, two public baths, one for men and the other for women, a wash-house with 137 troughs; the shipping and gulf steamers are supplied with water. £49,530 stg. have been expended on the water works; balance bearing interest at 6 per cent. on 1st January, 1865, £43,876 stg. Amount of interests on the above sum, £2632 stg.; repairs, £150 stg. = £2782. Revenue from all sources, about £3000 stg.; balance to sinking fund, £218.

Port-of-Spain derives great advantages both from the geological composition and the natural disposition of the ground upon which it stands. The soil, being an admixture of sand and clay, is highly permeable, so much so that, during the wet season, water is seen springing up at different places, in the lower portion of the town. It is also a well known fact that some of the privies never required emptying, the contents percolating through and becoming disseminated in the soil. How loathsome and noxious when the inhabitants got their supply of water from wells! Thus, what is a real advantage to the upper part of the town may be regarded as detrimental to the lower section. The declivity being, as already observed, about sixty feet per mile, surface or rather pluvial water is soon carried off. At present rain-water from the Queen's park and the adjacent ground finds its way into the town, and it has become necessary to divest it westwards through the Ariapita lands.

On many points lots are lower than the adjoining streets, and, consequently, very damp. The surface water having no issue into the gutters, is discharged S. or W. into the adjoining lots, or is slowly absorbed into the ground.

That part of Port-of-Spain which is known as Corbeautown is low near the sea and very damp from want of proper drainage. The part E. of the Dry River called "Grand Jardin" is flat and ill drained; and both sides of the river, near its mouth, are low and swampy. The

"Dry River," a deep ditch, being itself a receptacle for all sort of filth from the adjoining tenements, is a permanent source of insalubrity to the town.

As a summing up I will say that Port-of-Spain is sheltered East to North from wind; it is sheltered from the Caroni swamp by the eastern, and from the Diego Martin swamps by the western spur; it is, however, exposed to the westerly wind which sweeps over the marshy shore of the plain on which it stands. There is no obstacle to a free circulation of air; pluvial water is quickly carried off, and there exists every facility for a thorough drainage of the court-yards. The only parts of the town that are damp are portion of Corbeau-town, the "Grand Jardin," and both sides of the Dry River close to the sea. The area of Port-of-Spain may be estimated at 448 acres; and the number of the inhabitants being 20,000, we have only 44·64 inhabitants to the square acre, or a comparatively small population, each individual having 325 square feet. The present supply of water is abundant. With so many advantages, Port-of-Spain ought to be one of the healthiest towns in the West Indies. It is really a matter of regret that the regulations that have made it what it is should have become obsolete, and the Governor who will revive them will become entitled to the gratitude of coming generations.

Even under the Spanish rule Port-of-Spain was governed by a corporation styled the "Illustrious Cabildo." In the year 1853 it was constituted a Borough and was divided into 5 Wards. The Borough Council consists of 15 members, of whom one is elected Mayor every year. The powers of the corporation are very limited. Under section 51 of the Municipal Ordinance the Borough Council has power to make bye-laws for the good rule and government of the

Borough, and for the prevention and suppression of all nuisances not already punishable by virtue of some Ordinance, such bye-laws to be approved by the Governor.

In the year 1855 an Ordinance was passed for the establishment of General and Local Boards of Health; and the Borough Council was constituted a Local Board for Port-of-Spain. As such, it is charged with the duty of carrying out such orders and provisions as may be in force in the Borough. It has the power to appoint a Sanitary Inspector and other officers and servants and to make regulations for the duties and conduct of the same.

The General Board of Health has power to make orders; with regard to the sewerage of districts: with respect to the level and width of new streets, and provisions for their sewerage: with regard to the structure of new buildings in reference to their stability and the prevention of fires and the promotion of health: with reference to the sewerage of buildings, to water-closets, privies and cesspools: for the regulation of slaughter houses; also of lodging houses, and the prevention of overcrowding in the same.

Under clause 3rd of the Ordinance, the Governor may appoint a Secretary and Superintending Inspector; and the Board may assign to the Superintending Inspector such duties as they may think fit.

The General Board should meet for the despatch of business once, at the least, in each quarter, and oftener if need be. The duties of both the Sanitary and the Superintending Inspectors are determined by Ordinance No. 24 of 1850, for promoting the public health.

The Boards of Health and Municipal Ordinances are the only ones under which the Corporation has any action. There are, however, several other enactments which have reference to the good rule of the Borough. They are the following:

1stly. Ordinance No. 10 of 1840, for regulating buildings in the town of Port-of-Spain. In April 1806, a short time after the great fire which had destroyed the town, the then Governor of the Island, Lieutenant-General Hislop, issued, in the name of the King, a proclamation to regulate buildings in Port-of-Spain. In July 1830 another proclamation was issued by the Governor, Sir Lewis Grant, with respect to the same object. In the year 1820, under the government of Sir Ralph Woodford, the Cabildo had made an order to the same effect. Those regulations, however, became obsolete, and in the year 1840 an Ordinance was passed for regulating buildings and compelling the owners of houses built of wood or other inflammable materials, after a certain period, either to remove those materials, or to cause the houses to be covered with some uninflammable substance.

2ndly. Ordinance No. 12, 1846, for regulating the sale of bread. It provides, among other things, that bread shall be sold by the weight and not otherwise; that the bakers as well as the hucksters and sellers of bread shall use avoirdupois weight of sixteen ounces to the pound, and that they shall provide beams, scales and weights in order that all bread may be weighed, if requested by the purchaser. The Ordinance provides also, under penalty, that bread may be made of certain articles and no other. Any Magistrate or Justice of the Peace may grant warrant to any peace officer to enter into any house, shop, baker's house, etc. to search and examine whether any meal or flour has been adulterated by any admixture not allowed by law.

3rdly. Ordinance No. 6, 1849. Several clauses of this Ordinance have reference to the good government of the

Borough. Under clause 42, every person throwing or laying any dirt, litter, ashes, or any carrion, fish, rubbish, etc. on any street; or causing any offensive matter to run from any manufactory, slaughter house, or dunghill in any street becomes subject to a fine not exceeding forty shillings; or may be committed to prison for a period not exceeding fourteen days. Under clause 46, any person offering or exposing for sale any putrid or unwholesome meat, poultry, fish, or other provisions, or other offensive commodities whatsoever, or keeping the same in any market, store, etc. may on conviction forfeit and pay such sum not exceeding ten pounds: and any such unwholesome meat, etc., or offensive commodity may be immediately destroyed. Under clause 49, any person keeping swine, except in some place licensed in that behalf, becomes liable to a penalty not exceeding forty shillings, or may be committed to prison for a period not exceeding fourteen days.

4thly. Ordinance No. 13 of 1851. This Ordinance makes it unlawful for any person to sell or offer or expose for sale any fresh meat within the limits of Port-of-Spain, or within a mile from any part of it, except in such public market-houses as may be appointed, or in such shops as may be licensed by the Borough Council, under a penalty of twenty pounds for the first offence; and for every subsequent offence, of twenty pounds and imprisonment in the Royal Gaol for the term of two calendar months. Power is also granted to remove and destroy unsound meat.

5thly. In 1858 an Ordinance was passed for establishing a system of underground sewerage in the town of Port-of-Spain. For the purposes of the Ordinance the Borough was divided into six sewerage districts, and the total cost of the works was estimated at £15,000 repayable by an annual rate of 2 per cent. of the value of all lands and houses within the town.

If the above Ordinances or such of their provisions as have reference to the good government of the Borough had been or were enforced; if the General Board of Health would exercise the powers vested in it by Ordinance No. 34 of 1855, Port-of-Spain would be or soon become one of the best built and best regulated towns in the world. But unfortunately some of those laws have become a dead letter, and others are left inoperative, although the salubrity of Port-of-Spain depends mostly on their being strictly enforced.

According to the census of 1861 the population of Port-of-Spain amounted to 18,866 inhabitants. I believe it can safely be brought up to 20,000. That population was divided as follows: 7,669 males, and 10,197 females, or 75·21 to 100·7·756 were under the age of twenty years and 11·110 above. The inhabitants were classed as follows: mechanics, 1,652, or 8·89 per cent.; handicrafts, 2,808, or 15·12 per cent.; laborers, 864, or 4·11 per cent.; domestics, 987, or 5·32 per cent.; hucksters and shopkeepers, 636, or 3·42 per cent.; boatmen, sailors, 349, or 1·88 per cent.: non-described, 9,642, or 51·97 per cent.: 1,928 are left for the shipping, professions, clergy and charitable institutions.

Since, and including the year 1861, the number of births and deaths was as follows:

Births.		Deaths.	
1861	524	1861	979
1862	555	1862	751
1863	550	1863	730
1864	573	1864	735
1865	612	1865	780
	2,814		3,975

If from the number of registered deaths, I am allowed to deduct those that occurred at the Colonial Hospital during the above period, viz.: 908, then we would have 3,070 deaths and 2,814 births; balance against births, 156; a sad result indeed! I propose the above deduction, because, of the many persons who come to town for the benefit of medical attendance, not a few die and are registered as inhabitants of the Borough; that number fairly compensates, I believe, for the inhabitants of Port-of-Spain who die at the Colonial Hospital and whom I have deducted.

Taking the population of Port-of-Spain at 19,500 during the above quinquennial period, and the number of deaths at 3,070, we would then have 3·14 per cent. as the rate of mortality. Let us make allowance for incorrect registration, let us bring the population of Port-of-Spain to 20,000 souls, the mortality would still be great: but it is especially great among young children who die from sheer neglect. I should, however, observe that young age is a predisposing cause to zymotic diseases, particularly from the age of 6 months to five years.

During the same period the number of registered births and deaths, throughout the Island, was as follows:

Births.		Deaths.	
1861	2,447	1861	3,090
1862	2,443	1862	2,900
1863	2,776	1863	2,384
1864	2,974	1864	2,532
1865	2,955	1865	2,448
	13,595		13,354

balance in favor of births 241.

Let me again observe that the registration of deaths should be taken as pretty correct, inasmuch as no funeral can be performed except on showing a certificate from the Registrar of Births and Deaths: but as there is no control as regards the registration of births, it is certain that they are not as regularly registered.

The climate of Trinidad and, I should say, of Port-of-Spain, is a South American equatorial climate, consequently mild, with no great alternations of heat and cold, no destructive cyclones; droughts are of rare recurrence. It is, however, hot and damp, with the many concomitant inconveniences and dangers of such climatic conditions. Paludal fever, in all its different forms, is endemical throughout the year; yellow fever, however, is of rare occurrence. Angina is a very common complication of paludal fever. Dysentery is very common, as also infantile diarrhœa and *Cholera Infantum*: many children die of the latter disease, especially in the chronic stage. Catarrhal affections are frequent during the prevalence of northerly winds. Inflammatory diseases are rare, with the exception, however, of hepatitis and inflammation of the lymphatics of both extremities. Typhoid fever is uncommon, as also eruptive fever such as variola, measles, scarlatina, especially the latter. Eczema, boils and sores are very prevalent. Tuberculosis, and leprosy which, in my opinion, is a form of scrofulosis, are also rather prevalent, and unfortunately have a tendency to spread.

It is a fact generally acknowledged that the conditions under which the above diseases are developed may be beneficially modified by proper hygienic precautions. The climate of Trinidad is indisputably hot and damp; and causes of insalubrity exist at their *summum* in a damp-warm atmosphere. On the one hand it acts in relaxing the springs of organism, which then becomes an easy prey to morbific influences; on the other, by assisting in the decomposition of organic matter, it creates those very influences, as the gazeous substances evolved from such decomposition act as a poison. Supposing causes of insalubrity to be permanent, the constitution, not of individuals only, but of whole generations may be profoundly modified. The inhabitants of marshy districts are sallow, weak, inactive, and die young.

By the hygienist atmosphere should be regarded as an immense reservoir from which plants are supplied with carbonic acid, and animals with oxygen. It is, however, liable to changes which arise from the action of both the vegetable and the animal life. Man is connected with atmosphere in various ways: but that connection is necessary, incessant. If from the providential stability of its chemical composition it is the *pabulum vitæ*, it may, under certain circumstances, become a fruitful source of diseases. Dampness, want of ventilation, overcrowding in insalubrious lodgings are incompatible with health. No doubt that certain maladies owe their existence to the toxical action of contaminated air. As a general rule, effluvia give birth to fever in all its various forms and react on the digestive and nervous systems; miasms evolved from animal matter undergoing putrefaction give rise to diarrhœa and typhoid fever.

The principles to be met in the atmosphere are, either inherent, as heat, electricity, light and aqueous vapours; or accidental. Man is, to a certain extent, powerless against the former, whilst he can, within certain limits, control the latter. Evidently no measures that can be suggested will ever control the influence arising from the heat, light and moisture dependant on our geographical position; but we should, as far as possible, remove all those causes which have a tendency to increase moisture, and to give rise to emanations; we should not allow, on any account, the accumulation of vegetable and animal refuse in the Borough, keeping in view that the salubrity of any town is the resultant of the salubrity of each private and public building.

Government is the natural guardian of the public health; and it is its imperative duty to take proper care that none of the causes of sickness which can be removed should act detrimentally to the public health. As those causes are manifold, manifold should be the measures devised to that end; and they should be adopted simultaneously. The State should, however, proceed with prudence and keep in view the feasibility of any plan which it would think fit to adopt. Undoubtedly we may facilitate the ventilation of the town; we may improve the natural advantages which the ground affords for draining every portion of the Borough: we should insist on the speedy removal of all vegetable and animal matter; we should insist upon sufficient space being allowed to each individual.

The ventilation of Port-of-Spain may be said to be irreproachable. Of late, however, and owing to a want of proper regulations, a few narrow streets and lanes have been laid out. This is apparent in that portion of the town which is comprised between the St. Ann's road, Oxford-street, "la Tranquillité" and the little savana. That section is badly drained and inhabited generally by a poor class living in wooden tenements. I have no doubt that individuals have been encroaching on the thoroughfares; the mischief, I apprehend, cannot be remedied, for I do not see how the government or the municipality could interfere. There is no registry of the streets and consequently no records for reference. I might here mention that the portion of Barrack-street opposite the N. frontage of the Royal Gaol was much wider than it is at present. Some of the owners took it into their head that their enclosures must be brought on a line with the rest of the street, and coolly encroached on the public thoroughfare, finding that they might be in the wrong, they applied to the Court of Intendant, but received no answer. They then requested Mr. M. Sorzano to draw the street line, which he did. The Borough Council objected to the proceedings: on the 7th of October 1858, however, a petition was addressed to the Board pretending to explain the whole transaction. A Committee was thereupon appointed, who reported unfavourably: no further step was taken. And yet the streets adjacent to the gaol should have been made as wide as possible, as much for free ventilation as for police purposes.

I have already remarked that the Borough Council had not sufficient powers. "If however"—to make use of the words of Mr. Keate in his answer to the Mayor of the Borough—"the affairs of the town are to continue to be managed by corporations, those bodies ought to have all the requisite powers for exercising their functions, and there should be no divided authority." I suggest that, for all municipal purposes, the dominion of the streets be vested in the corporation. Sometime, in the year 1850, the Town Council made some regulations for the better government of the town; they were disallowed in toto, because some of them provided for offenses already punishable under the Police Ordinance; and because some others exceeded the powers of the Board, inasmuch as the dominion of the streets belonged to the Queen, "I do not find, said the Attorney-General, that the dominion of the streets is vested in the Town Council. It remains, I presume, in the Crown. The direction, therefore, of the Committee to cause all gaps in the foot paths to be filled up, if intended to apply, as I understand, it is intended, to carriage ways leading from the yards of private houses to the streets, would, I think, be justified only if the property or dominion of the streets including the foot-paths were vested in the Town Council; such a regulation is beyond their power." I believe it would be well and right to increase the usefulness of the Borough Council by increasing its powers.

The General Board of Health having power to make orders in respect of new streets, some time in the year 1863, the Borough Council addressed a memorial to that Board requesting it to take some action regarding new streets, slaughter houses, etc. But no notice was taken of the memorial. I would suggest that all new streets be of not less than forty feet, foot-paths included; that they should be registered both at the Town Hall and in the office of the Keeper of Maps and Surveys, for reference in case of dispute; that nobody should be permitted to build on a line with the street, without having previously obtained authority from the proper officer, who would then give the exact line, and deliver a certificate for which he would receive a fee.

As regards the drainage of streets, it is, from the natural declivity towards the sea, southwards and westwards, as efficient as can be desired. The bulk of pluvial water is, however, so great at times, that some of the streets are soon overflowed and the metal washed away. I would suggest that the surface rain water coming from the Queen's park and the small savana be diverted towards the St. Ann's ravine by the means of underground pipes. This, of course, comes within the province of the Borough Council, and it is for that Board to see what can be done in the matter.

The drainage of private yards is an object of greater importance and difficulty. As I have already observed, many lots are naturally drained into the adjacent ones. This should not be allowed, and measures should be taken to cause the grounds to be so raised as to throw the water into the adjoining thoroughfare, and the General Board of Health ought to make orders to that effect.

Surface rain-water is a source of moisture only during six months of the year; but the water supplied from the water-works is, under present circumstances, a permanent source of dampness in many lots and nearly all our streets. Few persons are aware of the great evil arising from the habit, so general in this town, of allowing water to run to waste from the service pipes. In many tenements there is no arrangement for the drainage of that water, which causes excessive dampness. Generation of effluvia is much less to be apprehended during the wet than during the dry season: during the latter small pools of dirty water become so many focuses of malaria, the united emanations of which poison the atmosphere of the town. Soap-suds are allowed to escape from many yards into the streets; they loosen the pavement, impregnate the soil with impurities, and assist the growth of weeds. Soap-suds contain a large proportion of animal matter from dirty clothes, the decomposition of which gives rise to sulphuretted hydrogen, a most deleterious gas.

Strange to say there is in the law for supplying Port-of-Spain with water, no provision against the evil of which I complain, and in consequence the supply, though abundant, may be said to be scantily distributed. I suggest that some measures be adopted to prevent such an excessive waste under penalty. I have heard it said that washing in the yards could not be prevented by law. Admitting even this, I submit that the clause of the Police Ordinance which makes it unlawful to discharge into the streets foul water from manufactories should be made applicable to all houses. A wash-house has been provided at a large cost, for the benefit of the washerwomen of the town; and as they charge the fee exacted from them to the persons whose clothes they wash, I cannot conceive what objection they can have to using the troughs of the above establishment.

The great difficulty, however, is the removal of the town refuse and dirt. The scavenging of the Borough, though very inefficient, costs the corporation a very large sum of money. Could any assistance be given or any plan devised to ensure better scavenging? Under clause 45 of the Police Ordinance any person throwing or laying any dirt, litter, ashes, offal, decayed vegetable matter or rubbish of any kind into or on any street is punishable by fine, if convicted before any Justice of the Peace. Such being the law, how is it that, at any time of the day all sorts of dirt and rubbish, brushwood, cow-dung and horse-litter are thrown or laid on the streets, so that, half an hour after a street has been swept and the dirt removed, it often looks as if it had not been cleansed for days? The only remedy which suggests itself is to render, under a heavy penalty, all occupiers of houses responsible for any dirt which might be found in front of their respective dwellings. This I regard as a most essential measure, as it is, in my opinion, the only remedy against a crying evil. In fact, the cleanliness of any town is dependant upon the following conditions:

1st., no dirt or rubbish of any kind should be thrown or laid on the thoroughfare: 2nd., they should be kept within the yards till the scavenging carts call for them: 3rd., the refuse water from houses should be led into the sewers. But where no sewers exist, how to dispose of the same? This is a most difficult question, especially as its solution involves one of outlay and money.

I have stated previously that Port-of-Spain had been divided into six sewerage districts, and that sewers had been laid in one district (No. 3), at a cost of £6,515 10. At the same rate the sewerage of the whole town would cost the sum of £39,093 instead of £15,000. But I do not hesitate to say that the sewerage of the other districts will cost more, either because some of them are larger, and at least far more crowded. But let us take the sum of £39,093 as correct. The Superintendant of Public Works has besides, in his report dated 29 March 1865, given it as his opinion that an increased supply of water would be necessary, and the estimated cost has been put down by him at £23,678. Taking the estimate as correct, the sewerage of the whole town should be calculated as follows:

cost of sewers	£39,093
probable cost of a fresh supply of water	23,678
	£62,771
If to that sum we add the sum of	43,875

amount due for water-works on 1st January, 1865,
we would then have a gross amount of..........£106,646
or $511,900 owed by the Borough; and, as already stated, the annual value of property, in Port-of-Spain, is only $385,000! I ask whether, under such circumstances, it would be prudent to insist on the completion of the sew-

erage works? Could the Borough Council, under such a heavy burden, impose fresh taxes or borrow money to improve the streets? and pave gutters which, in more than one instance, are no better than stagnant pools of putrid water?

How to dispose of the sewage of a large town? this is a problem which has not yet found its solution. Dr. Parkes remarks in his "Review of the progress of Hygiene during the year 1860" "that the opinion seems still gaining ground that the great question of sewerage requires re-discussion. Although everybody is opposed to the use of cesspools, and though it is evident that well contrived and properly ventilated sewers with a good fall and a proper supply of water, remove excreta most readily and economically from our habitations, yet it cannot be denied that the existence of this underground net-work of tubes filled with hurtful gases which are continually drawn up into the houses in spite of all traps and valves, is a very great disadvantage. And the part that sewers themselves, if improperly contrived, can play in the dissemination of disease is now well known, and was acknowledged in the never-to-be-forgotten Windsor epidemic of typhoid fever to which a late national calamity has again called attention."

"The plan of allowing the liquid part only of the excreta to pass into the sewers and retaining the solid part in closed boxes which are periodically carted away in boxes especially contrived for the purpose, has now been in use in Paris, Turin, Milan and other cities, some years. At present, there is no good evidence of the effect of this arrangement on health, although doubtless the sewage matter is in a much better state for the farmer."

"At present, it would be difficult to express a decided opinion, but it seems possible that a solution has now been found of the difficult problem of utilizing sewage matter."

"It is probable that the Carbolic acid will supersede all other deodorizers for this purpose. It has been tried with success at Glasgow and Exeter .... It was mixed with a small quantity of lime, and so effectually retarded decomposition of sewage, as not only to do away with smell, but to considerably increase the value of sewage as a manure, by completely retaining all the Nitrogen."

Is it really more economical, is it better to dispose of the night-soil and refuse water by carrying them to the sea where they become lost; or is it better to adopt the deodorizing process, and thus preserve for agricultural purposes a valuable fertilizer? Human excreta are considered as a very rich manure; and, of late, practical as well as scientific men have turned their attention to their preservation. Doubtless the deodorizing process has rendered this more easy. And since, in my opinion, we are not in a position to pay for underground sewers, let us try the deodorizing process; it has apparently answered well where it has been tried. The time must come when rural economy will be better understood; then we shall begin to appreciate and utilize the refuse of towns. Whilst on this subject I would suggest that no broken bottles or other dangerous materials be allowed to be mixed with the sweepings of yards and streets. So long as the agriculturist is obliged to make a separation of both to prevent accidents to men and stock, he will not utilize those sweepings.

Ordinance No. 10 of 1840 for regulating buildings in the town of Port-of-Spain should be repealed and a new one passed. The Ordinance of 1840 was, I fear, rather harsh in some of its clauses, especially the 4th clause which forbade the roofs already shingled to remain so after the 1st of October 1845, and prescribed that no outside ends or sides, being of wood, should remain so after the 1st of October 1850. Proprietors who had been suffered to have shingled roofs, and the sides and ends of their houses built of wood must have felt it a grievance to be compelled to remove the same or to replace them, after a lapse of 5 and 10 years, by uninflammable materials. I suggest that, for the purpose of any building Ordinance, the town be divided into two sections, viz.: the town properly so called, and the suburbs; the town to be comprised between the Dry River, Richmond-street, the sea and New-street, the rest being held as suburbs. After the passing of the Ordinance, no new house should be built of inflammable materials, either in town or suburbs; no house built of or roofed with inflammable materials could undergo repairs within the town, but should be re-built according to law; but repairing could be permitted in the suburbs, provided however that the cost of repairs would not amount to one-third of the estimated value of the house. The town would thus gradually improve and there would be no just subject for complaint. Sometime in the year 1856 Governor Elliott had appointed a Committee to prepare suggestions regarding the construction of houses and the regulations of lodging houses. The report of the Committee, signed by all the members, was subsequently submitted to the General Board of Health for their consideration and approved by them with some slight alterations. In case it were deemed expedient to pass a new building Ordinance, it would be well to take notice of that report.

The 46th clause of the Police Ordinance enacts that alimentary substances which have become stale and unwholesome should be destroyed; and the Ordinance for regulating the sale of meat gives power to any Justice of the Peace to order the destruction of unsound meat exposed for sale at the markets. This is right. I suggest, however, that periodical visits be made to establishments where flour and animal food are kept for sale, in order to ascertain whether they are sound or not: and in case all such alimentary substances be not of good quality, they should be thrown into the sea. At times, salt-fish, tasajo and flour are offered for sale, which are fit food for pigs and corbeaus only: and our Indian Immigrants are but too prone to buy the unwholesome stuff which is sold to them cheap. In my opinion no unsound meat or fish, and no damaged flour ought to be exposed for sale. In Europe those substances are turned to advantage; from the flour they manufacture starch and dextrine, and unsound fish and putrid flesh are prepared into fertilizing composts: here they are bought to be used as food.

There are, at present, in town three slaughter houses, one at Ariapita, and two on the bank of the Dry River, near its mouth; they are private establishments subject to no surveillance. Slaughter houses ought to be here as they are in all well regulated towns, municipal property, placed under stringent regulations, with the object of both enforcing that thorough cleanliness which is necessary for the preservation of meat, and preventing the slaughtering of diseased animals. As things now are, not only sick oxen are killed, but dead animals are actually taken to those establishments to be there prepared for the markets. As a rule, sheep, pigs and goats are not killed at the slaughter houses; and, contrary to the law, the carcases are huckstered about and taken to private houses for sale, the sellers thus defrauding the municipal revenue, and, it may be, selling unsound meat. In my opinion, the Municipality should be encouraged to have their own slaughter house; and the General Board of Health ought, without delay, to make regulations for all such establishments. A Veterinary Surgeon should be appointed at a fixed salary, and with power to examine all and every animal before it is killed, and to give his permit: no meat, either beef, veal, or mutton, etc. could be offered for sale, except on producing the permit, to the proper officer. A fee would be paid for every permit, before the carcase were removed. The public would thus have a guarantee that no unsound meat would be offered for sale, and the municipality could not be defrauded. Any person found huckstering meat in any place within the town without a permit, should be apprehended and brought before a Justice of the Peace to be dealt with according to the law.

Under the 49th clause of the Police Ordinance, any person keeping swine in Port-of-Spain, except in some licensed place, becomes liable to a penalty: and yet, pigs are met in almost every street. Swine are dirty animals, subject to loathsome disease; and pigsties are very offensive. I suggest that they be not kept in town, under any pretext: and every pig found at large ought to be destroyed, and the owner fined.

A large number of cows is kept in town, and numerous goats are met, almost everywhere, though it is forbidden to allow them to roam about. Goats are cleanly, and only troublesome: but cows may become a nuisance, if not kept cleanly and in proper pens; their dung is, either washed into the streets in a diluted state, or deposited on the thoroughfares. The law should be enforced as regards goats;

and cows should be kept in proper sheds, and their dung removed daily, or twice a-week, according to the number kept together.

I believe that I have, in the foregoing pages, pointed out where is danger to the public health, and I have endeavoured, at the same time, to indicate the remedy. Danger lies in the law being left inoperative. Remedy should be sought in its strict enforcement; and new enactments should be passed, if necessary. I have often heard the following remark, and I fully concur in it. I have heard it said that our laws are numerous and good enough if they were properly executed. Where, however, legislative enactments are suffered to remain inoperative, not only the object for which they were made is not attained, but the people become familiarized with the idea that they can break the law with impunity, and they get into habits of insubordination.

Improvidence and *laisser-aller* are the characteristics of our poorer classes; and any measure calculated to render them more provident should be hailed with gratitude. It is essential that they should be made aware that the law is something living and active, and that infractions must not be passed unnoticed.

Public Hygiene owing its existence to the necessity of remedying the many evils which improvidence had created in populous districts, it had nothing to do with the arrangements of ancient cities; but in our days it should direct, as far as possible, how new ones should be laid out in all their parts; provisions ought to be made not only for proper ventilation, by giving directions with respect to the width and delineation of the streets and squares and their drainage; but we should go further, and even interfere with the construction of private dwellings, not by directing what they should be, but rather what they should not be. If by correcting the insalubrity of a district we can prolong the life of its inhabitants, how much more easily can we obtain the same object by preventive measures, with this difference, however, that prevention is better and cheaper than correction. Let us improve the lodgings of the poor and the workmen; give to all plenty of air, light and water; provide for the prompt removal of dirt and human excreta; put a check to the mephitism resulting from overcrowding, and then you may hope to diminish that annual tribute of human lives which is levied by those cachectic diseases, the offspring of filth and misery.

I have already remarked that atmospherical influences may modify the constitution of whole generations and communities. If, together with those natural coincidents are combined those of insufficient diet and the appurtenances of filth, the consequences will soon become apparent. Anœmia, scrofulosis, tuberculosis and leprosy must in our Island be the deplorable result. Scrofulosis and tuberculosis have a common origin: it is said that both have a tendency to increase. I am justified, I believe, in saying that tuberculosis is on the increase, and I hesitate not to say that consumption is more frequent in our days than it was thirty years ago. I would not dare, however, to affirm that leprosy is more common, though such is my impression.

Both affections are hereditary or may be accidental; all causes depressing life may so modify the organism as to render it more liable to constitutional diseases. Doubtless the climatic conditions of Trinidad have not varied for the last thirty years; but with those conditions are none combined those of insufficient diet and insalubrious lodgings. Now, by insufficient diet I mean, not only a diet deficient in quantity, but mainly in quality. At one time beef was sold at 7½ and 5 cents a pound: the price has increased to 10 and 20 cents; and the people are not now in as good circumstances as they were immediately after emancipation. Many take only one meal which but too often consists of some salt-fish and raw vegetable; others, at certain seasons, live mainly on fruits. In many of the houses, the air is confined and contaminated, and the yards are reeking with vegetable and animal matter in a state of decomposition. And I am sorry to say that such is the condition of the lodgings occupied by that class among which phthisis exercises its ravages. Supposing, as is but too commonly the case, that the inmates of such places lead a sedentary life and have an insufficient diet, is it surprising that consumption is on the increase? If leprosy is a form of scrofulosis, as I contend it is, is it surprising that the loathsome malady has a tendency to spread? and, as it is highly transmissible by generation, have we any reasonable hope that it will not be worse in thirty years than it is now? Dr. Bennett remarks as regards tuberculosis: "it is only by removing all the causes that are depressing life contrary to the healthy development of the function of organism, and by placing the sufferer in the most favourable hygienic conditions for the development of his organization, that we can hope to correct or cure such disease."

Single individuals, or even families may, under favourable circumstances, escape from these depressing causes by removing to more healthy places, but communities cannot; it is therefore by the suppression of such causes that we can hope to correct and prevent the diseases which they engender: and we can suppress them only by legal provisions and their strict enforcement. The General Board of Health should meet, at least, once every quarter, and it meets only on an emergency; and yet there is sufficient employ for the Board, if willing to work. The Ordinance concerning buildings and the sale of bread, as I have remarked previously, are dead letters: the Ordinance regulating the sale of meat is only partially carried into effect: and if mutton, pork and goat are exposed for sale at the markets it is because the butchers find it more advantageous to sell the meat there than to go huckstering it about the town. The 46 and 49 clauses of the Police Ordinance are not executed: and I have heard the police officers excused on the plea that, as they should pay exclusive attention to the preservation of the public peace, they cannot be blamed for neglecting less important duties. Surely, so long as it will be their duty to put the Police regulations in force they cannot be excused for not performing their obligations. If, however, they cannot possibly do that, the Government should take the matter into consideration and make the necessary provisions. In my opinion a comprehensive Police Ordinance, rigidly enforced, even in its apparently less important parts would, by compelling the people to look to their own comfort and that of their neighbours, do more to improve their habits than is usually thought.

It is much to be regretted that, in a purely agricultural country like ours, the people should resort to towns. The united population of Port-of-Spain and San Fernando may be said fairly to represent 25 per cent. of the whole population of the Island; and there is no manufacture in either of those boroughs. In Port-of-Spain the proportion of women to men is as 100 to 75·31. The increase of population naturally depends on the excess of births over deaths. The number of births is larger in towns than in rural districts, but the mortality is also greater; in England the mortality of rural districts is to that of towns as 100 to 144; and, according to the reports of the Registrar-General, the diseases incident to childhood are twice more deadly in towns. (Dr. J. Henry Bennet, etc.)

There is no doubt that, *cæteris paribus*, living in rural districts is more conducive to health and longevity than living in towns. The purer atmosphere of the country invigorates the constitution; and when provisions are made for thorough drainage about the dwelling-houses, it is impossible that the organism should suffer, whilst the digestion of coarser food is greatly facilitated by exercise in the open air. It may be that some of the measures proposed would be the indirect means of inducing people to seek employment in the rural districts: such a result we should hail as most advantageous, both to them and the community.

Dr. J. Henry Bennet observes with regard to phthisis: "Cities exercise a mysterious attraction over the lower as well as the higher classes of mankind. It must be the feverish excitement of city life, the hope of greater social advancement; for the greater portion of the lower classes in cities live as hard or harder lives than they would if similarly engaged in the country. No doubt the vitiated air breathed in cities, in the close crowded workshops and in the closer and still more crowded sleeping rooms, gradually weakens the constitutional powers, and forms the principal predisposing cause of pthysis. The poor should return to their native villages, if by any means feasible, even if there they have to accept a lowlier position than that which they have attained."

Tuesday the 9th April, 1867.

ALEXANDER WILLIAMS ANDERSON, Esq., in the Chair.

The following donation was announced :

"Notes on the Natural History of the Scorpion," by the Hon. Richard Hill ; and "Remarks on some species of West-Indian Marine Shells in the Cabinet of Amherst College, Mass.," by Henry Krebs. Presented by Henry Krebs, Esq., of St. Thomas.

The following communication was read :

Additions to the Catalogue of the Land and Freshwater Mollusca of Trinidad.

By R. J. Lechmere Guppy, Esq., F.G.S., F.L.S.

Since the publication of my Catalogue of Land and Freshwater Mollusca in the last number of the Proceedings of the Association I have discovered other species previously unknown to me, some of which I believe to be new to science. One of these is a land-shell of small size but peculiar structure, and another is a freshwater bivalve belonging to a group not hitherto found in the island. I have given diagnoses and figures of these species in the Annals of Natural History for the present year, and now communicate their names and most prominent characters.

Besides the shells now enumerated I have discovered three inoperculata, all of small size, but which are as yet undetermined. I trust to make them the subject of a future paper.

Class GASTEROPODA.

Sub-class PROSOBRANCHIATA.

Order Phaneropneumona.

DIPLOMATINA Benson 1849.

Terrestrial Operculata with pupiform scarcely rimate shells having a nearly circular aperture, an expanded or double peristome, convex whorls, and a thin operculum of few whorls with prominent edges.

Diplomatina Huttoni Pfeiffer.

Pfeiffer, Proc. Z. S. 1851; *Conspect., No.* 181; *Iconogr.*, t. 48, f. 36, 37; *Cat. Phanerop. B. M.*, p. 86.

A minute pupiform sinistral shell of about 5 whorls, with riblike longitudinal striæ and a continuous double peristome. Length 2½ mill., breadth 1 mill.

This curious little shell is found near the Maracas waterfall. Its occurrence in Trinidad is very singular; for the genus has hitherto only occurred in India, and the present species was described by Pfeiffer from Indian examples. It seems very improbable that this species could have been introduced; and as *Ennea bicolor* is also common to Trinidad and India, it would be of interest to arrive at a true explanation of the matter. I may state, however, that there is scarcely as yet absolute certainty that the present shell is identical with its Indian analogue.

I was led to the discovery of this shell by information supplied me by my kind friend Mr. Thomas Bland, F.G.S., of New York.

Order Scutibranchiata.

Helicina Lamarck.

Helicina (Perenna) lamellosa Guppy.

Ann. & Mag. Nat. Hist. 3 ser. vol. xix., p. 260.

A small depressed light reddish-brown thin *Helicina* ornamented with spiral ridges which bear free lamellar edges especially towards the carinate periphery. Height 2½ mill., greatest diameter 4½ mill.

For this little shell, found at the Cotoras Islets, I have constituted provisionally a new sub-genus under the name of *Perenna*.

Class CONCHIFERA.

Sub-class Siphonida.

Animal with respiratory siphons.

Order Veneracea.

Animal with a compressed foot adapted for creeping or leaping.

Cyclas Bruguières 1792.

Fluviatile Conchifera with thin ventricose nearly equilateral shells having small cardinal and lateral hinge-teeth in both valves.

Cyclas punctifera Guppy.

Annals and Mag. Nat. Hist., 3 ser. vol. xix., p. 160.

A small somewhat ovate thin diaphanous whitish bivalve, concentrically striate and covered with numerous rather granular points. The length of a large example is 4 mill., its height 3½ mill., and its thickness 2½ mill. I am indebted for the first example to Mr. Prestoe who discovered it whilst we were engaged searching for mollusca in a pond at St. Ann, where I have found additional specimens.

Tuesday 14*th May*, 1867.

Alexander Williams Anderson, Esquire, in the Chair.

Henry Krebs, Esq., St. Thomas, and the Hon. George Webbe, F.R.A.S., Nevis, were elected Corresponding Members.

The following communications were read:

1. *Documents relating to the Boehmeria nivea.*

(Abstract.)

These documents consisted of a letter from the Foreign

Office, London, to the Colonial Office, enclosing a report from the American Vice-Consul at Bradford, stating that although until lately no method had been discovered for manufacturing the China Grass *(Boehmeria nivea)*, yet that within the past few years some firms at Bradford have succeeded in bringing the fibre into a state most closely resembling the best mohair or other bright worsted, and have worked up great quantities of the refined material as a substitute for worsted, always in combination with cotton. And for many articles of this mixed kind, especially those requiring a stiff, strong, and cool texture combined with a silky appearance it is found that the China Grass makes the very best material. The market value of the raw fibre of the China Grass has for some years past maintained itself at the very high rate of £80 per ton, which price it is supposed cannot be much lessened for many years; and there is a practically limitless market for all the raw China Grass that can be imported at from £70 to £80 per ton. The papers concluded with a letter from Dr. Hooker to the Colonial Office, recommending the cultivation of the *Boehmeria* in Trinidad and other colonies.

Mr. Prestoe exhibited a specimen of the *Boehmeria nivea*, and stated that this climate was well suited to the plant, which would produce abundant crops here with little trouble.

2. *Note on Petroleum and Naphtha.*

By R. J. Lechmere Guppy, Esqre., F.G.S., F.L.S.

(Abstract.)

Public attention having been lately attracted to the products of Petroleum on account of the dangerous nature of some of these products, the author took the opportunity of addressing a few words to the Association on the subject.

After stating that Petroleum is native naphtha, a term originally applied to the inflammable liquid compound of hydrocarbons issuing from the soil in Persia, the author explained that the rock-oils found in other parts of the world do not differ materially, being compounds of three hydrocarbons. The hydrocarbon series includes a vast variety of organic and mineral products, as coal, asphalt, peat, oils, resins, &c., &c. Certain of these are dangerous on account of their vapor when mixed with atmospheric air becoming explosive on the application of flame. Well refined oil is not dangerous, but any oil the vapor of which is inflammable at a lower temperature than 120° can hardly be considered quite safe.

The author pointed out the mistaken use of the terms "Pitch" and "Pitch Oil" as applied to the asphalt of Trinidad and the Petroleum Oil, Kerosine Oil or other products of asphalt and petroleum.

Tuesday 11th June, 1867.

The Hon. Henry Stuart Mitchell, M.D., Ph.D., President, in the Chair.

John Niven, Esq., Port-of-Spain, was elected a Member.

The following Visitor was introduced:—Dr. William Henry Stone, F.R.C.P., by Mr. Lechmere Guppy.

The following communication was read:

Additional Note on the Use of Sulphites and Bisulphites, whether Medicinally or otherwise.

By the Hon. Henry Mitchell, M.D., Ph.D.

I had hoped, Gentlemen, to have laid before you this evening some special remarks on the medicinal use of a few of the compounds of Sulphurous Acid. In this, however, I am disappointed, as the paper which contained them has been mislaid. I shall therefore confine myself to a very cursory statement, showing that the exhibition of these salts is slowly gaining ground both among Medical Practitioners and others engaged in Arts and Commerce. In a late publication, by order of the Agricultural Society of Scotland, on the symptoms and treatment of the cattle-plague, it is confidently asserted that where the disease appears its progress can be prevented from extending, by giving to the unaffected members of the herd 3 ounce doses of Bisulphite of Soda daily. This information, from such a source, should be joyfully hailed by our planters and applied to the varied epidemics which from time to time attack their working stock and for which the treatment hitherto adopted has proved both uncertain and usually unsuccessful. It has also been further stated on apparently reliable authority, that in the district of the Abruzzi in Italy, where the same pest was raging, one-third of the animals treated by the Bisulphite of Soda recovered. In a late medical journal, an English physician in describing an epidemic of Scarlet-Fever, states that 36 cases treated by himself, some of whom were in a precarious state when first seen, all recovered, and in no instance did the malady extend to the other inmates of the same houses. This may be considered unusual success in the treatment of a malady as much dreaded in the Northern Counties and in Scotland as the plague is on the shores of the Levant. Finally, during the last epidemic of Cholera in England, we have the evidence of Dr. Scoffern, whose skill in Chemical Pharmaceutics can scarcely be surpassed, that every case of Choleraic Diarrhœa which he treated with Bisulphite of Soda was at once arrested and prevented from passing into the fully developed malady. I shall now beg your attention to a short description of the action of a Bisulphite in the principal manufacture of the West Indies. M. Melsons was one of the first chemists who drew attention to the powerful influence of the Bisulphite of Lime as an anti-ferment in preserving the complex and unstable juice of the Beet from decomposition during the process of manufacture into sugar. Previous to his announcement the Bisulphites of Lime and Alumina had been already tried on cane juice, but without producing any practical result worth mentioning, and subsequently as far back as 1852 this Bisulphite was essayed in Trinidad and elsewhere with varying success, but not with such results as to ensure its adoption. It is only within the last two years that the Demerara planters have reduced to practise so valuable an agency, and, to their credit be it said, the adoption of the Bisulphite of Lime is there almost in general use as an anti-ferment in the treatment of cane juice. The mode of applying this salt I give in the words of Mr. S. Lambert, a gentleman of Demerara who has occupied himself much with the chemistry of the neglected cane: "one-half per cent. of Bisulphite of Lime, or one half gal- "lon to one hundred gallons of cane juice is passed through "a small worm-tap into the juice at the nearest point to the "mill bed, with a small dripping stream so graduated as to "distribute this dose as uniformly as possible through the "whole mass in the receiver. The juice is thenceforth "treated as in the usual manner with Lime. Since the "adoption of this plan, the results are announced day by "day in a most satisfactory manner, and it is worthy of re- "mark that those who saw at the December Exhibition the "Bisulphite of Lime open-pan sugar for the first time, and "have since adopted the plan, have made better sugar than "the original experimentalists; a result apparently due to "the wholesome state of emulation among the planters." So much for the Bisulphite and the wholesome state of emulation among the Demerara sugar manufacturers; if anything like the same feeling exist here, it must surely be gratifying to know, that as a rule the cane juice of Trinidad is less complex than that of Demerara, consequently more easily turned into sugar. The results therefore ought to be as good, if not better, and attained at less expense. This, however, is by no means the case at present, for reasons that require better explanation, and it would be desirable that the example of the sister colonists should be followed, as far as circumstances permit, in defecating cane juice, as long at least, as it is esteemed a first principle in the manufacture of sugar, that the cane should be crushed into atoms and its heterogeneous elements well mingled with the air as the first step towards obtaining the saccharine contents in their purity.

When mentioning the Bisulphite of Soda in connexion with its use by Dr. Scoffern in Choleraic Diarrhœa, it should have been further stated on the same authority, that one tea-spoonful of a saturated solution of this Salt added to one gallon of milk, preserved the whole mixture unchanged and sweet for ten days during the heats of July in London. This fact should have its practical value in the West Indies where so much of the comfort of life as well as health itself depends on the daily supply of milk and other easily decomposable articles of diet. In 1862 the use of the Bisulphite of Lime was patented in its application to prevent the acetification of such fluids as porter, ale, &c. The complete success of this step should have led, one would think, to our planters observing the same precaution with molasses, the fermentation of which on public wharfs and elsewhere is so unpleasant to more senses than one. From a pamphlet received by the last English Mail, it appears that Dr. Medlock, the patentee of the application just named, has extended his chemical ægis, under the broad seal of the Patent Office, over animal food generally, under the term of "a new and simple process for the preservation of Meat, Poultry, Fish and other varieties of animal food." It is unnecessary to enter specially into the details as published by the patentee of an operation simple in itself and of such extensive application: it is enough to say that fresh meat may be preserved for a lengthened period by being sponged over with the patent solution of Bisulphite of Lime to which a small portion of Salt has been added (see Note).* When the meat is required for use, it has only to be soaked for a few minutes in cold water and then wiped dry, when it presents no trace of smell or flavor beyond that of the original meat. I have ventured to add these remarks on the Bisulphites in the hope that their use may be appreciated in a Colony where their application may be extended with due precaution not only in medical practice, but in the manufacture of one of our principal staples, and though last not least, to articles of food which, instead of appearing on our tables as wholesome and nutritious delicacies, in too many cases pall on the jaded appetite in the unsatisfactory form of salted meats and salted fish. Should the results of Doctor Medlock's patent fully bear out his programme, we may anticipate, according to him, that at

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* Note from Dr. Medlock's Pamphlet.—"In the case of a small family "who wish to keep a leg of mutton or a sirloin of beef for a week in "sultry weather with the thermometer at 90°, take a teacupful of the "Patent Solution of Bisulphite of Lime, a desert spoonful of salt, and "about a quart of cold water, mix in a suitable vessel. Dip the meat "in this mixture for a few minutes, taking care with the end of a cloth "to wet it all over, then hang up the joint as usual."

no distant date good sound meat will be introduced into all the markets of the world at about 2½ per ℔.—a calculation based numerically on the flocks and herds at present grazing in the provinces of La Plata and Australia. In the former there are supposed to be about 27,000,000 cattle and 40,000,000 sheep, and in the latter 180,000,000 cattle and 300,000,000 sheep.

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PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART III.] [DECEMBER 1867.

Tuesday, 9th July, 1867.

The Hon. HENRY STUART MITCHELL, M.D., Ph. D., President, in the Chair.

William Henry Stone, Esq., F.R.C.P., F.R.C.S., and Robert Hall Bakewell, Esq., M.D., were elected Members.

The following communication was read :—

On the TERTIARY FOSSILS *of the* WEST-INDIES, *with especial reference to the* CLASSIFICATION *of the* KAINOZOIC ROCKS *of* TRINIDAD.

By R. J. Lechmere Guppy, F.G.S., F.L.S.

§1. *Introduction.*

The desire to know something of the constitution and history of the earth we live upon has always held a place in the human breast, and we find the earliest philosophers hazarding speculations upon the subject. This desire is quite natural, and forms a part of the thirst after knowledge which is one of the attributes of human beings.

Leaving on one side the more or less fanciful geology and cosmogony of the ancients we find that the first developments of geological science were chiefly confined to the study of the mineralogical and petrological features of the earth. The first rude classification of rocks arose out of this study ; and the principles upon which that classification were based have held sway for a very long time over geological science. Accordingly we find that the first attempts to classify the rocks of the Caribean area were made upon old principles. Nearly every traveller to the West-Indies and equinoctial America has had something to say upon the physical structure of this part of the globe. The illustrious Humboldt, in his Personal Narrative and his Political Essay on the Island of Cuba, presents us with his observations on the Geology of Venezuela and Cuba. He noticed the fossiliferous rocks of Cumana, and put the query whether any of their organic contents were identical with existing species in the adjoining seas; a query answered by me in my paper on the Relations of the Tertiary Formations of the West Indies.

Among the more noteworthy of Humboldt's successors in this field I may mention the names of Dauxion Lavaysée, St. Claire-Deville, Nugent, and DelaBeche, who have written upon the geology of Trinidad, Tobago, Jamaica and other islands.

It was not however until the science of Paleontology arose that Geology was evolved from the chaos in which it had lain previously to the beginning of the present century.

By degrees, as the natural sciences advanced, it became more and more clear that the true means of classifying the rocks which form the earth's crust, and which are therefore the only ones accessible to our observation, was by the study of their imbedded organic remains. It is not within the limits of this paper, devoted as it is solely to West Indian geology and especially to that of our own island, to detail or even glance at the various steps by which the progress of geology was facilitated by the advance of paleontological knowledge. I shall therefore pass on at once to the first notices of fossils found in the the West Indies. Moreau de Jonnés* appears to have been one of the first to observe such objects. Humboldt, as I have already mentioned, had noticed the fossils of Cuba and Venezuela. Duchassaing, a medical practitioner in St. Thomas, collected and determined the fossils of Guadeloupe, and with the assistance of Michelin published the results in the "Bulletin" of the Geological Society of France. Other collections were made by Nugent and others ; but our first real knowledge of the Caribean tertiary fauna is due to Colonel Heneken, who was engaged in military operations in Haiti in the year 1849. The collection of fossils made by him was examined and described by Mr. Carrick Moore and the results published in the Journal of the Geological Society. Fortunately for West-Indian geology this series of remains was in very fine preservation, and it was therefore easy to compare them with the beautiful fossils of Bordeaux, Dax, and Vienna, their European analogues. The fossil molluska of the miocene beds of Haiti have consequently served as a standard for ascertaining the relative ages of the tertiaries of the West-Indies.

* Histoire Physique des Antilles françaises.

The next important step in our knowledge of the geology of the islands was the commencement of the Government Geological Survey; the island first examined being Trinidad. The determination of the tertiary rocks of the island was based upon what had been previously published by Mr. Carrick Moore. But the classification thus arrived at was imperfect. This fault was in great measure due no doubt to the very little attention paid to the fossils; the object of the survey being principally economic and practical geology. Still, a useful warning may be drawn from this, as to the impossibility of obtaining correct views without the aid of the higher sciences.

The greatest share of the verification of the Caribean Miocene fell to the lot of Dr. Duncan, who described the rich series of fossil corals from the tertiary beds of Antigua, Jamaica, Haiti and other islands. Dr. Duncan's elaborate and highly-successful investigations enabled him to confirm the previous generalizations on the age of the Caribean Miocene, and to perceive and illustrate the applicability of the theory of the migration of organised beings to the case in question. His researches tended to give a greater degree of probability to the hypothesis of the tertiary Atlantis on which Heer had labored, and to the support of which the arguments of Forbes, Godwin-Austen and Darwin had lent such force.

The next advance in West-Indian geology was due to the zeal and industry of Mr. Barrett, Director of the Geological Survey of the West-Indies. That naturalist collected a fine series of remains from the Jamaican tertiaries; but before he could describe them he lost his life in diving for those living organisms a knowledge of which was necessary to enable him to judge accurately as to the true nature of the fossil species. Having temporarily taken Mr. Barrett's place in Jamaica, Mr. Wall, in conjunction with Dr. Duncan, communicated a very important notice of the geology of that island to the Geological Society. That communication embodied descriptions and figures of many of the fossil corals of Jamaica.

The remains collected by Mr. Barrett in Jamaica having been deposited in the British Museum, were examined by Mr. Carrick Moore, who communicated in 1863 a notice of them to the Geological Society. In 1865, being then in London, I undertook at the request of Mr. Woodward the description of these fossils, for which I had been prepared by several years study of the fossils and recent shells of the West-Indies, and at the same time I described and enumerated other fossil molluska and echinoderms from the West-Indies, including Trinidad. Subsequently I communicated to the Geological Society a resumé of what was known of the geology and paleontology of the tertiary formations of the West Indies, enumerating the fossils and describing such new species as were accessible to me.*

It will of course be understood that the present paper relates to the tertiary geology only of Trinidad and the Caribean area. But by way of parenthesis I may allude to the secondary rocks of Trinidad, the conclusions as to which have been based upon the researces of Boussingault, Rœmer, Karsten, Lea, Von Buch, d'Orbigny, &c. On this subject I have published a paper in the "Geologist." The cretaceous rocks of Jamaica have been treated of by Barrett and Woodward, and the latter has described from that

* This paper contains references to most of the published works on West-Indian Geology, and to it therefore I would refer those desirous of working at the subject. It was pnblished in the 22nd vol. of the Quarterly Journal of the Geological Society. London 1866.

formation a new genus of shells under the name of *Barettia*. Some corals have also been enumerated by Dr. Duncan.

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§2. *The Atlantis Theory.*

My present limits will not admit of my going at any great length into the conclusions arrived at from the researches which have been made into the geology of the West Indies. After having therefore briefly touched upon some of the points alluded to in the first part of this paper I shall conclude with a list of the species of molluska, articulata, echinodermata and protozoa described from the tertiary rocks, showing in what localities the species are found. The columns of the table are arranged in the presumed order of the antiquity of the deposits occurring in the localities.

The most remarkable perhaps of the results of the investigations referred to is the close alliance exhibited between the fauna of the Caribean miocene and that of the European beds of Malta, Bordeaux, Dax, Vienna, and Piedmont, and with the existing fauna of the Eastern Seas. According to the ideas entertained by the most advanced naturalists of the present day, this close alliance must be accounted for by a migration of species accompanied by a modification of their forms. But as land is as necessary for the migration of most marine animals as it is for terrestrial beings it follows that there must have been land on areas now occupied by the ocean.

Heer had advocated the theory of a miocene atlantis, basing his conclusions on his investigations of the miocene flora of Switzerland. That flora exhibits a remarkable analogy with that now existing in the Southern United States of North America. But there was a part of it which was also allied to eastern Asiatic forms; and Professor Oliver hence endeavored to show that it was more probable that the plants had migrated by way of Eastern Asia to the miocene regions of Europe. Though I am of opinion, and though I have endeavoured to prove in my papers on West Indian geology, that Professor Oliver's hypothesis is scarcely the most probable, I am glad that his very able essay will still be of great service; for the data given by him are really as much to the point if we assume a migration towards the East, a proposition which is indeed far more tenable on physical grounds, though at first sight apparently not so, on account of the great depth and width of the Atlantic which makes us recoil from the idea of a land connection between the shores of the Atlantic, so lately, speaking geologically, as the period in question, that of the upper miocene. This latter argument seems to have weighed very strongly with Sir Charles Lyell who, in the 6th edition of his Elements of Geology, devotes several pages to a close examination of this question. These learned gentlemen seem to have overlooked the fact that the European miocene flora is extinct, whilst that of North America, Japan, &c., is living, and that, as Mr. Hamilton has remarked, it is not possible that a migration should take place from a living to an extinct flora.

At first sight this difficulty seems to be removed by the researches of Lesquereux and Newbery who have shown that the Eocene flora of North America is closely allied to that of the miocene of Europe. But this argument, though available for either hypothesis, bears much more strongly

in favor of the Atlantis theory, providing it be admitted that the Atlantis was pre-miocene.

In the last volume (the 22nd) of the Quarterly Journal of the Geological Society, I have given the arguments upon which I base my views as to the Atlantis hypothesis; and as no one has yet shown those views to be untenable, I shall now only briefly state that my conclusions, derived from a careful study of all the evidence, are that the Atlantis continent was most likely pre-miocene, and that during the miocene period probably only the higher summits of the land remained as coral islands, much as in the existing Pacific Ocean. This view is strongly supported by the evidence before referred to, which has been brought forward by Forbes and Godwin-Austen, and which has been concurred in by Darwin, and further supported by Dr. Duncan's investigations.

The migration then of organised beings during the miocene period, as indicated by the alliances of the fossil and recent animals and plants, was probably from meridional America across the Atlantic and through North Africa and South Europe to the East Indies.

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§3. *The Classification of the Tertiary Rocks of Trinidad.*

The researches which have been made into the paleontology of the tertiary strata of Trinidad enable me to offer an improved classification of these rocks. At the same time I must state that my opportunities have not sufficed for a satisfactory determination of all the beds included by Messrs. Wall and Sawkins in the Tamana Series nor of those composing the Naparima Marls. Neither have I been able to investigate the relationships of either the Moruga or the

Nariva Series. The want of specific determinations of the fossils procured by the Geological Survey renders it difficult for me to establish any comparison between the fauna of the deposits referred to and those of the Manzanilla and San Fernando Beds on the one hand. Consequently I cannot be quite sure that I am correct in my classification of the Moruga and Tamana beds.

I propose that the names Newer Parian and Older Parian applied by the Geological Survey should be dropped. The Newer Parian includes the whole of the tertiary formations older than the postpliocene detrital series, whilst the term Older Parian was given to the lower cretaceous strata. These latter may retain the local name of Pointe-à-Pierre Beds, their geological age being probably neocomian.

Classification of the Tertiaries of Trinidad, in descending Order, with some of the Deposits in the other West Indian Islands, &c.

Trinidad.	Antilles, &c.
I. Postpliocene.	
a. Unstratified detritus, alvial accumulations of recent date, &c.	Terrains à Galibis of Guadeloupe. Detrital and recent formations in many of the Antilles.
b. Stratified detritus.	
II. Pliocene.	
a. Wanting.	Newer Pliocene Beds of Barbados and the Antilles containing recent species only.

b. Matura Beds, with 10 or 15 per cent. of extinct species.	

III. Upper Miocene.

a. Moruga Series.	
b. Jordan-Hill and St. Croix beds containing fossil corals and mollusca (Mya, &c.)	Tertiaries of Cumana, Barbados, Jamaica, Haiti, Anguilla, Antigua, Scotland formation of Barbados, &c.
c. Savanetta Beds (Caroni Series).	

IV. Lower Miocene.

a. Manzanilla Beds (Tamana Series.)	? Terebratula beds of Guadeloupe.
b. San Fernando Beds.	"Isolated Rock" in Scotland formation of Barbados.

List of the Fossil Molluska, Echinodermata, Articulata and Protozoa hitherto discovered and recorded from the Tertiary Rocks of the Caribean Area (exclusive of the Postpliocene).

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	
Subkingdom MOLLUSKA. Class GASTEROPODA.											
Physa rivalis Mat. and Rack.	x	x	...	...	...	...	...	...	...	...	
Planorbis terversanus d'Or.	x	x	...	..	..	...	..	...	...	...	
Gundlachia ancyliformis Pf.	x	x	..	...	...	...	...	...	...	...	
Bulla striata Brug.	x	x	x	x	...	...	x	..	...	...	Europe.
paupercula Sow.	...	...	...	...	...	...	x	...	...	...	
granosa Sow.	...	...	...	...	...	...	x	...	...	...	
Tornatina coix-lacryma Guppy.	...	...	...	...	...	x	...	...	...	...	
canaliculata d'Or.	x	x	...	...	...	...	...	...	...	...	
Cylichna ovum-lacerti n. sp.	...	...	...	...	...	..	...	...	x	...	
Scalaria clathrus Lam.	x	x	...	...	...	...	...	...	...	...	
Leroyi n. sp.	...	...	...	...	x	...	...	...	...	...	
Ehrenbergi Forbes.	...	...	...	...	...	...	...	...	...	...	Barbados.
Chemnitzia turris d'Orb.	x	x	...	...	...	...	...	...	...	...	
subcarinata d'Or.	x	x	...	...	...	...	..	...	...	..	
Leiostraca clavata n. sp.	...	x	...	...	...	...	...	...	...	...	
Odostomia lævigata d'Orb.	x	x	...	..	...	...	...	...	...	...	
cancellata d'Orb.	x	x	...	...	...	...	...	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	
Aclis helecteroides n. sp.	...	x	...	...	...	...	...	...	..	...	
Natica canrena Linn.	x	x	...	...	...	...	...	...	...	...	
sulcata Born	x	...	x	...	...	x	x	...	...	...	
phasianelloides d'Orb.	...	...	...	...	...	x	x	x	...	x	Cuba
subclausa Sow.	...	...	...	...	...	x	x	...	...	...	
Sigaretus depressus Phil.	x	x	...		...	...	...	...	...	...	
Turritella imbricata Linn.	x	x	...	...	...	...	...	..	...	...	
tornata Guppy.	...	...	x	...	...	x	x	...	...	...	
planigyrata n.sp.	...	...	..	...	x	...	...	..	...	...	
Vermetus papulosus Gupp.	...	...	..	...	...	x	x	..	...	...	
lumbricalis Linn.	x	x	...	...	...	...	...	...	...	...	
trilineatus n. sp.	...	x	...	...	...	...	...	...	...	...	
Petaloconchus sculpturatus Lea.	...	...	...	...	x	...	x	...	...	...	U. States.
Siphonium decussatum Gml.	x	x	...	...	...	...	...	...	..	...	
Narica sulcata d'Orb.	x	x	...	...	...	...	...	...	...	...	
Triforis guttata n. sp.	...	x	...	...	...	...	...	...	..	...	
Cerithiopsis punctatum Lin.	x	x	...	...	...	...	...	...	..	...	
Cerithium plebeium Sow.	...	...	x	...	...	x	x	x	...	...	
uniseriale Sow.	...	...	x	...	...	...	x	...	...	...	
Solarium semidecussatum n. sp.	...	x	...	...	...	...	...	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla. Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
S. quadriseriatum Sow.	...	...	...	...	x	x	x	x	...	...	
Cancellaria BarrettiGupp.	...	...	...	...	...	x	x	..	...	...	
lævescens Gupp.	...	...	...	...	x	x	x	...	...	...	
Moorei Guppy.	...	...	x	...	...	x	x	...	...	...	
Strombus pugilis Linn.	x	...	...	...	...	x	x	x	...	...	Cuba.
bifrons Sow.	...	...	...	...	...	...	x	...	...	...	
ambiguus Sow.	...	...	...	...	...	...	x	...	x	...	
haitensis Sow.	...	...	...	...	...	...	x	...	...	...	
proximus Sow.	...	...	...	...	...	...	x	...	...	...	
Murex domingensis Sow.	...	...	x	...	...	x	x	...	...	...	
Typhis alatus Sw.	...	x	...	...	...	...	x	...	...	...	
Ranella crassa Dillw.	x	...	...	...	...	x	...	...	...	...	
Triton variegatus Lam.	x	..	...	...	...	...	x	...	...	...	
femoralis Linn.	x	...	..	...	...	...	x	...	...	...	
gemmatusReeve.	x	...	...	...	...	...	x	...	...	...	
Latirus infundibulum Gml.	x	...	...	...	x	x	...	...	...	...	N.America.
Turbinellus ovoideusKien.	x	...	. .	...	x	...	x	..	..	...	
validus Sow.	...	...	...	...	x	...	x	...	...	...	
haitensis Sow.	...	...	...	...	...	...	x	...	..	...	
Fasciolaria semistriata Sow	...	...	...	...	...	...	x	...	...	...	
intermedia Sow.	...	...	...	...	...	...	x	...	...	...	
Tarbelliana Grat.	...	...	x	...	...	...	...	...	...	...	Chile, Europe.
Pyrula melongena Linn.	x	...	x	...	...	x	x	...	...	...	Europe.
Fusus Henekeni Sow.	...	...	...	...	...	...	x	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
F. haitensis Sow.	...	...	...	...	...	...	x	...	...	...	
Phos Moorei Gupp.	...	...	...	...	...	x	x	...	...	...	
elegans Guppy.	...	...	x	...	...	x	x	...	...	...	
Nassa incrassata Müll.	x	x	x	...	...	x	x	...	...	...	Europe.
solidula Guppy.	...	...	x	x	...	...	...	...	...	...	
Terebra inæqualis Sow.	...	...	x	...	...	x	x	...	...	...	
bipartita Sow.	..	...	...	...	...	...	x	...	...	...	
flammea Linn.	x	...	...	...	...	...	x	...	...	...	
sulcifera Sow.	...	...	...	...	...	...	x	...	...	...	
Cassis sulcifera Sow.	...	...	...	...	...	x	x	...	...	...	
monilifera Gupp.	...	...	...	...	...	x	...	...	...	...	
Cassidaria lævigata Sow.	...	...	...	...	...	...	x	...	...	...	
sublævigata Gupp.	...	...	...	...	...	x	...	...	...	...	
Oniscia domingensis Sow.	...	...	...	...	...	...	x	...	...	...	
Malea camura Guppy.	...	...	...	...	...	x	x	...	...	...	
Ficula carbasea Guppy.	...	...	...	...	x	...	...	x	...	...	
Persona simillima Sow.	...	...	x	...	...	x	x	...	...	...	
Crepitacella cepula Guppy	...	...	x	...	...	...	...	...	...	...	
Columbella Duclosiana d'Or.	x	x	...	...	...	...	...	...	...	...	
pulchella Kien.	x	x	...	...	...	...	...	...	...	...	
peculiaris n. sp.	...	x	...	...	...	...	...	...	...	...	
haitensis Sow.	...	...	...	...	...	...	x	...	...	...	
venusta Sow.	...	...	x	...	..	...	x	...	...	...	
gradata Guppy	...	...	x	...	...	x	...	...	...	...	
ambigua Guppy	...	...	...	...	...	x	...	...	...	..	
Oliva reticularis Lam.	x	...	...	...	...	x	...	...	...	..	

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	
hispidula Lam.	x	...	x	...	...	...	x	...	...	...	
cylindrica Sow.	...	...	x	x	x	...	x	...	...	...	
oryza Lam.	x	x	...	...	...	...	...	...	...	...	
Ancillaria glandiformis Lam.	...	...	...	...	...	x	x	...	...	...	Europe.
lamellata Guppy	...	...	...	...	...	...	...	...	x	...	
Pleurotoma consors Sow.	...	...	...	...	...	x	x	...	...	...	
venustum Sow.	...	...	...	...	...	x	x	...	...	...	
Barretti Guppy	...	...	x	...	...	x	x	...	...	...	
jamaicense Gup.	...	...	...	...	...	x	...	...	...	...	
Heneckeni Sow.	...	...	...	...	...	...	x	...	...	...	
haitense Sow.	...	...	x	...	...	...	x	...	x	...	
jaquense Sow.	...	...	...	...	...	...	x	...	...	...	
elatior d'Orb.	x	x	...	...	...	...	...	...	...	...	
luctuosa d'Orb.	x	x	...	...	...	...	...	...	...	...	
Conus recognitus Guppy	...	...	...	...	...	x	x	...	...	...	
planiliratus Sow.	...	...	...	...	x	x	x	...	...	...	
stenostomus Sow.	...	...	...	...	...	x	x	...	...	...	
granozonatus Guppy	...	...	...	...	...	x	x	...	...	...	
interstinctus Guppy	...	...	...	...	...	x	x	...	...	...	
gracilissimus Guppy	...	...	x	...	...	x	x	...	...	...	
haitensis Sow.	...	...	...	...	...	...	x	...	...	...	
symmetricus Sow.	...	...	x	...	...	...	x	...	...	...	
marginatus Sow.	...	...	...	...	...	...	x	...	...	...	
domingensis Sow.	...	...	...	...	...	...	x	...	...	...	
catenatus Sow.	...	...	...	...	...	...	x	...	...	...	
consobrinus Sow.	...	...	...	...	...	...	x	...	...	...	
prototypus n. sp.	...	...	...	...	x	...	...	...	...	...	
pusio Brug.	x	x	...	...	...	...	...	...	...	...	
Mangelia micropleura n. sp.	...	x	...	...	...	...	...	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
Mitra Henekeni Sow.	...	...	...	...	x	x	x	...	...	...	
varicosa Sow.	...	...	...	...	...	...	x	..	...	...	
Voluta soror Sow.	...	...	..	...	...	...	x	...	...	...	
pulchella Sow.	...	...	...	..	...	...	x	...	...	...	
Marginella coniformis Sow.	...	...	x	...	x	x	x	..	...	...	
interrupta Lam.	x	...	x	...	...	...	...	...	...	...	
cœrulescens Lam.	x	x	...	...	...	...	..	...	...	...	
Volvarina pallida Lam.	x	x	...	...	...	...	...	...	...	...	
catenata Mont.	x	x	...	...	...	...	...	...	...	...	
Erato Maugeræ Gray	x	x	..	...	...	..	...	...	...	...	
Cypræa pustulata Lam.	x	...	...	...	...	...	x	...	...	..	
Henekeni Sow.	...	...	...	...	...	...	x	...	...	...	
Dentalium missisipense Conr.	...	...	...	...	...	...	x	...	...	...	U. States.
dissimile Guppy	...	...	...	...	...	x	...	...	...	...	
disparile d'Orb.	x	x	...	...	...	...	...	...	...	...	
antillarum d'Orb.	x	x	...	..	...	...	...	...	...	...	
Trochita Candeana d'Orb.	x	x	...	...	...	...	...	...	...	...	
Crucibulum piliferum n. sp.	...	x	...	...	...	...	..	...	...	...	
subsutum n. sp.	...	x	...	...	...	...	...	...	...	...	
Crepidula aculeata Lam.	x	x	...	...	...	...	...	...	..	...	
Gadinia afra Gray	x	x	...	...	...	...	...	...	...	...	
Fissurella cayennensis Lam.	x	x	...	...	...	...	...	...	...	...	
Stomatia eidolon Guppy	...	...	...	...	...	...	...	...	...	x	
Neritina Woodwardi Guppy	...	...	...	...	...	x	...	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla. Trinidad.	San Fernando Trinidad.	
Trochus decipiens n. sp.	...	x	...	...	...	x	...	..	...	...	
var. laticarinatus	...	x	...	...	...	...	...	...	...	...	
plicomphalus n. sp.	...	x	...	...	..	...	...	...	...	...	
Turbo castaneus Chemn.	x	...	x	..	...	x	...	...	...	...	
Cyclostrema bicarinatum Gupp	...	...	...	...	...	x	...	...	...	...	
Vitrinella marginata n. sp.	...	x	...	...	...	...	...	...	...	...	
Class CONCHIFERA.											
Martesia striata Linn.	x	x	...	...	...	...	...	...	...	...	
Teredo fistula Lea	...	...	...	...	x	...	x	...	...	...	
Gastrochæna cuneiformis Lam.	x	x	..	...	...	...	...	...	...	...	
Corbula viminea Guppy	..	...	...	...	...	x	x	..	..	...	
vieta Guppy	...	x	..	...	x	x	...	...	x	...	
cubaniana d'Orb.	x	x	...	...	...	...	...	...	...	...	
caribæa d'Orb.	x	x	...	...	...	...	...	...	..	...	
Neæra costellata Desh.	x	...	...	..	...	x	...	...	...	...	
Cercomya ledæformis Gupp.	...	...	...	...	...	...	...	...	x	...	
Mactra turgida Gmel.	x	x	...	...	...	...	...	...	...	...	
subovalina Gupp.	...	...	...	...	...	...	...	...	...	x	
Mactrinula macescens Gupp.	...	...	...	...	...	...	...	...	x	...	
Tellina biplicata Conrad	...	...	...	x	x	...	x	...	...	...	Cuba; U. States.

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	
Strigilla carnaria Linn.	x	x	...	...	...	...	...	...	...	...	
Semele variegata Lam.	x	x	...	...	...	..	...	...	...	...	
Donax striata Linn.	x	x	...	...	...	...	...	...	...	...	
fabagelloides n. sp.	...	x	...	...	...	...	...	...	...	...	
Lucina tigrina Linn.	x	...	x	...	...	. .	x	...	...	...	Egypt, Europe.
pensylvanica Linn.	x	...	x	...	...	x	x	...	...	...	U. States, Piedmont
muricata Chemn.	x	x	...	...	...	...	...	...	...	...	
Gouldia martinicensis d'Orb.	x	x	...	...	...	...	...	...	...	...	
Trigona mactroides Born.	x	x	...	...	...	...	...	...	...	...	
Cytherea planivieta Guppy	...	...	...	...	...	x	...	...	...	...	
carbasea Guppy	...	...	...	...	...	x	...	...	...	...	
juncea Guppy	...	...	x	...	...	...	...	...	...	...	
convexa Say	x	...	x	...	...	...	...	...	...	...	
circinata Born.	x	x	...	...	...	...	...	...	...	...	
Venus paphia Linn.	x	...	x	...	...	x	x	...	...	...	Vienna.
rugosa Chemn.	x	...	...	...	...	...	x	...	...	...	
puerpera Linn.	x	...	...	...	..	...	x	...	...	...	
flexuosa Linn.	x	x	...	...	...	...	...	...	...	...	
cancellata Gronov.	x	x	x	...	...	...	x	...	...	...	
crenulata Chemn.	x	x	...	...	...	...	...	...	...	...	
Walli Guppy	...	...	...	...	...	...	...	...	x	...	
Woodwardi Guppy	...	...	x	...	...	...	...	...	...	..	
Dosinia acetabulum Conr.	x	...	...	...	x	...	...	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene.						Lower Miocene.		Additional Tertiary Localities.
			Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	
cyclica Guppy	...	...	...	...	...	...	...	...	x	...	
Cardium muricatum Linn.	x	x	...	...	...	...	...	...	...	...	
haitense Sow.	x	x	x	...	...	x	x	...	...	...	
lingua-leonis Guppy	...	...	...	...	...	x	...	..	...	...	
inconspicuum Guppy	...	...	...	..	...	x	...	...	...	...	
castum Guppy	...	...	...	...	...	...	...	...	x	...	
Cardita minima Sow.	x	x	..	...	...	...	...	...	...	...	
scabricostata Guppy.	...	...	...	...	...	x	x	...	...	...	
Chama arcinella Lam.	x	...	...	...	...	x	x	...	...	...	N.America.
ruderalis Lam.	x	x	...	...	...	...	...	...	...	...	
Erycina tensa Guppy	...	...	...	...	...	...	...	...	x	...	
Leda bisulcata Guppy	...	...	...	...	...	x	...	...	...	...	
incognita Guppy	...	...	...	...	...	...	...	...	...	x	
Packeri Forbes	...	...	...	...	...	...	...	...	...	...	Barbados.
perlepida n. sp.	...	x	...	...	...	...	...	...	..	...	
illecta n. sp.	...	...	...	...	...	...	..	...	x	...	
Nucula Schomburgki Forbes	...	...	...	...	..	...	...	...	...	x	Barbados.
baccata n. sp.	...	x	...	...	...	...	..	...	...	...	
vieta n. sp.	...	x	...	...	...	...	..	...	...	...	
Arca noæ Linn.	x	x	...	...	...	x	x	...	...	...	
incongrua Say	x	...	x	...	...	...	...	...	...	...	
consobrina Sow.	...	...	x	...	...	x	x	...	...	...	
inæquilateralis Guppy	...	...	...	...	...	x	...	...	...	...	
patricia Sow.	...	...	...	...	x	...	x	...	...	...	
trinitaria Guppy	...	...	..	...	...	...	...	...	x	...	
filicata Guppy	...	...	...	...	...	...	...	...	x	...	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
centrota n. sp.	...	x	...	...	...	...	..	..	...	...	
Adamsi Shuttl.	x	x	...	...	...	...	...	...	...	...	
squamosa Lam.	x	x	..	...	...	...	...	...	...	...	
pexata Say	x	x	x	..	...	...	x	...	...	...	N.America.
Pectunculus pennaceus Lam.	x	...	x	...	...	x	...	...	...	...	
acuticostatus Sow.	...	...	x	...	...	x	x	...	...	...	
Pecten exasperatus Sow.	x	...	...	...	...	x	...	...	...	...	
inæqualis Sow.	...	...	...	...	...	x	x	...	...	...	
thetidis Sow.	...	...	..	...	...	...	x	...	...	..	
nucleus Born.	x	x	...	...	...	..	...	...	...	...	
oxygonus Sow.	...	...	...	...	...	...	x	...	...	...	
comparilis Tuomey & Holmes	...	...	...	...	x	...	...	...	...	...	N.America.
anguillensis n.sp.	...	...	...	...	...	...	...	x	...	...	
Mortoni Ravenel	...	...	...	...	...	...	..	x	...	...	N.America.
Spondylus bostrychites Gupp.	...	...	...	...	...	...	x	x	...	...	
Ostrea virginica Gmel.	x	...	...	...	x	...	x	x	x	...	Europe. U.States.
cucullata Born.	x	x	...	..	...	...	...	...	...	...	
Gryphæa athyroides Guppy	...	...	...	...	...	...	...	...	..	x	
Class BRACHIOPODA.											
Terebratula lecta Guppy	...	...	...	...	...	...	...	...	...	x	
trinitatensis Guppy	...	...	...	...	...	...	...	...	...	x	
carneoides Gupp.	...	...	...	...	...	...	...	...	...	x	
Class POLYZOA.											
Cupularia pyriforme	x	x	x	...	...	x	x	...	...	...	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla. Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
Cupularia calyx-glandis n. sp.	...	...	...	...	...	...	...	..	x	...	
Cellaria salicornia Pallas	x	x	...	...	..	...	...	...	...	...	
Subkingdom ECHINODERMATA.											
Class ECHINIDÆ.											
Cidaris melitensis Wright	...	...	...	...	...	...	...	x	...	...	Europe.
metularia Lam.	x	...	...	...	...	...	...	...	...	...	Guadeloupe
Tripneustes ventricosus Ag.	x	...	...	...	...	...	...	...	...	...	Do.
Echinus cameleo Mich.	x	...	...	...	...	...	...	...	...	...	Do.
Echinometra lobata Blainv.	x	...	...	...	...	...	...	...	...	...	Do.
acufera Blainv.	x	...	..	...	...	...	...	x	..	...	
Clypeaster Duchassaingi Mich.	..	...	...	...	...	...	...	..	...	...	Guadeloupe
parvus Duch.	...	...	..	...	...	...	...	...	...	...	Do.
crustulum Mich.	...	...	...	...	...	...	...	...	...	...	Do.
ellipticus Mich.	...	...	...	...	...	...	...	x	...	...	Do.
Scutella Michelini Duch.	...	...	...	..	...	...	...	...	...	...	Do.
Encope Desmoulinsii Duch.	x	...	...	...	...	...	...	...	...	...	Do.
Echinoneus cyclostomus Leske	x	...	...	...	...	...	...	x	...	...	Antilles.
orbicularis Desor	...	...	...	...	...	...	...	...	...	...	Cuba.
Caratomus pisiformis M. & D.	...	...	...	...	...	...	...	...	...	...	Guadeloupe
Cassidulus guadalupensis M. & D.	..	...	...	...	...	...	...	...	...	...	Do.

			Upper Miocene.						Lower Miocene.		
	Recent.	Matura-Pliocene.	Cumana.	Barbuda.	Caroni Series Trinidad.	Jamaica.	Haiti.	Anguilla.	Manzanilla Trinidad.	San Fernando Trinidad.	Additional Tertiary Localities.
Echinolampas semiorbis Guppy	...	...	...	...	...	..	...	x	...	...	
lycopersicus Guppy	...	...	...	...	...	...	...	x	...	...	
ovum-serpentis Guppy	...	...	...	...	...	...	...	...	...	x	
Pygorhynchus jamaicensis Mich.	...	...	...	...	...	x	...	...	...	...	
Amblypygus americanus Mich.	...	...	...	...	...	x	...	...	...	...	
Hemiaster Michelotti Mich.	...	...	...	...	...	...	...	...	...	...	Cuba, Guadeloupe.
Schizaster cubensis d'Orb.	...	...	...	...	...	...	...	...	...	...	Do. Do.
Scillæ Desm.	...	...	...	...	...	...	...	x	...	...	Europe.
Brissus dimidiatus Ag.	x	...	...	...	...	...	...	x	...	...	Cuba.
Class CRINOIDEA.											
Pentacrinus rotularis n. sp.	...	...	...	...	...	...	...	...	...	x	
obtusus n. sp.	...	...	...	...	...	...	...	...	...	x	
Subkingdom ARTICULATA.											
Ranina porifera H. Woodw.	...	...	...	...	...	...	...	...	...	x	
Spirorbis clymenioides Guppy	...	...	...	...	...	...	...	...	...	x	

	Recent.	Matura-Pliocene.	Upper Miocene. Cumana.	Upper Miocene. Barbuda.	Upper Miocene. Caroni Series Trinidad.	Upper Miocene. Jamaica.	Upper Miocene. Haiti.	Upper Miocene. Anguilla.	Lower Miocene. Manzanilla Trinidad.	Lower Miocene. San Fernando Trinidad.	Additional Tertiary Localities.
Subkingdom PROTOZOA.											
Class RHIZOPODA											
Nummulina Ramondi Defr.	...	...	x	...	...	x	x	...	...	x	Widely distributed.
Orbitoides Mantelli Morton	...	...	x	...	...	x	x	x	...	x	Do.
Orbitolites complanatum Lam.	x	...	...	...	...	...	...	x	...	...	Do.
Miliola seminulum	x	...	...	...	...	...	...	x	...	...	Do.
Nodosaria raphanistrum	x	...	...	...	...	...	x	...	...	...	Do.
affinis	x	...	...	...	...	...	x	...	...	...	Do.
Robulina cultrata	x	...	...	...	...	...	x	...	...	...	Do.
Rosalina Beccarii	x	...	...	...	...	...	x	...	...	...	Do.
INCERTÆ SEDIS.											
Cisseis asterisca Guppy.	...	...	...	...	...	...	...	...	...	x	
SUMMARY.											
Species still existing	103	61	17	1	4	16	27	7	...	1	
Pliocene: Matura	61	79	6	1	1	5	8	...	1	...	
Upper Miocene: Cumana	17	6	42	3	2	22	29	2	1	2	
Barbuda	1	1	3	4	2	...	3	...	...	...	
Caroni Beds, Trinidad	4	1	2	2	22	7	14	3	1	...	
Jamaica	16	5	22	...	7	71	45	5	1	3	
Haiti	27	8	29	3	14	45	105	7	2	4	
Anguilla	7	...	2	...	3	5	7	29	...	2	
Lower Miocene: Manzanilla Beds	...	1	1	...	1	1	2	...	15	...	
San Fernando Beds	1	...	2	...	...	3	4	2	...	18	
Total Species 280.	103	79	42	4	22	71	105	29	15	18	

APPENDIX.

Notes on the foregoing Table, with Descriptions of the New Species.

It is highly probable that some of the names given in the above list will prove, upon a close examination of the fossils, to be synonyms—and doubtless others will be found to be still existing, such as *Cardium haitense* of Sowerby, which I dredged up in the Gulf of Paria. But there are still a great number of undescribed and extinct species, chiefly in the collection of the Geological Society, and many others will yet be discovered.

Cylichna ovum-lacerti n. sp.

Shell small, cylindrical-subovate, minutely striate transversely; spire small, sunken; aperture as long as the shell, dilated anteriorly; outer lip straight, blunt; columella callus with a strong tortuous fold.

Lower Miocene, Manzanilla.

Scalaria Leroyi n. sp.

Shell turreted, cylindric, many-whorled, longitudinal ribs few, indistinct, base spirally striate, aperture oval.

The example figured is a small one, but like nearly all the molluska of the Caroni series in Trinidad, the shell appears to have grown to a very large size, for another specimen in my cabinet is upwards of six inches long. I have dedicated this species to my friend Mr. Louis Alexander Le Roy, to whom I am under great obligations for his kindness in procuring me specimens of the Savanetta fossils, and without whose assistance my knowledge of the upper miocene fauna of Trinidad would have been much more limited than it is.

Caroni Beds, Savanetta.

Chemnitzia turris d'Orb. Moll. de Cuba, pl. xvi. f. 10-24. Other forms of this species are distinguished specifically by d'Orbigny as *C. pulchella*, *C. ornata*, and *C. modesta*.

These and other varieties are common in the Matura Beds.

Aclis helecteroides n. sp.

Shell turreted, cylindric, many-whorled, shining, whorls slowly increasing, impressed with a deep groove below the suture, which is equally deep, forming a spiral thread; aperture sub-circular, columella slightly reflexed, peristome simple.

Pliocene, Matura. It resembles a *Proto*, but the columella prevents its reference to that genus. I will not be sure, however, that it ought not to be placed in the neighborhood of *Turritella*. Its smooth texture seems to be against that view of its affinities. I refer it to the genus *Aclis* provisionally only.

Leiostraca clavata n. sp.

Shell rather club-shaped, whorls smooth, flattened, the last forming more than ⅓; spire acuminate, suture linear, scarcely impressed; aperture suboval, elongate, narrow above, dilated in front; peristome simple, columella some what reflected and thickened.

Pliocene, Matura. Allied to *L. acuta*.

Turritella planigyrata n. sp.

Conic-cylindric, striate by fine spiral lines, whorls very slightly convex, the later ones nearly flat; aperture subquadrate.

Caroni Series, Savanetta. A very distinct species, remarkable for its almost entire want of ornamentation, and the flatness of its whorls. I have lately received another species of *Turritella* from Mr. Le Roy, which is more like *T. imbricata.*

Vermetus trilineatus n. sp.

Conic-cylindric, turreted, spire pointed, whorls flat, bearing three narrow spiral keels; lower whorls irregular; suture distinct, linear shallow.

Pliocene, Matura. The young shell is not to be distinguished from a small *Turritella*, but the subsequent growth supplies the Vermetiform character. This shell was given as *Vermetus Royanus* in my list of Matura fossils published in 1864. It has not a deep suture as that species has.

Triforis guttata n. sp.

Reversed, cylindrical; whorls about 8, zoned with three spiral lines of small obtuse points which are connected spirally and longitudinally by threads; suture impressed; base with three or four strong striations; aperture produced into a canal; peristome produced, inner margin with a narrow defined callus.

Pliocene, Matura. Allied to *T. ventricosus* Gmel, under which name it is given in my list of Matura fossils, 1864.

Solarium semidecussatum n. sp.

Small, orbicular depressed, strongly decussate on the upper surface, nearly smooth on the lower surface; umbilicus deep, its margins crenate and spirally striate.

Pliocene, Matura. It is with some doubt that I refer this species to the genus *Solarium.*

Columbella peculiaris n. sp.

Cylindric-suboval, often a little distorted; whorls 6, slowly increasing, the last forming about ½; spire obtuse; suture somewhat irregular or dentate; aperture small, pointed above, peristome simple, columella simple, truncate.

Pliocene, Matura. Perhaps allied to *C. clausiliformis* Kien., but of shorter and more ventricose figure.

Mangelia micropleura n. sp.

Subfusiform, longitudinally ribbed, the ribs crossed by numerous striæ, of which a prominent one forms an angle on the upper part of the whorls; last whorl longer than the spire; aperture rather narrow, lanceolate, with a sinus on the posterior part of the thickened peristome.

Pliocene, Matura. Allied to M. pulchella. The ribs vary considerably as to size and distance apart. It was denominated *M. tæniata* in my list of 1864.

Conus recognitus.

C. solidus, Sow., Quart. Journ. Geol. Soc., vol. vi., p. 45.
,, ,, Guppy, Quart. Journ. Geol. Soc., vol. xxii., pl. xvi., f. 1.

As the name given by Sowerby had been previously applied to another Cone, I propose the name of *recognitus* for the present shell found in Haiti and Jamaica.

Conus prototypus n. sp.

Somewhat pyriform, finely striate anteriorly, becoming quite smooth on the angle of the whorls, which bears a rather indistinct keel; spire mucronate, rather elevated; aperture somewhat widened towards the anterior canal.

Caroni Series, Savanetta. A cone which departs very considerably from the usual type in its swelling outlines-

and the consequent direction and shape of the aperture. It is more of the shape of *C. bulbus* than of any other species I know. It is, however, probably a young specimen.

Crucibulum piliferum n. sp.

Shell covered with numerous erect tubular spines which are small towards the apex, larger towards the base ; apex small smooth, spirally recurved.

Pliocene, Matura. Given as C. tubifer in my previous list. It may be a variety of the next species, but its plicæ are smaller, whilst the spines furnish an easily-recognised character.

Crucibulum subsutum n. sp.

Strongly striate, rugose, somewhat irregularly oval ; striations with a tendency to run in pairs.

Pliocene, Matura. Allied to *C. striatum* Say, under which name it appears in my paper on the Matura beds.

Trochus decipiens n. sp.

Topshaped, imperforate, ornamented by many spiral lines of moniliform granules ; whorls rather concave above, and bearing a rather broad angular keel on their lower portion ; base flattened, covered with lines of rather square granules, aperture subquadrate, wider than high, broadly angulate by the keel ; columella thickened, spreading into a calllus over the umbilicus.

Var. *laticarinatus.*

Keel broader and higher, whorls deeply concave above, suture deeply impressed ; lines on the base squamosely granular.

Pliocene, Matura. As *Trochus granulatus* in my list of 1864.

Trochus plicomphalus n. sp.

Topshaped, deeply perforated by a small circular umbilicus, zoned with many spiral granular lines, aperture subquadrate, columella straight, thickened; base with many (10—20) moniliform rows of granules, umbilicus deep, its margins dentate.

Pliocene, Matura. It resembles *T. ziziphinus* in shape, but is devoid of any keel on the whorls.

Vitrinella marginata n. sp.

Orbicular, umbilicate, discoidal, few-whorled, minutely spirally striate; outer margin with about four small articulated keels not visible from above, the outer one forming the periphery; whorls somewhat convex above; spire raised, ornamented with articulated radiating striæ; aperture nearly circular, rather oblique.

Pliocene, Matura. A most elegant little shell.

Donax fabagelloides n. sp.

Transversely oblong, somewhat triangular, subequilateral, anterior and posterior angles rounded; zoned with broad dark bands, and finely radiately striate; margins crenate-dentate.

Pliocene, Matura. Remarkable for its resemblance to *D. fabagella*, under which name it appeared in my list of 1864. It is more equilateral than that species, and not so high relatively to its length.

Leda perlepida n. sp.

Transversely oval, subinequilateral, moderately convex, with numerous fine concentric striæ, and occasionally deeper and wider concentric furrows; posterior end acutely rostrate; lunule none; dorsal area elongate-lanceolate, longi-

tudinally striate; hinge-teeth numerous, chevron-shaped, widely interrupted beneath the umbo by a large hinge-pit.

Pliocene, Matura. As *L. eburnea?* in my list of 1864.

Leda illecta n. sp.

Smooth, ovate-transverse, inequilateral, somewhat tumid on the central portion, posterior end produced into a rostrum which is almost curved upwards; hinge-line somewhat deflected upwards and interrupted at the umbo; umbones approximated, scarcely prominent beyond the hinge-line; posterior cardinal area broad, smooth and ill-defined.

Lower Miocene, Manzanilla. This species also resembles *L. eburnea* Sow., but the rostrated posterior end is longer and more curved. It is allied to several recent and fossil species, but although it cannot be identified with any I have been able to find, it is somewhat difficult to exhibit clearly the differences in words. From the pliocene species *L. perlepida* it may be distinguished by its greater length and compressed rostrum.

Nucula baccata n. sp.

Subovate, inequilateral, a little produced posteriorly, ornamented by minute concentric ribs which are decussate by still finer radiating striæ; anterior and posterior ends angulate, interior pearl-shining; hinge-teeth slightly bent, divided by a very oblique hinge-pit; margins dentate.

Pliocene, Matura. As *N. similis* in my previous list; a species which it strongly resembles.

Nucula vieta n. sp.

Subequilateral, obliquely suborbicular, slightly produced posteriorly with regular rounded concentric ribs; posterior side very obliquely descending, posterior teeth straight, anterior side short, its teeth few and small; margins dentate.

Pliocene, Matura.

Arca centrota n. sp.

Transversely subrhomboidal, with a strong wide carination running from the umbo to the posterior angle; ornamented with many (36-38) squamosely nodose radiating ribs each with a fine subsidiary thread-like rib in the narrow interstice; anterior margin short, rounded; posterior margin strongly sinuate, angulate above with the hinge-line and forming a more rounded angle with the strongly crenate lower margin. Hinge-teeth small in the middle of the straight hinge, but becoming larger and diverging considerably towards the angles; ligamental area more or less grooved, especially anteriorly.

Pliocene, Matura. The nodosities on the ribs are arranged, at least on the disk, in regular longitudinal rows, and the intermediate thread-like ribs are wanting on the central portion, becoming developed anteriorly and posteriorly.

Cupularia calyx-glandis n. sp.

A crateriform species allied to *C. pyriforme* and *C. Owenii* but distinguished by its more completely cup-shaped form. The details of the cells are not very easily made out from my specimens, but they seem to resemble *C. pyriforme* in general arrangement.

Lower Miocene, Manzanilla.

Pecten anguillensis n. sp.

Shell fan-shaped, ornamented with radiate muricate striæ, and about 10 or 11 prominent rounded ribs, which are crossed by concentric striæ, the concave interstices broader than the ribs. Upper valve nearly flat, lower one gently concave.

Miocene, Anguilla. Allied to *P. Peedeensis* Tuomey and Holmes, North America.

Spondylus bostrychites n. sp.

S. bifrons Sow. (non Goldfuss) Quart. Journ. Geol. Soc., vol. vi., p. 53.

A species found in Haiti and Anguilla. As the name *bifrons* had been already given by Goldfuss to a species of the same genus it is necessary to change the name.

Pentacrinus rotularis n. sp.

No other part than the stem of either of the species here named has been discovered. The stem of *P. rotularis* is circular in section, composed of numerous joints whose diameter is rather more than thrice their height.

Lower Miocene, San Fernando.

Pentacrinus obtusus n. sp.

Stem angular, somewhat irregularly pentagonal in section; joints about 1½ mill. high and about 4½ mill. in diameter.

The differences between the stems to which I have assigned these names and all other species of which I have any knowledge seem to be sufficient to warrant the creation of provisional specific appellations.

Diagrams showing the distribution and relations of the various formations of Trinidad and South-America were exhibited; and a suite of fossils from the tertiary rocks of the Caribean area.

Dr. W. H. Stone exhibited some thermometers of new and improved construction, including a solar radiation thermometer, and explained their uses and mode of action.

Tuesday, 13*th August*, 1867.

HORACE DEIGHTON, M.A., F.R.A.S., in the Chair.

The following Visitor was introduced:—Mr. Orville Chas. Allen, by Dr. Stone.

Mr. Lechmere Guppy was appointed Secretary, and Dr. William Henry Stone was appointed to the vacant place on the Council, until the next election.

The following communications were read:—

1. *Letter from* PROFESSOR AGASSIZ *to the late* DR. LEOTAUD.

Museum of Comparative Zoology
at Harvard College, Cambridge, Mass.,
le 20th May, 1867.

Monsieur,—On n'écrit pas impunément un bon livre, et si je ne suis pas le premier à vous importuner depuis la publication de vos "Oiseaux de Trinidad" je ne serai certainement pas le dernier. Les quelques pages d'introduction que vous avez placées en tête de votre ouvrage m'ont surtout vivement intéressé, parce qu'elles prouvent que vous appréciez dans toute leur valeur les faits de distribution des espèces que vous avez étudiées. Ces faits ont un intérèt d'autant plus grand pour moi que je viens d'en recueillir de toutes semblables au sujet des poissons du Brésil. Les fleuves peuvent être séparés des grands bassins auxquels ils appartiennent, comme certaines îles l'ont été des continents. C'est ainsi que le Maranhon, le Parnahyba, &c., c'est-à-dire, tous les grands fleuves de la côte nord du Brésil, étaient jadis des affluents de l'Amazone, lorsque le continent se reliait directement du Cap St. Roque aux Antilles, et que l'Amazone coulait sur les terres basses de la côte, à une centaine de lieues plus à l'est que les côtes d'aujour-

d'hui. J'ai les preuves géologiques les plus directes de ces changements, et je ne doute pas que vous n'ayez mis le doigt sur la fond de la question en supposant que Trinidad à été séparée du continent par l'empiètement de l'Océan, après avoir été préalablement circonscrite par l'Orinoko, comme l'est aujourd'hui l'île de Marajo par les deux bras de l'Amazone. Mon but en vous écrivant est de vous demander, si la surface de votre île présente le même aspect géologique que le continent avoisinant, ou, en d'autres termes, si vous avez sur vos terres basses des traces des dépôts de l'Orinoko, comme il y en a sur toute la surface de l'île de Marajo et sur toutes les îles de la côte du Brésil depuis Para jusqu'à Céara. Ce qui s'est passé dans le bassin de l'Amazone a du se répéter dans celui de l'Orinoko, et vous me rendriez un bien grand service en m'en fournissant les preuves, qui doivent être faciles à recueillir. Un autre point très-important qui se rattache à la même question :— quels sont les rapports spécifiques des poissons d'eau douce de Trinidad avec ceux du continent ?

J'ai de magnifiques collections pour servir de terme de comparaison avec votre faune fluviatile, mais je ne possède pas une écaille de votre île : pourriez-vous me fournir les moyens de faire ces comparaisons ? La chose ne serait pas difficile ; les poissons se conservent parfaitement bien dans l'alcohol, qui ne doit pas être trop fort pour les racornir, mais assez pour les coaguler l'albumen — une moyenne de 80 0/0 est la meilleure. Si je pouvais vous offrir quelque chose de ce pays ou du Brésil qui puisse vous être agréable, maintenant qu'il existe une collection publique chez vous, et que l'île vous doit, je vous prierais de me préparer une collection aussi complète que possible de vos poissons d'eau douce en nombreux exemplaires, jeunes et vieux, y compris les espèces les plus insignifiantes que l'on trouve en grand nombre dans les plus petits ruisseaux et dont quelques unes n'ont pas plus de 3 à 4 centimètres de longueur. Il a paru à New York, il y a une dizaine d'années, un mémoire sur les poissons de Trinidad, mais l'auteur, Mr. Gill, n'a pas eu occasion de comparer ses espèces avec celles du continent, et il n'a pu consulter personne sur la nomenclature qu'il a adoptée, en sorte que son travail est à refaire. Agréez, Monsieur, &c.

Ls. AGASSIZ.

2. *On a* Method *of* Burial.

By William Henry Stone, M.A., M.B., F.R.C.P., F.R.C.S., &c.

(Abstract.)

After an introduction in which the author remarked upon the present mode of burial and its concomitant circumstances in different countries, he states that it occurred to him that the experiments of Dr. Stenhouse on the preservative powers of charcoal might be made to bear useful fruit in this direction.

The Author continued as follows: — Dr. Stenhouse showed by experiment that the bodies of small animals might be kept embedded in charcoal for an indefinite time even in dwelling rooms without giving a single evidence of putrefaction. The experience which I can add to his amounts to this: that the process is equally efficacious when applied to the human body. In the first instance I made use of it for the body of a near relative which, from circumstances,

could not be buried near the place of death, but had to be kept over a week and then removed into the country. I proposed to supersede the usual costly and inefficient lead coffin by this simple means, and with complete success. The coffin was kept in a dwelling-house for 8 days during the warmth of June, not only without unpleasant effluvium, but without that indescribable odour of death which is ordinarily characteristic of a corpse recently dead. The method was easy in the extreme; three inches of fine Peat Charcoal were laid on the floor of the coffin in place of the conventional mattrass; upon this the body was laid, and packed with the same material from the feet upwards towards the head, the face was left open a day or two longer in deference to the wishes of relatives, and it was only when slight signs of putrefaction and changed colour began to show themselves that this was also filled in; the remaining space, about three inches, was then filled to the top with the powder, and the lid screwed down. The price of the best Peat Charcoal sent from London to Canterbury and delivered was only 25s., whereas a lead coffin would have cost many pounds without answering its purpose: for you may not be aware that the undertakers are in the habit, at the last moment, of boring a small hole through the lead with a bradawl to prevent what not uncommonly occurs without this manœuvre, namely, the explosion of the leaden casing. Nearly all the old lead coffins in the vast vaults of my father's London Church, were actually rent down the side from the neglect of this precaution. I need hardly comment farther on the value of lead coffins.

The second case which I wish to draw your attention to occurred in Madeira. It was that of Sir Francis Legard, who died of empyema during my residence in that island. It was determined to embalm the body in order that it might be conveyed to the family vault in the north of England. The plan I adopted for embalming was a modification of one which has been described by a French operator. A small cut was made over the femoral artery in what is termed Scarpa's triangle, a pipe was firmly tied into the artery and its other end connected with a tube of vulcanized caoutchouc ten feet long: in the other end of this was placed a large glass funnel, the body was then laid on the floor, and I mounted a flight of steps set beside it with the funnel in one hand and a gallon jug of "Goadby's solution," *i.e.*, a strong solution of Corrosive Sublimate, Baysalt, and Creosote. Filling the tube and funnel I raised the latter till the hydrostatic pressure was sufficient to cause the fluid to flow gently but with great force into the vessels. I continued to do this until clear fluid replaced the blood which, after a time, poured from the small divided branches of the femoral and other veins. The tube was once shifted, being first placed upwards, and when that end of the artery had been tied, inserted downwards so as to inject the corresponding leg. The quantity of fluid thus absorbed amounted to three gallons and a half. The coffin was then filled as before with pounded charcoal. The Portuguese medical official gave me the proper certificate, expressing much satisfaction at the process. Now this body had to be kept one month in the semi-tropical and singularly moist climate of Madeira, in the vault under the English church, before it could be sent home. I visited it several times, as did other medical men, to test the success of the method, and there was never the faintest smell of decomposition, or,

indeed, any smell whatever, except that of the creosote employed.

I feel persuaded that the former and simpler plan would prove most effectual here, and would render unnecessary the hasty mode of burial now in vogue, a system which is always indecent, perhaps occasionally dangerous. The latter more elaborate process would be far more decorous than the salting and pickling, or stowing away in barrels of rum which I have heard of.

Tuesday, 10*th September*, 1867.

The Hon. LOUIS ANTOINE AIME DE VERTEUIL, M.D., in the Chair.

The following Communications were read:—

1. *An* ACCOUNT *of the* LEAD MINES *of* CARUPANO. By Mr. Westall. (Communicated by Dr. Stone.)

2. *On a* MERIDIAN INSTRUMENT. By William Henry Stone, M.B., F.R.C.P.

3. *A* SKETCH *of the* GOLD MINES *of* YURUARI.
By Doctor Francisco Padron.
(Communicated by Dr. W. H. Stone.)
(Abstract.)

In this communication the author gave an account of the discovery and history of the gold mines at Yuruari, in Venezuelan Guiana, near Ciudad Bolivar. Shafts have been sunk 60 to 80 feet deep, under the superintendence of Californian miners. The gold is found in fine yellow and blue clays, the latter considered to be kaolin.

Steam-engines have been introduced for working the machinery for pulverizing the quartz in which gold is found. The yield was two ounces per ton, the quartz not being selected; but the incompetence of the machinery to crush any considerable quantity of quartz, combined with the great unhealthiness of the place, caused the abandonment of the mines by the Company which had been formed to work them, after the death of several of their employés.

The working of the mines, however, was continued by the residents. These were six hundred in number, of whom 200 were actually engaged in mining. The author stated that under these circumstances the mines yielded $50,000 per month, notwithstanding the imperfection of the means employed for the extraction of the metal. A large immigration followed, raising the population to about 6,000; and a Company is projected for working the auriferous deposits. The author stated that quartz of very great richness had been discovered lately.

Tuesday, 8th October, 1867.

Alexander Williams Anderson, Esq., in the Chair.

The following Donation was announced:—"Catalogue of Marine Mollusks collected in the Bahama Islands in November, 1866." By Henry J. Krebs. Presented by the Author.

Philip Noel Bernard, Esq., and Francisco Padron, M.D., were elected Members.

Jules François Court, Esq., M.D., of Paris, was elected a Corresponding Member.

Election of Officers.

The Ballot for Officers for the year 1867-68 having been taken, the following were declared duly elected:

The Hon. Louis Antoine Aimé de Verteuil, M.D., *President.*
Horace Deighton, Esq., M.A., F.R.A.S., *Vice-President.*
Robert John Lechmere Guppy, Esq., F.G.S., F.L.S., *Secretary and Treasurer.*
Henry William Caird, Esq., M.A., *Member of Council without Office.*

The Association then proceeded to revise the Rules. The Rules were amended accordingly.

The following Communication was read :—

On the Manufacture *of* Sugar *by the* Process *of* Drying *the* Cane. By The Hon. Henry Stuart Mitchell, M.D., Ph.D.

Although borrowed from even the earliest stage of the beetroot under the consulate, it was not till 1845 that the operation of slicing was applied to the sugar-cane. It was hoped that the cane, after having been sliced and dried and ground into powder, might be preserved long enough unchanged in this condition to allow of its being transported to Europe, where, not merely the whole sugar might be extracted at once in its present form, but the ligneous portion would furnish an inexhaustible supply of fibre for the paper market. The Intercolonial tonnage also would thereby have been necessarily doubled. These hopes were, however, doomed to disappointment. The dried cane powder became altered on the voyage, and not only did great part of the sugar disappear, but the changes consequent on its decomposition discoloured the residuary fibre.

But there was one result from this trial sufficiently noteworthy. It was clear that the cane could be sliced and dried in commercial quantities, and several of those concerned in the matter determined to extract the sugar on the spot; accordingly, more than one attempt was made to carry out the slicing, and every difficulty was, apparently, overcome when the building erected for the plant was, unfortunately, burned. One of the principal difficulties hitherto had been that of drying the sliced cane, to avoid this, in 1845 Messrs. Constable and Michæl introduced their method on the estate of Ste. Marie, the property of Major Beauscarin, in Guadeloupe. It was as follows:—The canes, which were sliced at the rate of one ton in 20 minutes, fell into metallic baskets capable of holding each that amount. The baskets were moved by a central crane, and around the crane, at equal distances, were placed 6 copper vessels adjusted to receive the baskets when filled. These copper vessels were filled to such an extent with water that when the basket, full of sliced canes, was lowered into any one, the liquid rose to the surface. The basket No. 1, with its contents, having been thus dipped into vesssel No. 1, was allowed to remain unmersed till such time as the sliced canes had parted by displacement with a due proportion of their sugar to the water in vessel No. 1; basket No. 1 was then hoisted out by the crane and consigned to vessel No. 2, where a second proportion of sugar was displaced, and so on throughout the series. In the meantime a fresh basket, full of sliced cane, was consigned to No. 1 vessel, the liquid in which abstracted a further proportion of sugar, and so on, till the contents of the first vessel were as fully saturated with sugar as the law of displacement allowed,

and the slices of cane in the first basket were proportionately exhausted. This was virtually the old system of Dubunfaut with its defects, viz.: that the water was not easily kept at a suitable temperature; that the whole sugar was not extracted; and that, from the time which elapsed between slicing and exhaustion, considerable changes occurred in the saccharine fluid which affected the quantity and quality of the result. These defects, in principle, did not, however, of themselves, contribute much to the failure of the plan; the system broke down in the subsequent evaporation, in which the heat employed was generated entirely from gas manufactured on the spot—an operation attended with such difficulties that the trials were given up after heavy outlay. This was much to be regretted, as the slicing process had shown that a much larger proportion of the sweets could be extracted from the cane than had been hitherto done in any other mode, for even the five-roller mills which had been started with sanguine hopes, during the preceding two years, had been successively abandoned. A system so simple and yet promising such complete results was not destined to disappear without traces. In September, 1847, Mr. Davies, Apothecary in Chief to the French service at Basseterre, resumed the experiments of slicing and drying the canes, at the point where they had been left off in 1845. He found that by driving off about 33 per cent. of moisture from sliced canes, they became so friable as to be reduced, without difficulty, to a course powder in which the coloring matter and supposed albumenoid principles of the cane had become insoluble in water, while the saccharine elements were crystallized unchanged and ready for immediate solution and extraction by water, either hot or cold—the former would have been the more rapid—but he had met with an objection to its use which, if not scientific, was at least practical. The vessels he employed were of copper, and transmitted the heat so rapidly that the attendants were constantly burning their fingers; he did not consider it worth while to take any precautions to avoid this evil, as he found cold water sufficient for the purpose and more economical. The process he adopted was the following: Six upright cylinders of copper about 4 feet high and 9 inches in diameter, were so arranged as to communicate with each other and with a reservoir of water on a higher level; they were each furnished with guages and stop-cocks; five of these were filled with cane powder, and the last with animal charcoal—this last was merely precautionary, but not essential to the work. Water was ad mitted into No. 1 and retained there for 20 minutes after the guage showed that the vessel was full; it was then passed into No. 2 and so on. In practice it was found that on escaping from No. 4 the water had absorbed so much sugar as to mark 22·5 of Beaume, or about the density when syrup is usually consigned to the vacuum pan, and that the cane powder first in contact with the water, viz.: that in No. 1 was completely exhausted, even to the tongue, that most convenient and reliable saccharometer, and represented what it was reduced to in reality—a mass of wet sawdust. At this stage of the process it was removed from No. 1 and replaced by a fresh portion of cane powder. As this part of the operation was performed without interrupting the duties of the other cylinders, it is clear that two of the greatest desiderata in the application of Science to Art had been attained, namely: the complete extraction of the

sugar in a state of purity, and that by a continuous operation. The mechanism thus employed by Mr. Davies in September, 1847, appeared to leave little room for improvement. It was submitted to and approved of by the French Government, who commissioned the inventor to repair to Paris in the ensuing month of March to take the necessary steps for erecting a set of machinery on a larger scale on the French King's Estate of Tremouillant in Martinique. Fortune seemed thus about to crown Davies laborious and successful trials; but, like the course of true love, his expectations were doomed to disappaintment. Before his appointed hour of embarkation arrived, cries of *Vive la République* were ringing throughout the French islands, and the new process with, no doubt, many a kindred scheme, was shelved for the time. Since that I have several times, in conjunction with Mr. H. Warner, repeated the process of slicing and drying the sugar-cane, with exactly similar results, namely: the extraction of all the contained sugar by displacement with cold water, in about one hour and twenty minutes, in the form of a pure syrup marking between 22° and 23° Beaume. Within the last three years Mr. Warner directed his attention again to the slicing of the cane to ascertain how far he could succeed in extracting the sugar without recourse to drying the slices. After repeated trials, conducted with every precaution, he succeeded in obtaining, by displacement, a liquor marking 9° of Beaume where the original juice of the cane marked 10° Beaume; this was a great success, but not equal in results to the other mode where the slices were dried, because there was not only an original loss in not obtaining the whole sugar, but the juice had an opportunity of becoming changed to an extent that greatly increased the quantity of glucose. This latter evil may now be obviated by the use of the Bisulphite of Lime, with which the displacing water might be slightly dosed so as to allow the antiferment to preserve the juice unchanged throughout the process of manufacture.

In conclusion I may mention that the only difficulty which has at any time stood in the way of manufacturing sugar by the process of slicing, drying and displacement—apart from the mechanical one of slicing, was a rapid and economical mode of drying; this, I am happy to say, has been at length attained by the successful action of the Megassicator, which may be now constructed to dry economically and speedily any given weight of sliced cane. The above remarks have been principally directed towards obtaining from the cane a saccharine fluid as pure as possible. It is in this elementary step that the whole difficulty of manufacture lies; the mere evaporation and concentration may be effected in various ways; pure sugar and water is not easily destroyed even by the rudest manipulation; but common cane-juice, as it runs from the mill, will produce an inferior muscovado, except under the most careful and expensive treatment.

I propose in a future paper to offer a few remarks in a general form on the simplest modes of evaporation and concentration.

Wednesday, 6th November, 1867.

ALEXANDER WILLIAMS ANDERSON, Esq., in the Chair.

The following Communication was read :—

On POPULATION. By Robert Hall Bakewell, M.D.

(Abstract.)

In this paper the Author gave statistics and opinions in reference to the doctrines of Malthus, and contrasted the mortality and conditions of urban with those of rural life.

Tuesday, 10th December, 1867.

The Hon. LOUIS ANTOINE AIME DE VERTEUIL, M.D., President, in the Chair.

The following Visitor was introduced : Dr. MacDonough, of H. M. S. "Gannet."

The following Gentlemen were elected Members : Lewis Henry Moorsom, Esq., M.I.C.E., Queen's Park ; and Louis de Verteuil, Esq., South Naparima.

NOTICES OF MEMOIRS.

On POISONOUS FISHES. *By* M. Auguste Duméril.

M. Auguste Duméril has communicated to the Annals of the Linnean Society of the Department of the Maine-et-Loire a very exhaustive article on poisonous Fishes. In the "Annals and Magazine of Natural History," 3 ser., vol. 20, p. 153, will be found a translation of M. Duméril's paper.

M. Duméril first considers the causes of the poisonous effects produced by the flesh of fishes. These are : (1) the decomposition of organic matter in, and the discharge of refuse into, the water inhabited by the fishes; (2) the decomposition (from long keeping or bad curing) of preserved fish; (3) the nature of the aliment consumed by the fishes; (4) the use of noxious plants in order to capture the fish; (5) the age of the fish; (6) the season; (7) the commencement of alteration in the tissues of the fish after capture; (8) disease in the fish; (9) the effect of copper-beds at the bottom of the sea. In regard to cases (1) and (2), M. Duméril appears to admit these causes, but only as operating in a moderate number of cases. (3) seems to be very doubtful, especially as to the feeding of the fishes upon coral and the fruit of the manchineel, which does not seem to have been verified. As to (4), M. Duméril considers that a great number of the plants employed for poisoning fishes do not thereby cause any bad effects upon man, whilst others are admittedly hurtful. A note is appended to the paper, giving the names of the nocuous and innocuous species of plants. (5) seems to be deserving of consideration, being admitted in practice with respect to several species of fish; (6) season has undoubtedly some influence, and many fish appear to be baneful at the period of spawning; their oval being especially hurtful. It is under the head of (7) that our author seems disposed to place, perhaps, the majority of accidents due to the eating of fish. He admits the probable efficacy of the test of a piece of silver in respect of this cause, the liberation of sulphuretted hydrogen causing the blackening of the metal. In respect of (8) it is suggested that a condition of disease may sometimes alter the natural qualities of the fish. (9) The author attaches no importance whatever to the influence of copper-beds.

M. Duméril enumerates the following species as poisonous:—

Meletta thrissa	Antilles	Very poisonous
venenosa	Indian Seas	Do.
Tetraodon Honkenyi	Cape of Good Hope	Do.
Geneion maculatum	Do.	Do.
Diodon orbiculare	Antilles	Do.
Balistes vetula	Do.	Do.
Ostracion cornutus	Do.	Do.
Sphyræna becuna	Do.	Poisonous
barracuda		Sometimes poisonous
Caranx fallax		Do.
Scarus capitaneus	Mauritius	Do.
Lachnolæmus caninus		Do.
Thynnus pelamys		Sometimes poisonous when eaten too long after capture
Cybruin caballa		
Caranx Plumieri		
Thynnus vulgaris		
Engraulis bælama	Indian Seas	Poisonous when not deprived of head and intestines

M. Duméril then considers the symptoms of fish-poisoning, and concludes with some remarks on the treatment. This should be (1) to induce as promptly as possible an evacuation of the noxious substance; (2) to combat the effects produced by it. The first is effected by the use of emetics and castor-oil, or calomel; the second by the administration of stimulants, such as tea and, in particular, coffee and alcoholic liquors. Should irritation persist, opium is recommended, and when the irritation has ceased, the use of ipecacuanha is advised to allay heat and dryness of the skin; and finally, after the removal of the symptoms, tonics are considered indispensable.

R. J. L. G.

On Petroleum *as* Fuel. *By* Colonel Julius W. Adams. (Technologist, vol. 7, p. 14, July, 1866).

In this paper the author details experiments made with a view of determining the value of Petroleum as a fuel for steam-boilers. By a modification of the ordinary furnace, substituting steam and oil pipes and burners for the ordinary bars, the proper combustion of the crude petroleum was secured. Though not decisive as to the economy of petroleum for use in this manner, to determine which further experiments are necessary, yet this fuel is shown to be advantageous as respects the rapidity of getting-up steam, reduced loss of heat, reduced dimensions of boiler and furnace, and freedom from smoke and ash. A very obvious feature of the plan tried was the perfect control obtained over the fire, which could be reduced or increased with as much ease as the flame of an ordinary paraffin lamp.

R. J. L. G.

NOTICE TO CORRESPONDING MEMBERS.

The Council of the Scientific Association desire to notify to the Corresponding Members that the Association has been put to a very considerable expense in printing and distributing their Proceedings; and that although the Corresponding Members have the privilege of receiving the Parts of the Proceedings at Members' prices, yet, that unless the Association receive some proof of the continued interest of the Corresponding Members in the undertaking, the Association cannot continue to forward the Proceedings free.

The Council also desire to draw attention to the 17th Rule of the Association, by which a certain number of copies of every paper printed in the Proceedings is allowed free of expense to the Author.

BRITISH MUSEUM

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART IV.] [JUNE 1868.

Tuesday, 14th January, 1868.

WILLIAM HENRY STONE, M.A., M.B., F.R.C.P., in the Chair.

The Hon. John Imray, M.D., Dominica, was elected a Corresponding Member.

The following Visitor was presented :—Dr. MacDonough, of H.M.S. "Gannet."

The following Donations were announced :—

"El Federalista," No. 1276, (14 Nov., 1867).

"Estudio Seismologico," por Lino J. Revenga.

British Museum Transferred 1882

"Historia de la Quimica," por José M. Vargas.

"Etudes Entomologiques: Longicornes de Caracas," par M. Marco-Aurelio Rojas.

Notice Necrologique sur le Dr. Marco-Aurelio Rojas.

"La Sumergida Isla de Atlantis;" Traducido por G. A. Ernest.

Carta al Professor Perrey sobre los fenomenos seismicos de America.

All presented by the Sociedad de Ciencias fisicas y naturales de Caracas.

The Secretary read the following Report for the year 1867:—

REPORT TO THE SCIENTIFIC ASSOCIATION *for the Year* 1867.

The period has again arrived when it becomes the duty of the Secretary to lay before you a statement of the condition of the Association, and a review of its labors during the preceding year.

As regards the numbers of the Association, we stand in a satisfactory position. During the year we have elected nine members and four corresponding members, and we have lost one member by death. The following figures show our present numbers:—

Members	26*
Honorary Member	1
Corresponding Members	10
Total	37

being a total increase of 12.

The principal circumstance to be noted in connection with the finances is the increase from the beginning of

* The names of two of these have since been removed from the list, in consequence of non-compliance with the rules.

1867 of the annual subscription of members to five dollars. This has enabled us to meet the liabilities consequent on the issuing of the Proceedings in the new form. The sale of Proceedings, as shown by the amount received therefrom, has increased, and I trust that in the next Report the Secretary will be able to announce a still further increase under this head.

The following balance-sheet exhibits the financial position of the Association :—

RECEIPTS.		PAYMENTS.	
Balance 1st Jan., 1867...	$ 44 34	Printing, &c.	$109 80
Subscriptions received..	102 00	Postage and Stationery.	6 22
Sale of Proceedings.....	8 78	Expenses of Meetings ..	12 00
		Balance 31st Dec., 1867.	27 10
	$155 12		$155 12

The following Papers have been read during the year 1867 :—

1. The Hon. Henry S. Mitchell, M.D., Ph.D.—On Earth Closets.
2. The Annual Report of the Secretary.
3. R. J. Lechmere Guppy, F.L.S. & G.S.—Remarks on the cultivation of Scientific Knowledge in Trinidad.
4. The Hon. Henry Mitchell, M.D.—Hints on the Breeding and Rearing of Horses.
5. The Hon. Louis Antoine A. de Verteuil, M.D.—Hygienic Considerations on Port of-Spain.
6. R. J. Lechmere Guppy, F.L.S., &c.—Additions to the Catalogue of the Land and Freshwater Molluska of Trinidad.
7. Documents relating to the Boehmeria nivea.
8. R. J. Lechmere Guppy, F.L.S., &c.—Note on Petroleum and Naphtha.

9. The Hon. Henry Mitchell, M.D.—Additional Note on the Sulphites and Bisulphites.
10. R. J. Lechmere Guppy, F.G.S., &c.—On the Tertiary Fossils of the West Indies, with especial reference to the Classification of the Kainozoic Rocks of Trinidad.
11. Professor Louis Agassiz.—Letter to the late Dr. Antoine Léotaud.
12. William Henry Stone, M.A., M.B., F.R.C.P., &c.—On a Method of Burial.
13. Mr. Westall.—On the Lead Mines of Carupano.
14. Francisco Padron, M.D.—A Sketch of the Gold Mines of Yuruari.
15. The Hon. Hy. S. Mitchell, M.D., &c.—On the Manufacture of Sugar by the Process of Drying the Cane.
16. Robert Hall Bakewell, M.D.—On Population.

When the Secretary presented his last annual Report, the first part of the new issue of your Proceedings had appeared. Since then the second Part has been published; but I am not yet able to announce Part III., which ought to have been issued last month, but which may yet be delayed a week or two, owing partly to a pressure upon the printer, and partly to the expected arrival of a plate which had been presented to the "Proceedings," but which was sent home in the "Conway," one of the steamers driven on shore in the late hurricane at St. Thomas. It is to be feared this plate will not be recovered.

Upon the papers read during the past year I regret to be unable to offer you other than scanty remarks; illness and other engagements having prevented me from giving my usual attention to this part of our business. The first paper on the list however deserves a noticc; for notwithstanding the great disinclination to adopt the earth-closet system, there appears to be little doubt that it is the cleanest, the most wholesome, and the most rational, not to say economical, plan yet devised for the disposal of town refuse. It has been used with great success in the prisons and hospitals of India and is, I believe, in full operation in the large town of Port-Louis in Mauritius. It would be a great boon if this system should prove to be the remedy for the bad sanitary state of Port-of-Spain, which has been ably described by our President, Dr. de Verteuil, in his paper numbered 5 in the foregoing list. The scheme of sewerage, looked upon with so much doubt and want of confidence by so many here, might then be unnecessary.

Another proposal brought under your notice in two papers by Dr. Mitchell might be of great use in large establishments for the preservation of food. A patent has been taken out in England for the application of Bisulphites to this purpose, and it seems probable that the plan may be productive of much economy in the keeping of food.

Papers relating to the value of the *Boehmeria nivea* or China-Grass have been laid before you. As the plant may become a profitable article of export you will, I am sure, excuse my bringing it again to your notice; and it may be hoped that we shall obtain some further information relative to the mode of preparing the fibre for export.

The increase in our numbers, if it continues at the same rate as during the past year, will render it necessary that we should have some regular place of meeting. Our funds do not admit, at least at present, of our incurring expense to provide a place of meeting; and the only alternative which at present suggests itself is that the Association should endeavour to obtain the use of a room in some public building. It will also be necessary before long that there should be some place for the deposit of the books, papers, and other donations belonging to the Association.

The number of papers of a purely practical character published in the "Proceedings" is deserving of some remark, as showing how far a purely voluntary body, such as this Association is, has discharged the functions for the performance of which the Corresponding Committee of the Society of Arts was instituted with an annual Government grant in this Island. We enjoy at present none of the privileges accorded to Scientific Societies in Australia, Jamaica, Mauritius, and other Colonies, no less than in England.

Tuesday, 11th February, 1868.

The Hon. LOUIS ANTOINE AIME DE VERTEUIL, M.D., President, in the Chair.

Robert Knaggs, Esq., M.R.C.S.L., was elected a Member.

Tuesday, 10th March, 1868.

ALEXANDER WILLIAMS ANDERSON, Esq., in the Chair.

The resignation of Dr. R. H. Bakewell as a Member, was tendered and accepted.

The following Donation was announced :—

"The Journal of the Society of Arts," Nos. 780—788; *Presented by the Colonial Government.*

The following Resolution was unanimously carried :—That in the opinion of the Scientific Association a public Museum should be formed within this island; and that the collection of the Geological Survey, the books, specimens and instruments of the late Mr. Crüger and Dr. Léotaud, and the shells offered by Governor Keate to the island, would form a good nucleus for such a Museum; and that a Memorial be presented to His Excellency the Governor praying that such a public institution be formed.

Tuesday, 15*th April*, 1868.

The Hon. Louis Antoine Aime de Verteuil, President, in the Chair.

Charles Joseph Algernon Hicks, Esq., Colonial Bank, was elected a Member.

The following Donations were announced :—

"Journal of the Society of Arts," Nos. 789—797; *Presented by the Colonial Government.*

"Statistical Report on the Epidemic Cholera in Jamaica." —By John Parkin, M.D.; *Presented by H. W. Caird, Esq., M.A.*

"Report on Colonial Medicinal Contributions to the International Exhibition 1862." — By Charles Hunter; *Presented by H. W. Caird, Esq.*

"Suggestions for increasing the Quantity and improving the Quality of Trinidad Sugar," 1847.—By Henry Mitchell, M.D.; *Presented by H. W. Caird, Esq.*

"On the Use of Trinidad Bitumen for the Purpose of increasing the Illuminating Power of Coal Gas."—By Drs. Letheby and Anderson; *Presented by W. Darwent, Esq., C.E.*

The Memorial drawn up in accordance with the Resolution passed at the last Meeting was brought up, and having been read and approved was ordered to be signed: and it was moved and carried that the Hon. Dr. de Verteuil and the Hon. Dr. Mitchell be requested to be a deputation to present the Memorial to His Excellency the Governor.

Mr. Darwent exhibited some artificial fuel made from Asphalt, and made some remarks thereupon.

The following communication was read :—

Documents *relating to the* Cultivation *and* Manufacture *of the* Boehmeria nivea.

(Abstract.)

These papers contain a detailed account of the mode of cultivation and preparation of the China-Grass in China and India. The propagation of the plant is effected by cuttings of the roots, and replanting is required every ten years. The crops, of which there are three in the year, appear to be somewhat irregular. Care must be taken not to cut the young shoots, therefore it is recommended to keep at least an inch from the ground, and the original stem is not to be cut. The first crop gives the worst fibre, and the third or last crop of each year the best.

When gathered, the leaves are taken off by children or women. The plant is then steeped for a period varying from an hour to two days. After this the plant is broken in the middle, by which the fibrous portion is loosened and raised from the stalk; into the interstice thus made the operator thrusts the finger nails and separates the fibre from the centre to one extremity and then to the other. At Canton, after having cut off the roots, the fibre is separated from the stalk and stripped off by drawing it over a pin fixed in a plank. The next process is scraping the material, which is facilitated by first soaking in water. The knife or scraper is about two inches long; its back is inserted in a handle of twice its length. It is held in the left hand; its edge, which is dull, is raised a line above the index finger. Strips of the material are then drawn over the blade from within outwards, and being pressed upon by the thumb, the pilous portion of one surface and the mucilaginous part of the other are thus taken off. After being wiped dry it is exposed to the sun for a day, and the whitest is then selected for fine cloth.

The operations of bleaching and dividing are then performed on the fibres. The first is effected sometimes by boiling, and sometimes by beating on a plank with a mal-let. Women and children are then employed in splitting the fibre, which they do with their fingers. Finally, the threads are gathered into balls and subjected to several soakings and washings. Lime or ashes are placed in the water used for soaking; but some merely expose the fibre to dew and sun.

The stalks of the plant are considered fit for cutting when they have become of a brown color for about six inches above the roots. The scraping off the bark may be performed when the plant is cut, or it may be deferred until the whole crop is gathered.

Tuesday, 12*th May*, 1868.

Dr. Francisco Padron in the Chair.

André Blasini Knox, Esq., was elected a Member.

The following Donation was announced:—

"Chart of the Bahama Hurricane of October, 1866."—By John H. Redfield. Presented by Thos. Bland, Esq., F.G.S.

Tuesday, 9*th June*, 1868.

The Hon. Louis Antoine A. de Verteuil, M.D., President, in the Chair.

A letter from the Hon. R. Hill of Jamaica, Corresponding Member of the Association, was read, promising a communication on Poisonous Fishes.

The following table of Rainfall was presented; and Mr. Lechmere Guppy remarked upon the chief features of interest exhibited by the table, which was further illustrated by a diagram:—

ACCOUNT OF THE RAINFALL AND NUMBER OF RAINY DAYS IN EACH MONTH OF THE YEARS 1863, 1864, 1865, 1866 AND 1867,

At the Meteorological Observatory at St. Ann, in the Island of Trinidad; compiled by Mr. Thomas William Carr. (Communicated by Lechmere Guppy, F.L.S., &c.)

YEAR.	Janry.		Febry.		March.		April.		May.		June.		July.		August.		Septr.		Octr.		Novr.		Decr.		TOTALS.	
	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.	Rainy Days.	Rain-fall.
1863....	13	1·55	14	2·71	13	1·49	7	·80	9	1·26	19	9·21	20	10.03	22	10·64	18	12·34	19	5·99	20	4·24	17	6·62	191	66·88
1864....	24	2·47	11	·54	4	·37	2	·04	4	8·15	15	4·96	21	7·18	22	12·06	18	8·04	20	6.79	16	5·99	23	6·64	180	63·23
1865....	14	2·59	12	3·22	12	1·07	19	8·00	14	3·60	17	5·24	24	10·35	25	14·93	23	7·59	28	15·54	20	4·60	18	10·31	226	87·04
1866....	15	2·41	16	3·51	8	1·44	5	1·09	6	1·57	16	6·47	22	8·05	24	11·95	14	7·99	12	9·26	13	6·87	15	6 82	166	67·43
1867....	8	1·85	12	6·34	4	·70	4	·53	6	2·47	11	7·48	17	11·49	20	15·22	17	10·49	11	7·87	5	.72	16	3·39	131	68·55
Average.	15	2·15	13	3·26	8	1·01	7	2·09	8	3·41	16	6·67	21	9·42	23	12·96	18	9·29	18	9·09	15	4·46	18	6·76	179	70·63

NOTICES OF MEMOIRS.

On the Fossil Corals *of the* West-Indies. By P. Martin Duncan, M.B. Lond., F. G. S., &c.—(Quarterly Journal of the Geological Society, vol. xxiv., p. 9).

This is the concluding part of the author's highly interesting and valuable contributions on the fossil corals of the West-Indies. The first portion of the present paper is devoted to a description of the fossil madreporaria found by Mr. Eckel in the quarries of St. Croix, Naparima, Trinidad. Six out of the eighteen species enumerated by Dr. Duncan are new, and he has figured four of them, as well as other species from the Antilles. The following are the names of the Trinidad species:—

Heliastræa endothecata Dunc.	Stylophora raristella Defr.
——— cylindrica Duncan	——— minuta Dunc.
——— barbadensis Dunc.	——— mirabilis Mich. & Duch.
——— cavernosa Esper	Stephanocœnia intersepta Esper
——— altissima Dunc.	Agaricia agaricites Lam.
Brachyphyllia Eckeli Dunc.	——— undata Lam.
——— irregularis Dunc.	Porites Collegniana Mich.
Astræa pariana Dunc.	——— astroides Lam.
Isastræa confusa Dunc.	Alveopora Dædalæa Blainv.

The author's views as to the geological position of the St. Croix beds is that they are not older than the Nivajé shale of Haiti, the Vere beds of Jamaica, and the Chert and Marl of Antigua; and he does not think that there are data for establishing a Lower, Middle, and Upper Miocene in the Caribean area so as to correspond with the divisions of the European Miocene.*

R. J. L. G.

* This conclusion of Dr. Duncan's, however, may not hold good in all respects if the St. Croix beds are shown to be newer than the San Fernando and Tamana beds. See "Proceedings," anteà, p. 154.—Editor.

ERRATA IN PARTS II.—III.

Part II., p. 67, last line, for "Eclimoderm" read "Echinoderms."

,, ,, 96, line 8 from bottom, for "make" read "mark."

Part III., p. 154, 2nd column, for "Tertiaries of Cumana, Barbados," &c., read "Tertiaries of Cumana, Barbuda," &c.

,, p. 167. A cross should be placed in the last (San Fernando) column, opposite Nodosaria raphanistrum, that being the only still-existing species which has hitherto been discovered in the San Fernando beds.

,, p. 185, line 22, for "unmersed" read "immersed."

,, p. 191, line 22, for "oval" read "ova."

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SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

Part V. — DECEMBER 1868.

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NATURAL HISTORY

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BRITISH MUSEUM

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART V.] [DECEMBER 1868.

Tuesday, 14*th July*, 1868.

ROBERT GUPPY, Esq., M.A., in the Chair.

The following Donations were announced :—

1. "On the Lingual Dentition of some West-Indian Gasteropoda." By R. J. Lechmere Guppy, F.G.S., and Jabez Hogg, F.L.S., M.R.C.S.L., &c. *Presented by Lechmere Guppy, F.L.S.*

2. "Notes on West-Indian Geology, with Remarks on the Existence of an Atlantis in the early Tertiary Period; and Descriptions of some new Fossils from the Caribean Miocene." By R. J. Lechmere Guppy, F.L.S., F.G.S., &c. *Presented by the Author.*

British Museum Transferred 1889 DUPLICATE.

3. "On the Terrestrial Mollusca of Dominica and Grenada; with an Account of some new Species from Trinidad." By R. J. Lechmere Guppy, F.L.S., &c. *Presented by the Author.*

The following communication was read:—

NOTE *on the* EARTHQUAKE *of the* 7TH JULY, 1868. By R. J. Lechmere Guppy, F.L.S. & G.S., &c.

On the 7th July, at 5h. 1m. a.m., a smart shock of earthquake occurred in Port-of-Spain and its neighborhood. The duration of the shock was a few seconds only, and it was accompanied by a rumbling noise which preceded it by a perceptible, though very small, portion of time, and was quite distinct from the rattling produced by the earthquake in the materials of a house, furniture, &c. The direction of the earth-wave seemed to be, so far as I could ascertain, from NW. to SE. A minor shock occurred at 5h. 25m. a.m.

Tuesday, 11*th August*, 1868.

HENRY WILLIAM CAIRD, Esq., M.A., in the Chair.

The following Donations were announced:—

1. "Descriptions of some new or little-known Species of Fish in the collection of the British Museum." By Dr. Albert Günther, F.Z.S. *Presented by the Author.*

2. "Notes on certain Terrestrial Mollusca with Descriptions of new Species." By Thomas Bland. *Presented by the Author.*

The following communication was read:—

NOTICE *of the* OCCURRENCE *of the* SCARLET TANAGER *in* TRINIDAD. By Captain Henry Kelsall, A.D.C., of H.M.'s 16th Regiment. (Communicated by Lechmere Guppy, F.L.S.)

TANAGRA RUBRA LINN.

Syns :—Pyrangra rubra, P. erythropis, *Vieill.*
Cardinal de Canada, *Briss.*
Scarlet Sparrow, *Edwards.*
Canada Tanager, *Arct. Zool.*

A specimen of this brightly-colored species (a male, in nearly full plumage) which has not been hitherto noticed as a visitor to this island, was shot at St. Ann's on the 25th April, 1868. It was brought to Mr. Libert's, of Port-of-Spain, where the skin was preserved, and where I first saw it a short time afterwards, when it was shown to me as another species (*Pyrangra æstiva*, locally called "Cotinga rose") which is not very uncommon in Trinidad. On examination, however, I discovered it to be the Scarlet Tanager, and on my pointing this out to Mr. Libert and informing him that this was the first known instance of its occurrence in the island, he very kindly presented it to me for the purpose of being added to the Léotaud Collection, now in the Council Room at Government-House.

The Scarlet Tanager, being migratory, has a very wide range of distribution, being found as far north as Canada during the summer; whilst it passes the winter months in the warmer regions of the south. In the West-Indian islands it is probably not even a winter resident, but a bird of passage merely touching on its way north in spring. It is closely allied to a species very similar in appearance, which is found in Brazil, but, on close examination, may be distinguished from it by several slight, but sufficiently characteristic, differences.

Monday, 7th September, 1868.

The Association met at La Falaise, San Fernando, by the kind invitation of John Percy, Esq., M.R.C.S.I.

ROBERT GUPPY, Esq., M.A., in the Chair.

The Hon. John Imray, M.D., of Dominica, was elected a Member; and Thomas Bland, Esq., F.G.S., 42, Pine Street, New-York, was elected a Corresponding Member.

The following communication was read :—

On POISONOUS FISHES.

By the Hon. Richard Hill, Corresponding Member.

The fishes most generally known in the Caribean Sea as either hurtful or dangerous as food are the following* :—

Gymnothorax rostratus.
Coryphæna dorado.
Pagellus calamus.
Serranus arara.
S . . . . . . nigriculus.
S . . . . . . catus.
Sphyræna baracuda.
Scorpæna grandicornis.
Thynnus coretta.
Cybium (Solandri ?) Guarapucu.
C . . . . . regale.
Scarus cæruleus.
Alosa Bishopi.

Fortunately of all the above list of our fishes, the *Clupea thryssa*, as the *Alosa Bishopi* is sometimes called, or the yellow-tailed sprat, is the only one at all times dangerous.

* I published notes on the Poisonous Fishes of the West-Indies in a Jamaica journal, and they were re-published in the *Technologist*.

In the other fishes poison may be said to be only incidental or accidental; but in this species of Clupea it is an inherent quality. The effects of the poison of this fish on the human frame are violent to a terrific degree—death occurring immediately in many cases and, in some recorded instances, even before the fish had been swallowed.

Many have been the disquisitions, why fish should be at one time nutritious and at another injurious for food. It seems to be now held that some morbid change takes place in the system of the fish, under peculiar circumstances, and that under such change it becomes poisonous.

No test being ascertained to determine whether a fish be noxious or innoxious, the only sure course to be pursued is that of giving the offal of the suspicious fish to some domestic animal, such as a duck, not likely to reject it, and judging by what ensues.

The effects of fish-poison are extreme sickness at the stomach, gripings, cold sweats, cutaneous eruptions, cholera morbus, leaving behind a degree of paralysis. When the poison does not prove fatal, the patient is long in recovering. Where symptoms of empoisonment come on after the contents of the stomach have been brought off by an emetic, recourse should be had to strong cordials, ginger tea, brandy with laudanum, and Cayenne pepper made into pills.

We shall severally consider some of the West-Indian fishes reputed or known to be poisonous.

Scorpæna.

I doubt if any of the Scorpænas be really poisonous, in the sense of a fish detrimental as food. The Scorpæna is one of the *Loricati*—"Acanthopterygiens à joues cuirassées"—distinguished by Cuvier as fishes by their general form standing close to the perches, but from their singular aspect, with the head armed and bristled, having a special classification. The Scorpæna is the scorpaina of the ancient Greeks. The barbillons and fleshy shreds (lambeaux charnus) about the head, and the strong and unequal spines of the fins, give the several species a dangerous look. Their Mediterranean name, Vaschia, the itch, will guide us in our inquiry into the reason of their evil report. We find we are equally directed to the puncture of their spines as to the quality of their flesh. The particular Scorpæna known as the "crapaud de mer" in Martinique, as "rascacio" in Havana, and as "rascasse vingt-quatre heures" in St. Domingo, has an especially bad reputation. Valenciennes, in his associated labours with Cuvier, says of one species, in volume iv. of the History of Fishes, "on redoute beaucoup les piqures de ses aiguillons;" and of another, "les piqures de leurs épines les rendent redoutables"—the prick of their spines is much dreaded; and then he adds: that a prejudice prevails against the flesh as poisonous—mentioning, that because death is supposed to ensue in the course of a day, one has received the name of "rascasse vingt-quatre heures." As the rascacio of the Spaniards means nothing more than "prickling fish," it may only import that those who handle it may suffer from the spines a prickling of great severity for a whole day, and not that the flesh will poison within twenty-four hours. The most distinct fact of the danger of wounds from the spines is related by Sir Robert Schomburgk, in his History of Barbados. The fish, he says, lurks amongst the stones in shallow water, and inflicts a wound with its spines which causes the most violent pain. A fisherman, who had been struck by one, told Mr. Bishop that he was not able to reach his home without assistance (p. 667). It is only the *Scorpæna grandicornis* that has a bad reputation in our seas. The S. bufo, Parra says, is a fish of very savoury flesh, excellent for soups; and Plée expresses himself precisely in the same way with regard to the fish of Martinique. It attains a large size, individuals being got sometimes eighteen inches in length—(C. & V. Hist. Natur. des Poissons, liv. iv., ch. ix., vol. iv.)

PAGELLUS CALAMUS.

The *Pagellus calamus* (pagel à plume) and the *Pagellus penna* (pagel à tuyau) are the fishes known among us by the name of porgee, and have proved at times deleterious. They are readily distinguishable at table by the quill-like process by which the spine of the anal fin is inserted into the abdominal muscle. It is from this organisation they receive the names of calamus and penna. Porgee is a name they have in common with *Mesoprion* pagrus, and pargo of Porto Rico. In both instances the appellation is derived from the pagrus vulgaris of the Mediterranean, to which the pagellus is closely allied. Both pagrus and pagellus are *sparoid* fishes, of which the sparus of Artidi is the type. *Mesoprion pagrus*, however, ranks among the perches. The mesoprions are the fishes known in our market as snappers —(C. & V. Hist. Natur. des Poissons, liv. vi., ch. iii. & iv., vol. ii.)

Valenciennes, who wrote portions, conjointly with Cuvier, of the Natural History we have been citing, and was the author of that portion in which is described the "*serrans*," assigns to two of these fishes a pernicious character: we quote what he says of them.

"white water, or rather a sort of *sanies*, or matter, which, "in any case, is a sure sign that the becune is in a state of "disease. Don Arthur O'Neill, the Marquis del Norte, "has told me that he had seen experiments with the flesh "in this condition made upon dogs, and that they all con-"firmed the exactness of the means of being secure against "injury.

"The signs of being poisoned by the flesh of the be-"cune"—(the becune, it must be remarked, is our bara-couta of the market; the smaller of the two species; that properly known as baracouta being from six to nine feet long, and slimmer in form)—"are a general trembling, "nausea, vomiting, acute pains, particularly in the joints "of the arms and the hands.

"Sometimes these symptoms succeed each other with "such rapidity that it is difficult to fix with anything like "precision the periods of the morbid affection. When the "sickness does not end in death—and, happily, this is not "the most ordinary issue of it—one sees oftentimes the "virus causing pathological phenomena altogether singu-"lar. The pains in the articulation of the limbs become "very acute; the nails of the feet and the hands fall off "without any feeling; the hair, whose constituent charac-"ter we know is absolutely the same as that of the nails, "finally falls also. These effects, in many individual ca-"ses, are to be seen continuing for a great many years, "and an instance has been mentioned to me of a person suf-"fering in this way for five and twenty years. I, myself," M. Plée proceeds to say, "have not been a witness of any "accident of poisoning by the becune, and I write only "what I have heard others relate, who are well acquainted "with such occurrences, and who are worthy of credit."—(C. & V. Hist. Natur. des Poissons, vol. iii., liv. iii., ch. xxxi.) The very young fish, six inches long, are without teeth in the lower jaw. M. Poey, who has published a highly embellished work on the Natural History of Cuba, in which especial attention is devoted to the ichthyology of its seas, says that: "the means of recognising baracouta that are in a condition to produce mischief (état mal-faisant) is that the *root of their teeth will be found* of a *blackened colour;* and that, wanting this mark, the fish may be eaten without fear." —(C. & V. vol. iii.) I can say for this test, that seeing one day a fine-looking baracouta in a tray for sale, nearly, if not quite, three feet in length, and apparently well conditioned, I examined the teeth, and finding them faintly purple at the root, I remarked that the fine look of the fish would induce purchasers without doubt, but we must be prepared to hear of injurious consequences to those who should eat of it; and it happened next morning that complaint was common in the town (Spanish-Town) that many had suffered the well-known sickness from eating poisonous baracouta.

I should have added to the extract from the manuscript of M. Plée, "that," he says, "it is a remarkable fact that the baracouta, being salted, causes no injury." He adds that "at Santa Cruz, it is the usage never to eat the fish till the next day, and then not till after salting it;" and then remarks: "we may ask the question, whether salt should not be esteemed an antidote for baracouta-poison." We must accept this practice in Santa Cruz as having the warranty of experience in the average condition of fish sold in the market, but there are states in which baracouta may be sold in which salt produces no cautionary effect, for in the year in which I put together these fish-notes, our island newspapers recorded an instance in which four persons in Kingston were suffering from fish-poison—the fish being salted, or, as it was called, "*corned* Baracouta."

All the fishes we have been considering and treating of as adventitiously poisonous, belong to the great division ACANTHOPTERYGII, or hard-spined fishes; we proceed to consider now some of the soft-spined, or MALACOPTERYGIANS. One species is at all times to be found dangerous eating. It has certain specific marks. The sprat of the Caribean Sea, the fish referred to, is not properly a *Clupea*, but one of the allied genus *Alosa*, or shad. The opinion that this is the only fish to be considered permanently poisonous, and that larger fishes become deleterious in flesh by feeding on them when they shoal on particular banks, is altogether gratuitous as an explanation of the fatal and harmless influences which prevail at different seasons among the fishes taken on our shores. It was Father Labat who first started this notion; but, as Oliver Goldsmith in his work on Animated Nature (Book iii., ch. ii., History of Fishes) observes, "it only removes our wonder a little further back, for it may be asked with as just a cause for curiosity, how comes the permanently poisonous fish to procure its noxious qualities."

There is a harmless as well as a hurtful sprat. The noxious is distinguished from the harmless by the presence of a spot at the operculum. The fish that may be safely eaten has the same spot, but golden yellow. Are they different species, or are they one and the same, only indicating different conditions? The question has never been answered. Sir Robert Schomburgk submitted some specimens of sprat from Barbados to the examination of the eminent naturalists Müller and Troschel, of Berlin, and all we learn is that the species seemed new. One was named *Alosa Bishopi*. "It agreed in some points with *Alosa apicalis*, known as the red-eared pilchard, it had, however, a black spot behind the operculum, not to be observed in the *Alosa apicalis*." Its length was that of our market sprat, four and-a-half inches. He adds: "that the sprats are much esteemed in the West-Indian islands, but that a species called the yellow-tailed sprat proves, unfortunately, poisonous at certain periods of the year among the Leeward and Virgin Islands."—(Hist. of Barbados, ch. iv., p. 675-6.)

Goldsmith, speaking on Dr. Grainger's authority, the author of the poem "The Sugar-Cane"—"his poor worthy friend," as he calls him—mentioned that of the fish caught at one end of the Island of St. Christopher, some were the best and most wholesome in the world, while others, taken at a different end, were always dangerous and not uncommonly fatal. He was speaking of fish in general, and of sprats in particular. Our own experience of sprats is very similar. The sprats taken on the south-side of Jamaica are only occasionally to be suspected, but those on the north-side, always. How far the distinctive black and yellow spot prevails at those times and in those places, I have not learnt; but in the Kingston market they consider the distinction not specific, but adventitious in one and the same species, so that our wonder at this quality goes further back than Goldsmith thought, if the poison of the larger fishes depended on their feeding on sprats.

Among the fishes enumerated as poisonous in the division Malacopterygii, are the *Balistes* and *Ostraciones*, all genera of the family *Sclerodermi*. We have some eight different Ostraciones, all known by the name of *Trunk-fishes*, and some four or five Balistes, receiving ordinarily the appellation of *Old Wives*. Though differing much from each other in external appearance, there is great similarity in their internal organization.

The Balistes, beside having an air-bladder near the back, are provided with a ventral cavity into which they can introduce, when they will, air to lighten themselves in swimming, for they move through the water with toil and difficulty. They are not, like the Trunk-fishes, boxed in around and about the body, yet, in the place of scales, they are covered over with hard tubercles, set in groups, or dispersed in compartments more or less regular, and stoutly rooted in a thick skin. They receive the name of Balistes from the serrated spine on their back, which they can suddenly elevate for defence, just as the ancient Balista was forced up with a spring for the discharge of arrows. They have powerful teeth; in the anterior two compared to incisors, which enable them to break crustaceous and testaceous animals readily; and their flesh is said to become dangerous during the season in which they feed on the coral polypi; nothing but sea-weed was found, however, in those that Cuvier examined. Though possibly deleterious from their description of food, it is probable their most hurtful quality is to be found in the spines furnished them by nature for their defence. These spines are invested with a viscous fluid, producing inflammation in the wounds which they cause, and may have much to do with the poisonous reputation of the flesh.

The Ostraciones, or Trunk-fishes, in lieu of scales, have an envelope made up of regular compartments, set one into the other, and forming an inflexible coat of mail. It so invests the head and body, that they have nothing soft or moveable but the tail, the fins, the mouth, and the coriaceous edging of the gill-slits. All their swimming appendages are passed through holes in their cuirass. The greater number of their vertebræ are cemented together, and their ten, or a dozen, conical teeth can break shells and crustacea with ease. It will be seen that the Ostraciones have a close relation in external character with the Balistes. To what extent we are to place reliance on the assertion that the flexible portions of the fish are poisonous, especially the tail, I know not; but inasmuch as their flesh is but small in quantity, and their liver large, yielding oil considerably, and their stomach membranous and voluminous, they have not been suspected without reason of being poisonous. They are, with the Balistes, all tropical fishes.

The Diodons and Tetraodons are fishes of the family *Gymnodontidæ*. They both live on crustacea and fuci. Their flesh is mucous or slimy. They have a peculiar organization—a detached outer skin, a sort of crop, which they can inflate, swimming upsidedown. Their air-bladders are very large. The stomach of the Diodon is thin, furnished with many appendages which, like so many small cæcal pouches, contribute to the necessary completion of digestion, by retarding the aliment till it be acted upon by an augmented quantity of gastric juice. Their liver, thick and trilobate, extends almost to the anus.

The flesh of both, Diodon and Tetraodon, is regarded as dangerous food. "Pison assures us that the gall is poisonous, and that if it be not removed, it causes death to those who are so imprudent as to eat of the animal thus prepared. Their sensibility becomes blunted, the tongue immoveable, the limbs grow stiff, and life is extinguished, while a cold and a colliquative sweat inundates the entire body. The wound inflicted by the prickles or spines is considered dangerous. Serious accidents are experienced, if care be not taken to withdraw from the viscera of these animals, when they are prepared for the table, the remains of the aliments which they may be found to contain."—(Supplem. Cuvier's Animal Kingdom, Griffiths' edition).

We have to consider the Conger eels among the Malacopterygians. The flesh of the conger eel is a common article of the market, both fresh and salted, in Mediterranean ports.

Cuvier has withdrawn the *Murena Conger* from the genus *Anguilla* and made it the foundation of a subgenus under the name of Conger. "It is found in the Seas of Europe, of Northern Asia, and in those of America, as far as the Antilles. It is very abundant on the coasts of England and France, in the Mediterranean Sea, (where it was much sought after by the ancients), and in the Propontis, where it was, not long ago, in considerable estimation. Those of Sicyon were more especially esteemed." "The flesh of this fish is white and well flavoured; as it is very fat, it does not agree with all stomachs. In many places the conger eels are dried for exportation. For this purpose, they are cut open in their under part through their entire length; the intestines are removed;—deep scarifications are made upon the back;—the parts are kept separate by means of small sticks, and they are suspended by the tail to poles or the branches of trees. When they are perfectly dry, they are collected in packets, each weighing abont two hundred pounds." "Redi has found, in several congers which he has dissected, some species of hydatids, nine or ten inches in length, situated on the coats of the stomach, the liver, the muscles, the ovaries, and other parts." "The muræenæ proper were carefully reared in vivaria by the Romans. As early as the time of Cæsar the multiplication of these domestic muræenæ was so great that on the occasion of one of his triumphs that great general presented six thousand of them to his friends. Licinius Crassus reared them so as to be obedient to his voice, and to come and receive their food from his hands; while the celebrated orator Quintus Hortensius wept over the loss of those of which death had deprived him." In all cases the bite of these fishes is severe, and often dangerous.

Such is the testimony to the quality and estimation of the conger eel which Griffiths has collected in his Supplement to *Malacopterygii apodes*, in Cuvier's Animal Kingdom. We see that the flesh does not agree with all stomachs; but what renders it so frequently deadly? The late Dr. William Gordon of Montego-bay, than whom there was not a more careful or more erudite investigator into physiological and pathological facts, assured me that in a case which had terminated in death after long lingering, from eating the Conger of our coasts, not the common *Murænæ*, but the *Gymnothorax* in all probability, the injury suffered had resulted from eating the liver; the rest of the fish would have no part in the deleterious consequences that ensued. The case he referred me to was that of a man at Unity Hall, who ate of a fish taken at the mouth of Great River, *Tuesday*, 13*th October*, 1868.

HORACE DEIGHTON, Esq., M.A., F.R.A.S., Vice-President, in the Chair.

ELECTION OF OFFICERS.

The Ballot for Officers for the year 1868-9 having been taken, the following were declared duly elected :—

Robert John Lechmere Guppy, F.L.S., F.G.S., &c., *President.*

Henry William Caird, Esq., M.A., *Vice-President.*

Henry Francis Jeune Guppy, Esq., F.A.S.L., *Secretary and Treasurer.*

Horace Deighton, Esq., M.A., F.R.A.S., *Additional Member of Council.*

James Wickham, Esq., M.R.C.S.L., San Fernando, was elected a Member of the Association.

The Association then proceeded to take the Rules into consideration with a view to make any alterations or additions that might be desirable.

The following communication was read :—

NOTE *on* three CYPRINODONTES, small fresh-water Fishes *of the* Island *of* TRINIDAD. By Dr. Albert Günther, F.R.S., Corr. Memb. Scient. Assoc. Trinidad, etc., etc.

These *Cyprinodontidæ* are a family of small fresh-water fishes, the geographical distribution of which nearly coincides with that of the *Characinidæ*, and still more with that of the *Chromides*. They are more numerous in Central America and the West-Indies than in the Tropical parts of South America and Africa; a few species only being found in the East-Indies. The males of all species appear to be distinguished from the females by smaller size, more ornamental colours, greater development of the fins, and frequently by the modification of the anterior anal rays into an intromittent organ.

As regards Trinidad, only one species was known to me to occur in the island, viz.: the *Strableps tetrophthalmus*, distinguished by the peculiar structure of its eye, by which it is asserted to be enabled to see simultaneously above and within the water, when it swims with a part of the head raised above the surface. Specimens of this fish were collected by Mr. Cutter during a short visit to the Island.

Mr. R. J. Lechmere Guppy kindly presented to the British Museum two other species of which descriptions are added here, and I have no doubt that continued researches will reveal many other species of this singular group.

Rivulus micropus (Steindachner).

The length of the head is one-fourth of the total (without caudal), the height of the body two-elevenths. Snout rounded, with the jaws equal in length, somewhat shorter than the eye, which is one-third or two-sevenths of the length of the head. Mandible as long as the eye. Interorbital space quite flat, its width being half the length of the head. Dorsal fin situated far backward, opposite to the posterior third of the anal, and its distance from the gill-opening equals double the length of the head. Ventral fins very small, not much longer than the eye, and reaching the vent. Pectoral terminating at a great distance from the ventral. Light brownish body with a longitudinal series of dark brown dots, two of the series being very conspicuous. Vertical fins striolated with blackish brown. Generally a black white-edged ocellus on the upper part of the root of the caudal. D. 8, A. 16, V. 6, L. lat. 36.

This species appears to occur also in Venezuela, and even in the Rio Negro. The specimens examined are 1½ inch long.

Girardinus Guppii (Gthr.)

The height of the body is two-sevenths of the total length (without caudal), the length of the head nearly one-fourth, males rather more slender. The diameter of the eye is more than the length of the snout, not quite one-third of that of the head, and three-fifths of the width of the inter-orbital space, which is flat. In both sexes the origin of the dorsal fin is somewhat nearer to the extremity of the snout than to that of the caudal, and in the female it is opposite to the origin of the anal. Caudal fin large, rather longer than the head, obtusely rounded behind. The free portion of the tail is somewhat elongate, the length of the base of the anal being one-third of its distance from the caudal. Pectoral fin as long as the head, not extending so far backwards as the ventral fins, which reach the origin of the anal. D. 7-8, A. 8-9, V. 5, L. lat. 26-28.

In the *male* the anal fin is advanced to between the ventrals, which are elongate. The anal process, formed by two or three rays, is as long as the head and without hooks.

The *female* is yellowish olive, with the belly silvery, and with the trunk above the belly blackish; all the scales with a narrow blackish edge.

The *male* is conspicuously marked: two brown streaks run along the trunk and are sometimes confluent into a band, one brown streak runs along the middle of the side of the tail, a round black spot behind the shoulder, another at the commencement of the caudal streak, a third at the root of the caudal. One or two of these spots may be absent.

The male is 1 inch, the female 1½ inch long.

Wednesday, 18th November, 1868.

R. J. Lechmere Guppy, F.L.S., F.G.S., &c., President, in the Chair.

The following communication was read:—

On Fish-Poisons.

By the Hon. Richard Hill, Corresponding Member.

In my former communication* I treated of Poisonous Fishes; the present paper will be devoted to Fish-poisons.

Mr. Samuel Barton, pilot of Port-Royal, supplies us with a remark that carries us over a great deal of ground in accounting for the fishes of our coast so frequently manifesting poisonous qualities. Midway between Cuba, Haiti, and Jamaica, lie the extensive reefs and shoals of the Formigas. They are several miles in extent, and have barely more depth of water on them than for a moderate-sized vessel to pass in a smooth sea. This shoal presents a concentration of all the incidents to be found in our fringing shore reefs. Arborescent corals and spreading millepores stretch on walls and ledges, interspersed with huge meandrinas and brain-stones, among which lodge a profusion of holothurias, echinuses, star-fishes, and a variety of sponges. This great mass of reefs, called from their clustering swarm, the Ant's Nest, or the Formigas, is a very warren, or vivarium of all sorts of fishes. As you approach

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* Anteà, p. 210.

the great submarine plateau, the odour of the slime and of the spermatic substances that find a resting-place in the crevices and shallow pools spread through it, is very remarkable. You approach it from the east and find the cheering blandness of the sea breeze suddenly changing to the nauseating smell of a fish-market. Those who have waded on to our shore-reefs know not only the strong scent given out by the polyps that build there, but feel how sensibly the hands are affected,—and how the skin of the thighs is susceptible of a stinging influence from the slightest contact with the slime of corals—(*vide* Gosse's "*Naturalists' Sojourn in Jamaica*," page 54). It has been found by invariable experience that all the fishes taken on the Formigas are pernicious; that the baracoutas especially are always poisonous, at least in those months when the Formigas may be sailed over in unbroken water. Similar stretches of shoals among the Bahamas produce fishes similarly deleterious as food. The low-spreading ledges and banks of the Virgin-Islands, called the *Anegadas*, or the Drowned Islands, afford a similar unfavorable ground for fishing. In this way we may account for the remark of Dr. Grainger that fishes are poisonous at one end of St. Christopher, while they are harmless at another. The deep water shoals are not the resort of the star-fish, nor of any of the Echinodermata. They are, therefore, exempt from their evil influences. I do not know whether it be a fact consistent with experience,—but fishes of the deep-water fish-pots ought always to be safe eating.

We get over, by these several incidents of our fishing-grounds, the adventitious occurrence of poisonous among wholesome fishes. Some have a natural pernicious character, but others become deleterious from the food on which they subsist at certain seasons on certain banks and coasts. Our ensuing observations will be directed to the *sanies* indicating disorder in the living tissues of some fishes, and to the poisonous putrifaction or chemical process known to take place in others after they have been a few hours out of water.

There may be such a change effected by mere condition of the living tissues in animals, at certain times, as that indicated by the conversion of flesh into *adipocere.* After lying in water, meat begins to undergo the adipocerous putrifaction, or the conversion of flesh into a substance resembling the waxen fat of spermaceti. In the course of these changes a poisonous principle develops itself.—(*Christison on Poisons*, in the *London Medical Repository*, 1835). If over-driven cattle, killed before they are allowed to recover from fatigue, will produce malignant Dysentery, what difficulty can there be in accounting for conditions of life which may become poisonous to those who eat of what is not ordinarily deleterious? No chemical analysis can disclose a state in which there is nothing new or extraneous superadded—only a peculiar condition, and relation of the ordinary constituents, superinduced. *Kreatine* which is found in the flesh of fishes, is a crystalline substance. It never occurs in organised bodies but as the result of some abnormal process. The minutest particles of matter in organisation—whether saline or earthy, animal or vegetable—are combinations always so arranged by the powers of life as to be *diffused.* They are never so concentrated as to assume the crystalline form, except when in a state of excretion. As a general principle, crystallisation determines the incompatibility of the matter with the life of the structure in which it occurs.*

The liver of fishes, in performing its function of separating impurities from the blood, and of secreting fluids, necessary to digestion, must do all the increased depuratory work attendant on the absence of lungs. Exhalations from animals living in aeriform fluids are properly excretions. From animals living in aqueous fluids, excretory action must be much modified, and in fishes it exists only by that energy of "reduction" in which the albuminous matters of the chyle evolve gases by the "process of completion."† (Prout's Bridgwater Treatise). In reptiles the liver is large, in consequence of the low degree of respiration of that class of vertebrate animals; for the same reason it is large in fishes, and very large among the invertebrata. In fishes the gall-bladder is observed for the first time in the animal series, as we ascend from the invertebrate to the vertebrate classes, but it is not constant in its

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*I have no experience of the manifestation of kreatine or flesh-crystals in fishes either occasionally or permanently poisonous; but the ordinary chemical property of living structures as laid down by Dr. Prout, in the Bridgwater Treatise, book iii., ch. i., on the "Chemistry of Organisation," is, that "the essential elements are *hindered* from assuming a regular crystallised form. The incidental matters entering into the composition of a living body apparently furnish to the organic agent new powers—which powers the organic agent has been endowed with the ability to control and direct, in any manner that, from the exigencies of the living organised being, may become requisite." Raspail in his "Chimie Organique," section 1378, says: "Jamais je n'ai aperçu de crystaux dans le sein d'une cellule vivante et d'accroissement."

† "Il y a des poissons," says M. Ervmann, illustrating excretory modification in nutrition, "qui avalent l'air atmosphérique et en convertissent l'oxigène en acide carbonique, en la faisant passer au travers de leur intestins. Tel est le COBITIS—il se fait à la peau, et sous les écailles une transmutation semblable."—(Cuvier, Hist. Naturelle des Poissons, vol. i., liv. ii., ch. vii.)

existence among them. It is absent in many genera, and it is then substituted by a peculiar economy of efferent tubes. The compensatory energy of the liver in this class of organic beings must render it vastly congestive. We know that fish-liver contains an enormous quantity of oil—that fish-oil is an important article of commerce, and fish-liver oil is a valuable medicine; but we knew besides, that these oils in a corrupt state are active poisons. Hence we may infer that the liver is a great operator in the injury done by deleterious fishes; and if we but knew all the genera in which the gall-bladder is wanting, we might arrive at some rule for estimating the possible development of those prejudicial fluids that mingle from the liver with fish-flesh in cooking.

Before adverting to the circumstances under which tunny fish, when becoming unwholesome, is condemned by the police in the market of Venice, it is necessary to remark some peculiarities in the organisation of the mackerel tribe, the family of fishes to which the tunny belongs. We have enumerated some instances of scomberoid fishes that are pernicious. We have mentioned the bonito, and naming some of the caranxes and jacks, we have included the coryphæna dolphin, the king-fish, and the Spanish mackerel among them.

Everyone has remarked the lateral line that extends along the scaling of fishes from the gills to the tail, either interrupting or dividing the dermal imbrication. This line has a relation with the mucus that lubricates the skin, —"quelque appareil secretoire qui en suit la longueur." This lateral line is especially destinct in the tunny fish. Along it there occurs a peculiar reddening of the flesh, deeper than in any other part of the body. A number of little tubes forming pores start off from it; each of these little tubes has a bundle of nerves. There is something very similar to this in the carp.

In addition to this peculiarity of red flesh in the lateral line of the tunny, one of the most distinguished of the mackerels, we have to consider the non-existence of that reservoir for air, known as the swimming bladder, placed beneath the spine. The gas in this bladder, whether it be nitrogen, or oxygen, is a product of secretion. "The air-sac is most developed in species which frequent or feed at the surface of the water, and is least developed or wanting in those which lie at the bottom, or burrow in mud; its secretion contains a larger proportion of oxygen in the powerful predacious fishes of deep seas, and nitrogen predominates in the feebler species which frequent shores and shallow waters. Being developed, like the lungs of higher animals, from the alimentary canal, the air-sac of fishes generally communicates with the œsophagus or stomach by means of a short trachea or *ductus pneumaticus;* in some, however, this tracheal communication becomes completely obliterated, and the sac remains an isolated, closed cavity, filled with its gaseous secretion."—(*Outlines of Comparative Anatomy*, by Robert Grant, M.D., chap. iv., 5th sec.)

Cuvier very justly observes that whatever opinion may be entertained relative to the use of the air-bladder, it is difficult to explain how so considerable an organ has been denied to so many fishes as occurs in our researches; not only to those which ordinarily remain quiet at the bottom of the water, as rays and flat-fishes, but to many others that apparently yield to none in the rapidity or facility of their movements. The presence or the absence of the swimming-bladder has however no accordance with conformation, or no relation with it. A species nearly approaching the common mackarel, the *Scomber pneumatophorus*, is provided with this organ, and bears a name from having it, as a distinction; the *Thynnus vulgaris*, is without it, while the *Thynnus brachiopterus* has it, though small. It is wanting in the *Pelamys sarda*, one of the bonitos, and in the *Auxis vulgaris*, another; and occurs in the remoter scomberoid, the *Trichiurus lepturus*, the cutlass-fish. It does not exist in the Coryphæna dolphin, but is largely found in the caranxes or jacks. It is difficult to trace the effects of this difference in fishes of the mackerel family. Though the air-bladder may be no auxiliary in respiration, it must yet influence the circulation in some respect, for "it has been ascertained that when a fish that has it, has been deprived of it, the evolution of carbonic acid gas by the gills is nearly reduced to nothing."*—C. & Val. Hist. Nat.

We now turn to Cuvier's account of the wholesomeness or unwholesomeness of the flesh of the Tunny-fish, to which our King-fish is nearly allied; while the bonito is of the genus Thynnus or Tunny.

"It is befitting that we remark," Cuvier says, "how the tunny is as wholesome and agreeable when it is used fresh or salted, as it becomes hurtful when it at all approaches putridity. If the bones and the edges of the fish

* Cuvier cites the experiments of Humboldt and Provençal for this fact; he says: "On a pensé que la vessie natatoire pouvait être aussi un auxiliare des organes de la respiration, et il *est certain que lorsqu'on en prive un poisson la production de l'acide carbonique* par *ses branchies est presque réduite a rien.*"—(Hist. Naturel. des Poissons, Art Nutrition, pp. 522-528.

are *reddened,* the flesh immediately near the redness takes on a sharp and acrid taste, as if it had been peppered; and it causes imflammation in the throat, pains in the stomach,—diarrhœa, and even death, if one has eaten much of it. The police of Venice examine carefully the boats that bring in the fish, especially when the sirocco has delayed their arrival—and if ever so little touched they throw it into the sea. The freshest tunny ought to be sold within twenty-four hours."—(C. & V. Hist. Nat. des Poissons, vol. viii., liv. ix.)

What occurs with the tunny when decomposition commences, on the dead fish, is in reality the representation of the state of the living tissues when the cognate fishes assume the poisonous character. We say nothing of the oily fishes, such as the salmon, herring, &c., which are known when kept too long to give rise to symptoms of irritant poison.

I think that the facts and inferences set out in this paper are a much nearer solution of the mystery of fish-poison than the crude guesses we see published as explanations. I do not know how far the following vital economy in respect of the keeping quality of fishes may be applied to the subject we have been endeavouring to illustrate, but I give it as making some weight in the tendency of fish-flesh to become prejudicial as food. "Physiologists have shown that the quantity of respiration is invariably as the degree of muscular irritability. It may be considered as a law, that those fish which swim near the surface of the water have a high standard of respiration,—a low degree of muscular irritability,—great necessity for oxygen,—die soon,—almost immediately when taken out of the water, and have flesh prone to rapid decomposition. Mackerel, salmon, trout, and herrings are examples. On the contrary, those fish that live near the bottom of the water ('or feed on the ground') have a low standard of respiration, a high degree of muscular irritability, and less necessity for oxygen,—they sustain life long after they are taken out of water, and their flesh remains good for several days.—Carp, tench, eels, the different sorts of skate, and all the flat-fish, may be quoted as instances of this character."—(Yarrell's Introduction to his History of British Fishes). All our surface swimmers die and decompose soon, while our ground-fish, as in the Eliotris or mud-fish, have the power of endurance more manifested as a quality of their organisation.

It should be remarked that the mullets being vegetable feeders, or fishes taking animal food in a state of maceration or solution on the unctuous ooze of river-beds, are at all times wholesome fishes. Their sensitive lips, with ciliary fringes, hardly fit them for taking aliment of any substance harder than pulp; hence it is that in England they bait for them with the pith of cabbage boiled in fat, and we entice them with avocado pear, and the soft portions of wild banana.

The mud fishes, whether described under the name of Gobius, Eliotris, or Philypnus, are all fishes of the most esteemed character for the table. "Ce sont, en général," says Valenciennes in describing the Eliotris, "un groupe des Gobioides à ventrales séparés," the true gobies, as in our sand-fishes, having the ventral fins united like a cup, the difference between sand and mudfi-shes,—"ce sont, en général, des poissons paresseux, qui se tiennent tranquillement dans les vases ou dans des trous de rochers. La plupart fournissent un *aliment agréable* et de facile digestion." Speaking of the *gyrinus* and *guavina* specially, two of the gobies, he says of the first, "l'espèce est très-estimé à St. Domingue, *surtout* pour les malades;" and of the second, "repandue dans toutes les rivières de l'île de Cube, elle atteint dix-huit à vingt-deux pouces de longueur, et on *l'estime beaucoup comme aliment*."—(Cuvier et Valen. Hist. des Poissons, vol. xii., liv. xiv., ch. xiv.) The flesh of all is truly savoury and nourishing, and very digestible.

If notices of any peculiarity in the qualities of the fish generally brought into the markets, were communicated, they would form a body of important information to the public and the naturalist.

I must not omit to remark, it has sometimes happened that fishes have contracted a prejudicial quality, by being covered over in the baskets, in which they are carried for sale, with the leaves of poisonous shrubs. Instances of many such occurrences could be readily quoted. On these occasions fishes get qualities assigned them which do not belong to them.

In the year 1863 our Jamaica newspapers for some weeks discussed cases of fish-poison that had occurred on the North side of the Island, in which thirteen persons died. The facts were simply these. From the coast fishes fried and prepared as convenient articles for the plantation labourers to carry into the field for their morning repast, had found a ready market among the work-people of an estate some seven miles from the shore where the fishes had been taken. They were all Labroid fishes,—the usually splendid fishes called Parrot fish. From specimens I procured, they were the Scarus Chysopterus of Cuvier and Valenciennes:—light green in the body, and golden yellow in the fins and tail. They had never been known to be hazardous eating, they were taken in profusion, and were probably part of a shoal adventitiously seeking our coasts. In considering this occurrence it seemed to me that parrot fishes,—the scaruses, owe their extraordinary intensity of hues to Bromine, and that this corrosive matter, having assumed some unusual compound form, was immediately pernicious and destructive. The scaruses from their brilliant colours,—seldom softening into tints, are ordinarily deemed to be suspicious fishes, but the chrysopterus being of a subdued hue was not on this occasion a subject for caution. We must consider too that a great number together of scaruses had been fried, and that circumstantially an irritant character may have been acquired on this occasion.

Tuesday, 8th December, 1868.

R. J. Lechmere Guppy, F.L.S., F.G.S., &c., President, in the Chair.

The following communications were read :—

1. Further Additions *to the* Catalogue *of the Land and Freshwater* Molluska *of* Trinidad. By R. J. Lechmere Guppy, F.L.S., F.G.S., &c.

In my last communication to the Association on the subject of the landshells of Trinidad, I stated that I had discovered some inoperculate species which would form the subject of a future paper. I am now able to redeem my promise; the species then referred to, together with others obtained during a visit to the heights of Aripo, having since been described in the "Annals and Magazine of Natural History." In the present paper are also included the descriptions of one new species of *Glandina,* two of *Helix,* and one of a new genus discovered by me at Mayaro. The total number of species of land and freshwater shells known to exist in Trinidad is now raised to fifty-two.

Subkingdom MOLLUSKA.

Class GASTEROPODA.

Subclass INOPERCULATA — PULMONATA.

Order Geophila.

SPIRAXIS Adams 1850.

Terrestrial Inoperculata with thin cylindrical or ovate-oblong shells having a narrow aperture with a sinuate outer margin and a twisted columella.

Spiraxis simplex Guppy.

Ann. & Mag. Nat. Hist., 4 ser., vol. i., p. 438.

A turreted species, longitudinally sinuate-plicate, white under a light straw-colored epidermis, and having 8 or 9 whorls. Length 12-15 mill., diameter 4-6 mill.

A shell which, though rather larger than *Stenogyra octona,* recalls that species in some respects, but examination readily shows that it is different. Like most of the shells enumerated in the present paper, *Spiraxis simplex* appears to be rare, and has only occurred to me at Maracas and in one or two other localities among the northern hills.

GLANDINA Schumacher 1817.

Terrestrial Inoperculata with oblong-fusiform somewhat horny shells having 5-8 whorls, the last narrowed towards the base, and a rather narrowed oval-oblong aperture with a simple or slightly sinuate peristome and an arcuate columella more or less truncate.

Glandina minutissima n. sp.

A very minute glassy-hyaline smooth shining fusiformly-cylindrical shell with 5 whorls of which the last forms more than $\frac{2}{3}$ of the shell. Spire short, with an obtuse apex; aperture elongate-oval, narrow above, wide below; peristome simple, columella scarcely truncate, passing into a defined white callus joining the margins of the peristome upon the body-whorl. Height 2 mill., diameter $\frac{3}{4}$ mill.

Most of the shells of the genus *Glandina* are adorned with broad sinuate stripes of red or plum-color, especially those belonging to the group *Varicella*, of which the species now described is probably a member; but the shell now before us is devoid of markings or color. I found it amongst dead leaves at Maracas.

STENOGYRA Shuttleworth (See "Proceedings," *antea*, p. 20).

Stenogyra plicatella Guppy.

S. octonoides, *Guppy (as of Adams) Proc. S. A., Dec.* 1866, *p.* 21.

S. plicatella, ,, *Ann. & Mag. N. H.*, 4 *ser.*, *vol. i.*, *p.* 438.

A thin slender elongate-cylindrical sinuate-striate shell with 8-9 whorls. This is the species described in the "Proceedings," p. 21, as *S. octonoides* Adams, from which I find it to differ greatly.

(Melaniella Pfeiffer.)

Stenogyra coronata Guppy.

Ann. & Mag. N. Hist., 4 *ser.*, *vol. i.*, *p.* 439.

A horny cylindrical-fusiform shell ornamented with low distant riblets and having 8-9 whorls of which the last is narrowed. Length 7 mill., breadth 2 mill. A single example occurred to me at Maracas.

ZONITES Montfort 1810.

Terrestrial Inoperculata with very thin transparent depressed umbilicate helix-shaped shells.

To this genus probably belong the shells included in the subgenus *Conulus*, but the latter have a very narrow perforation in place of the wider umbilicus of the typical species. The genus is distinguished from *Hyalina* by the presence in *Zonites* of a retractile caudal appendage.

Zonites Guildingi Bland.

Stenopus Guildingi, *Bland*, *Ann. Lyc. Nat. Hist. New-York*, *vol. viii.*, (1865) *p.* 157.

Zonites Guildingi, *Guppy*, *Ann. & Mag. Nat. Hist.*, 4 *ser.*, *vol. i.*, *p.* 439.

A very thin amber-colored umbilicate depressed-orbiculate shell with a lunate aperture. Height 4½ mill., greatest breadth 9 mill. I have only found this species on the Cerros of Aripo, but Mr. Bland describes it from Venezuela.

Zonites implicans Guppy.

Ann. & Mag. Nat. Hist., 4 *ser.*, *vol. i.*, *p.* 440.

A minute widely umbilicate discoidal shell with 4 depressed whorls. Height ½ mill., breadth 2 mill.

Zonites umbratilis Guppy.

Ann. & Mag. Nat. Hist., 4 *ser.*, *vol. i.*, *p.* 440.

A species scarcely larger than the last, but distinguished by its regular striation and deeper umbilicus. It has 5½-6 whorls. Height ¾ mill., breadth 1½ mill. This and the preceding species are found amongst the vegetable matter at the roots of trees at Maracas and other valleys in the northern hills.

HELIX Linné 1758.

Terrestrial Inoperculata with discoidal, globose, convex-trochiform or conoidal shells; rarely pellucid, generally white, brown or reddish, or variously zoned or painted with colors.

The genus *Helix* although much restricted by recent writers, is still one of the largest in Zoology, containing a collection of species varied in shape, ornamentation and color, but readily recognised as belonging to one general type. The number of species enumerated in the 2nd edition of Albers' "Die Heliceen" is 1172. Some of these may probably be found to be only varieties; but on the other hand many species are not recorded in that work.

Until the discovery of the shells now enumerated no representative of this genus was known to exist in Trinidad.

Helix caeca n. sp.

A horny brownish conic trochiform obsoletely perforate obliquely costulate *Helix* having 4 whorls a convex rather elevated spire with a smooth apex and a deep suture. The aperture is nearly circular and a little oblique, the peristome is simple and straight, its margins united by a scarcely perceptible diffuse callus on the rather ventricose body-whorl. The columella is somewhat effuse. Height 1½ mill., breadth 2 mill., diameter of aperture 1 mill. Found on the trunks of trees and on mossy stones in Laventille and Maracas.

This species and the one next described bear a certain resemblance to *Helix harpa* Say (*Zoogenetes* Morse) especially in the character of their ornamentation. They are somewhat more depressed, especially *H. ierensis.*

Helix ierensis n. sp.

A horny brown trochiform very obliquely costulate deeply umbilicate *Helix* with a convex spire the apex of which is smooth; the suture is deeply sunk; whorls 5, a little carinate; peristome simple, columella a little reflected. Height 2 mill., breadth 3 mill.

This species, which I found at Maracas, is nearly allied to the preceding, differing from it in being more depressed and in its open umbilicus. Its aperture is also rather lunate than circular. It may be compared with the H. ochthephila of D'Orbigny (Voy. Amer. Merid., pl. 28, f. 9-12). The derivation of the specific name is from Iere, the Indian name of Trinidad.

Helix bactricola Guppy.

Ann. & Mag. N. H., 4 *ser.*, *vol. i.*, *p.* 440.

A small pyramidal deeply umbilicate fuscous horny *Helix* with 7 narrow slowly increasing closely costellate whorls carinate on the periphery, a conic spire, a smooth apex, and an angularly suboval aperture with a simple peristome. Height 2½ mill., breadth 4. Found on palms on the Cerros of Aripo.

Bulimulus Leach 1814.

(See "Proceedings," *anteà*, p. 17).

Bulimulus tenuissimus Fér.

A species resembling *B. fraterculus* (see "Proceedings," p. 18) but of stouter figure. It is found with that species.

Pupa Draparnaud 1805.

Terrestrial Inoperculata with stout cylindrical shells, having an obtuse apex and slowly increasing whorls, and a semioval or subcircular aperture with a reflexed peristome and generally furnished with teeth or plaits.

Pupa uvulifera Guppy.

Ann. & Mag. N. H., 4 *ser.*, *vol. i.*, *p.* 441.

A small ovate, cylindrical slightly striate shell with 5-6 whorls and an aperture furnished with plaits and a reflexed peristome. Length 3 mill., breadth 1. Found on the Gulf Islands and other places where the compact limestone occurs.

Pupa auriformis Guppy.

Ann. & Mag. N. H., 4 *ser.*, *vol. i.*, *p.* 441.

A minute ovate shell with 4½-5 whorls, a short obtuse apex and a semioval earshaped aperture furnished with a tooth-like parietal plait. Length 2 mill., breadth 1½. It may be distinguished from the preceding by its proportions, which are relatively shorter and stouter. It is rare, and found in similar situations to *P. uvulifera*.

TORNATELLINA Beck (see "Proceedings," *anteà*, p. 19).

Tornatellina costellosa n. sp.

An elongate-ovate subdiaphanous whitish-horny scarcely shining shell adorned with numerous close slightly sinuate longitudinal costellae: whorls 5-6, the last a little convex and forming two-thirds or more of the height of the shell; spire elevated, apex blunt, smooth; aperture suboval, dilated anteriorly, outer margin thin, simple; columellar margin bearing a callus; columella obliquely truncate, reflexed, forming in adult examples a slight fissure. Length 7 mill., breadth 3½.

This shell is smaller than *T. lamellata*, and is distinguished from it by the absence of a parietal plait and by its fine ribbing. I found it near Turure on the road to Mayaro.

AUTONOE n. gen.

Terrestrial Inoperculata with ovate obconoidal thin horny shells having a compressed body-whorl slightly angulate above; a short conoidal spire and a long narrow aperture a little dilate anteriorly, the outer margin simple and the columella tortuous, bearing a strong plait.

This genus is probably closely allied to *Melampus* and *Laimodonta*, differing chiefly from the former in its thin and horny shell and from the latter in its short spire and longer aperture.

Autonoe riparia n. sp.

A nearly smooth ovate obconoidal thin horny shell of about 5 whorls, the last somewhat compressed, whitish under a straw-colored epidermis; suture shallow, rather irregular; aperture elongate, widened below, inner margin covered with a callus and furnished with a strong plait; columella strongly twisted. Length 10 mill., breadth 6.

In shape this shell resembles *Melampus pusillus;* its thin texture however scarcely allows of our referring it to *Melampus*. If one compares the present species with *M. pusillus*, it will be remarked that in addition to the very great difference of texture, *A. riparia* has a shorter spire, a perfectly simple outer margin, and is destitute of the posterior parietal plait as well as of the internal ridge of the outer lip. Unfortunately I secured only one example of the species. I found it on Mayaro Point amongst the bushes some ten or twelve feet above the highest limit reached by the waves of the sea, a habitat, it will be noticed, very similar to that of the Auriculidæ.

Subclass Prosobranchiata.

Order Scutibranchiata.

Helicina Lamarck (see "Proceedings," *anteà*, p. 30).

Helicina ignicoma Guppy.

Ann. & Mag. N. H., 4 ser., vol. i., p. 441.

An orbiculate-conoidal radiately sinuate-costellate reddish species. Height 3 mill., greatest breadth 4½. I have only found this species on the heights of Aripo. It is nearly allied to two Antillian species, viz., *H. rugosa* and *H. plicatula.*

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2. Catalogue *of* Plants *in the* Botanic Garden.

By Henry Prestoe, Government Botanist.

(The publication of this paper is deferred.)

Rules *and* Regulations *and* List *of* Members *of the* Scientific Association *of* Trinidad—1868-9.

The object of this Association is the cultivation of Scientific Knowledge in the West Indies.

Rules.

1. This Association shall be called the "Scientific Association of Trinidad."

2. The objects of the Association shall be carried out by the reading of Papers and the discussion of Scientific subjects, by maintaining a correspondence with scientific men in other countries, by assisting in the development and application of Science in the West Indies, and generally by the collection and publication of useful information.

3. The Association shall consist of Members, Corresponding Members, and Honorary Members.

4. The Association shall in October of each year elect from among the Members a President, a Vice-President, a Secretary and Treasurer and one other Member, who shall constitute the Council of the Association. Such Council shall have, subject to the Rules, the general management of the affairs of the Association.

5. The person who shall have filled the office of President in any year shall not be eligible for election as President for the next following year.

6. When any candidate shall be proposed for admission to the Association as a Member, he shall be ballotted for at the next Meeting thereafter, one black ball in five excluding.

7. The Association may elect as Corresponding Members such persons in the West Indies and elsewhere as from their services to Science are likely to contribute towards the advancement of the objects of the Association.

8. The Association may elect as Honorary Members such persons not permanently resident in Trinidad as may be desirable.

9. The Association shall meet on the second Tuesday in each month, or on such other day as may be fixed by the Council.

10. No motion relative to the Rules of the Association shall be brought forward except at a Special General Meeting of the Association; and no such motion shall be carried, except by a majority of at least two-thirds of the Members present at such Special General Meeting.

11. One-third at least of the Members of the Association actually in the Island shall be required to constitute a Special

General Meeting: and in order to constitute such Special General Meeting, it shall be requisite to give notice thereof at an ordinary Meeting.

12. Provided however that the ordinary Meeting in October of each year shall have all the powers of a Special General Meeting without respect to the number of Members present.

13. The Subscription of each Member shall be One Pound and Tenpence per annum, payable half-yearly on the first day of January and the first day of July. Every new Member on election shall pay the subscription for the current half-year.

14. No Member whose subscription shall be in arrear for three calendar months, unless at the time absent from the Island, shall be entitled to any of the privileges of membership.

15. The Secretary shall at the monthly Meetings in April and October of each year lay before the Association lists of those Members whose subscriptions are in arrear.

16. No non-Member may be present at the Meetings of the Association; but Members may introduce Strangers to such Meetings. Provided that no person shall be considered a Stranger after he shall have been resident in the Island longer than three calendar months.

17. Every Member shall be entitled to one copy of each Paper printed since his election.

18. No Member shall be entitled to receive free any paper published during any period for which he shall not have paid subscription.

19. The Author of every Paper printed for the Association shall be entitled to have six copies of such Paper.

20. Members desiring to obtain copies of the Proceedings of the Association, other than those to which they are entitled as specified in the preceding Rules, may have the same, as far as copies are available, on payment of the following rates:—

When the Part of the half-yearly Journal shall not exceed 32 pages (for each part)................ 1s. 0d.
When the same shall exceed 32 pages (for each part) 1s. 6d.

21. Copies of the Journal of Proceedings of the Association may be sold to the public at the following rates:—

When the Part of the half-yearly Journal shall not exceed 32 pages (for each part)................ 1s. 6d.
When the same shall exceed 32 pages (for each part) 2s. 6d.

A Commission at the rate of twenty-five per cent. shall be allowed to the Agent, if any, appointed for the sale of such Journal; and the monies derived from the sale of Papers shall be applied to the purposes of the Association.

22. Corresponding Members not being required to pay any subscription may receive the parts of the "Proceedings" at the prices charged to Members.

23. These Rules shall not be applicable to Honorary or Corresponding Members unless where expressly so stated.

COUNCIL (elected 13th October, 1868.)

Robert John Lechmere Guppy, F.L.S., F.G.S., &c., *President.*
Henry William Caird, M.A., *Vice-President.*
Henry Francis Jeune Guppy, F.A.S.L., *Secretary & Treasurer.*
Horace Deighton, M.A., F.R.A.S., *Additional Member of Council.*

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Members are requested to communicate changes of residence, &c., to the Secretary.

Transf? from P. B. D.
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PROCEEDINGS

OF THE

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OF

TRINIDAD.

Parts VI. and VII.—JUNE 1869.

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CONTENTS OF PART VII.

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PROCEEDINGS

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OF

TRINIDAD.

PART VI.] [JUNE 1869.

RANUNCULACEÆ.

NARAVELIA Zeylanica, *DC.*	Ceylon.
CLEMATIS Caripensis, *Kunth.*	Western Tropics.

DILLENIACEÆ.

DILLENIA speciosa, *Thunb.*	India.
,, scaberella, *Roxb.*	Assam.
TETRACERA ovalifolia, *DC.*	Trinidad, Venezuela.
DAVILLA rugosa, *Poir.*	W. Indies (Trinidad), Venezuela, Guiana.

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CURATELLA Americana, *L.*	Western Tropics.

MAGNOLIACEÆ.

MAGNOLIA grandiflora, *L.*	North America.
,, ferruginea, *Andre.*	North America.
,, sphenocarpa, *Roxb.*	Bengal.
TALAUMA pumila, *Andr.*	Amboyna.
MICHELIA Champaca, *L.*	Tropical Asia.

SCHIZANDREÆ.

KADSURA Roxburghiana, *Arnott.*	Silhet, Trop. Himalayas
SPHÆROSTEMA grandiflora, *Blume.*	Temp. Himalayas.

ANONACEÆ.

ANONA muricata, *L.*	W. Indies, Tropical South America.
,, reticulata, *L.*	W. Indies (Trinidad).
,, squamosa, *L.*	W. Indies (Trinidad).
,, palustris, *L.*	W. Indies (Trinidad), Tropical S. America.
,, Cherimolia, *Mill.*	Mexico to New Grenada.
,, laurifolia, *Don.*	Jamaica, Tropical America.
ROLLINIA Sieberi, *A.DC.*	Mexico, Trinidad, St. Vincent.
,, multiflora, *Splitz.*	Trinidad, Trop. S. America.
CANANGA odorata, *Hook.*	Java.
ANAXOGORA acuminata, *St. Hil.*	Trinidad, Guiana.
UNONA discolor, *Vahl.*	India.
,, lævigata, *Wall.*	China.
,, ,, macropetala,	Java.
ARTABOTRYS odoratissimus, *R. Br.*	Ceylon, Java.
GUATTERIA suberosa, *Dumal.*	S. India, Ceylon.

XYLOPIA frutescens, *Aubl.*	W. Indies (Trinidad).
MONODORA grandiflora, *Benth.*	Guinea.
MILLUISIA montana, *Gard.*	S. India, Ceylon.
GONIOTHALAMUS *Gardnerii.*	India.

MENISPERMACEÆ.

COCCULUS Domingensis, *DC.*	W. Indies (Trinidad), Tropical S. America.
,, palmatus, *Decsne.*	
TILIACORA acuminata, *Miers.*	Trop. India, Ceylon, Java.
ANAMIRTA Cocculus, *W. & A.*	India, Ceylon, Malayan Isles.
CISSAMPELOS Periera, *L.*	All Tropical Countries.

BERBERIDEÆ.

BERBERIS emarginata,	North Asia.

NELUMBIACEÆ.

NELUMBIUM speciosum, *Wild.*	Asia, Tropical Australia.
,, luteum, *Wild.*	Trop. S. America, Jamaica.

NYMPHACEÆ.

VICTORIA regia, *Lindl.*	Amazon.
EURYALE ferox, *Salisb.*	Bengal, China.
NYMPHÆA ampla, *DC.*	W. Indies, Mexico to Brazil.
,, elegans,	Mexico.
,, gigantea, *Hook.*	Australia.
,, rubra,	India.
,, dentata,	Sierra Leone.

PAPAVERACEÆ.

ARGEMONE Mexicana, *L.*	Tropical Asia & America.

CRUCIFEREÆ.

CHEIRANTHUS Cheiri, *L.*	Europe.
AUBREITIA gracilis, *Spruce.*	South Europe.
IBERIS umbellata, *L.*	South Europe.
BRASSICA oleracea, *L.*	South Europe.
SINAPIS alba, *L.*	South Europe.
,, brassicata, *L.*	Tropics.
RAPHANUS sativus, *L.*	South Europe.
LEPIDIUM Virginicum, *L.*	North America, and W. Indies.

CAPPARIDEÆ.

CLEOME pentaphylla, *DC.*	Tropics.
,, speciosa, *Kunth.*	Western Tropics.
,, pungens, *Wild.*	Western Tropics.
CRATÆVA gynandra, *L.*	W. Indies (Trinidad).
,, Roxburghii, *Br.*	
CAPPARIS Jamaicensis, *Jacq.*	W. Indies (Trinidad).
,, ,, vars. a & b, *Grise.*	
,, cynophallophora, *L.*	W. Indies (Trinidad).
,, verrucosa, *Jacq.*	W. Indies (Trinidad).
,, frondosa, *Jacq.*	W. Indies (Trinidad).
,, horrida, *L.*	India, Ceylon.
STERIPHOMA elliptica, *Spruce.*	Trinidad, Cumana.

RESEDACEÆ.

RESEDA odorata, *L.*	Shores of the Mediterranean.

POLYGALACEÆ.

POLYGALA Timoutou, *Aubl.*	W. Indies (Trinidad).
,, longicaulis, *Kunth.*	W. Indies (Trinidad).

POLYGALA variabilis, *Kunth.* W. Indies (Trinidad).
,, Americana, *Mill.* W. Indies (Trinidad).
CATACOMA lucida, *Benth.* Trinidad, Trop. S. America.
SECURIDACCA volubile, *L.* Jamaica, Trinidad.

PITTOSPORACEÆ.

PITTOSPORUM undulatum, N. S. Wales.
,, Tobira, Japan.
,, crassifolium, New Zealand.

VIOLARIEÆ.

VIOLA odorata, *L.* Europe.
,, tricolor, *L.* Europe.

BIXACEÆ.

BIXA orellana, *L.* Western Tropics.
FLACOURTIA Ramontchii, *Herit.* India.
,, prunifolia, *H.B.* India.
,, cataphracta, *Rox.* India.
,, sepiaria, *Rox.* India.

SAMYDEÆ.

CASEARIA sylvatica, *Swartz.* W. Indies (Trinidad).
,, serrulata, *Smartz.* W. Indies (Trinidad).
,, parviflora, *Wild.* W. Indies (Trinidad).
GUIDONIA spinescens, *Grise.* Cuba, Trinidad, Guiana.

CARYOPHYLLACEÆ.

DIANTHUS Chinensis, *L.* China.
,, Hedwegii, Levant.
,, ,, laciniatus,
,, caryophyllus, Europe.

DRYMARIA cordata, *Wild.*	Tropics.

PORTULACACEÆ.

PORTULACA oleracea, *L.*	Tropics, and Temperate Zones.
,, pilosa, *L.*	Mexico to Brazil.
,, Gilliesii,	Mendoza.
PORTULACARIA afra, *Jacq.*	Cape Good Hope.

MALVACEÆ.

ALTHEA sinensis, *Cav.*	China.
,, ,, flore plena,	
MALVASTRUM spicatum, *Grise.*	W. Indies (Trinidad).
,, tricuspidatum, *Grise.*	W. Indies (Trinidad).
SIDA carpiniifolia, *L.*	W. Indies (Trinidad).
,, rhombifolia, *L.* ,, ,, vars. a & b, *Grise.*	Most Tropical Countries.
,, urens, *L.*	W. Indies, West Africa, Madagascar.
,, cordifolia, *L.*	Tropics.
ABUTILON periplocifolium, *G. Don.*	Western Tropics.
,, Indicum, *G. Don.*	Western Tropics.
,, striatum, *Dick.*	Brazil.
,, molle, *G. Don.*	Peru.
,, atropurpureum,	E. Indies.
BASTARDIA viscosa, *H.B.*	West Africa.
MALACHRA capitata, *L.*	Western Tropics, Tropical Africa.
,, palmata, *Michx.*	Cuba, Trinidad.

MALACHRA radiata, *L.*	Western Tropics.
URENA lobata, *L.*	Tropics.
,, sinuata, *L.*	Tropics.
PAVONIA bracteosa, *Benth.*	Trinidad, Guiana.
,, typhæleoides, *Kunth.*	Trinidad, Trop. S. America.
,, racemosa, *Swartz.*	Western Tropics.
MALVAVISCUS arboreus, *Cav.*	Jamaica, Bahamas.
,, mollis, *D C.*	Mexico.
ABELMOSCHUS moschatus, *Michx.*	Central America.
,, esculentus, *W. A.*	W. Indies, Guiana.
HIBISCUS trilobus, *Cav.*	Jamaica, Trinidad.
,, Canabinus, *L.*	India.
,, Sabdariffa, *L.*	W. Indies (Trinidad).
,, fragilis, *L.*	India, Bourbon.
,, Lampas, *Cav.*	India, Ceylon, Java.
,, Lindleyana, *Wall.*	Tavoy.
,, fastigiatus,	India.
,, tulipiflorus, *Hook.*	Dominica, Trinidad.
,, Rosa-sinensis, *L.*	China, India.
,, ,, var. flava-plena.	
,, ,, ,, rubra plena.	
,, ,, ,, variegata.	
,, ,, ,, Indicus.	
,, populifolius, *Don.*	India.
,, liliiflorus,	China.
,, callosus, *Blume.*	Java.
,, tricuspis, *Cav.*	India, Society Isles.
,, grandiflorus, *Michx.*	India.
,, phoeniceus, *Jacq.*	W. Indies, Venezuela.
GOSSYPIUM barbadense, *L.*	W. Indies, Trop. S. America.

GOSSYPIUM herbaceum, *L.*	W. Indies, Tropical S. America.
PARITIUM tiliaceum, *Adr. Juss.*	Tropical Seashores.
,, elatum, *Don.*	Tropical South America.
THESPESIA populnea, *Corr.*	Society Islands.

BYTTNERIACEÆ.

GUAZUMA tomentosa, *Kunth.*	Western Tropics.
,, ulmifolia, *Lam.*	W. Indies (Trinidad).
THEOBROMA Cacao, *L.*	Venezuela.
HERRANIA albiflora,	Venezuela.
ABROMA fastuosa, *R. Br.*	Timor, Australia.
,, augusta, *L. f.*	India, Moluccas.
BYTTNERIA scabra, *L.*	W. Indies (Trinidad).
KLEINHOVIA hospita, *L.*	India.
DOMBEYA mollis, *Hook.*	South Africa.
,, Mastersii, *Hook.*	West Africa.
KYDIA calycina, *Rox.*	India.
RUIZIA variabilis,	Bourbon.
ERIOLÆNA Hookeriana, *W. et A.*	South India.
VISENIA velutina, *Voigt.*	Java, Mauritius.
PTEROSPERMUM acerifolium, *Wild.*	India.
,, semisagittatum, *Ham.*	Assam.

STERCULIACEÆ.

ADANSONIA digitata, *L.*	West Africa.

PACHIRA aquatica, *Aubl.*	W. Indies, Trop. S. America.
,, Javanica,	Java.
ERIODENDRON anfractuosum, *D. C.*	Western Tropics.
DURIO zebethinus, *Rumph.*	India.
OCHROMA lagopus, *Swartz.*	W. Indies (Trinidad).
HELICTERES Jamaicensis, *Jacq.*	W. Indies.
,, baruensis, *Jacq.*	W. Indies (Trinidad).
,, virgata, *Wall.*	China.
HERITIERA littoralis, *Ait.*	India, Ceylon, Java.
,, minor, *Lam.*	Bengal.
MATISIA cordata, *H. B.*	New Grenada.
STERCULIA Carthaginensis, *Cav.*	New Grenada.
,, caribæa, *R. Br.*	W. Indies (Trinidad).
,, fœtida, *L.*	India, Ceylon.
,, sp.	East Indies.
COLA acuminata, *R. Br.*	Tropical Africa.

TILIACEÆ.

TRIUMFETTA Lappula, *L.*	W. Indies (Trinidad).
,, macrophylla, *Vahl.*	Trinidad, Guiana.
,, semitriloba, *L.*	Tropics.
SPARMANNIA Africana, *L.*	Africa.
CORCHORUS olitorius, *L.*	India.
MUNTINGIA Calabura, *L.*	Western Tropics.
APEIBA Tibourbou, *Aubl.*	Western Tropics.
,, ulmifolia, *H. B.*	Orinoco.
,, Petoumou, *Aubl.*	Trinidad, Venezuela.
SLOANEA Madagascariensis,	Madagascar.
,, Senemariensis, *Aubl.*	

GREWIA major, *Juss.*	India.
,, sepiaria, *Rox.*	Bengal.
BERRYA amonilla, *Rox.*	S. India, Ceylon.

TERNSTROEMIACEÆ.

CAMELLIA Japonica, *L.*	China, Japan.
THEA viridis, *L.*	China.
,, ,, var. erecta,	North India.

GUTTIFERÆ.

QUINA Creugeriana, *Grise.*	Trinidad.
,, Guianensis, *Aubl.*	Trinidad, Guiana.
TOVOMITA Amazonica, *Walp.*	Trinidad to Brazil.
CLUSIA rosea, *L.*	W. Indies (Trinidad).
,, flava, *L.*	Jamaica, Trinidad.
,, sp.	St. Lucia.
MORONOBEA coccinea, *Aubl.*	W. Indies (Trinidad), Tropical S. America.
MAMMEA Americana, *L.*	W. Indies, Venezuela.
,, humilis, *V.*	Western Tropics.
CALOPHYLLUM Calaba, *Jacq.*	W. Indies (Trinidad).
,, inophyllum, *L.*	Ceylon, India.
GARCINIA Mangostana, *L.*	Malayan Peninsula and Islands.
,, Gambogia, *Desrous.*	South India, Ceylon.
,, Livistonii,	India?
,, cornea, *L.*	Malayan Peninsula and Islands.
XANTHOCHYMUS ovalifolius, *Rox.*	Ceylon.
,, pictorius, *Rox.*	South India, Ceylon.

MESUA ferrea, *L.*	South India, Ceylon.

MARCGRAVIACEÆ.

NORANTEA Guianensis, *Wild.*	Trinidad, Guiana.
RUYSCHIA Souroubea, *Wild.*	Trinidad, Guiana.
MARCGRAVIA umbellata, *L.*	W. Indies (Trinidad), Venezuela.

HYPERICINEÆ.

MARILA racemosa, *Swartz.*	W. Indies (Trinidad).
VISMIA ferruginea, *Kunth.*	W. Indies (Trinidad).
,, Cayennensis, *Pers.*	W. Indies (Trinidad).
HYPERICUM Japonicum, *Thunb.*	Japan.
ANCISTROLOBUS carneus, *Wall.*	China.

RHIZOBOLEÆ.

CARYOCAR nuciferm, *L.*	Guiana.
,, butyrosum, *Wild.*	Guiana.
,, glabrum, *Pers.*	Guiana.

SAPINDACEÆ.

CARDIOSPERMUM Helicacabum, *L.*	Tropical Asia.
,, microcarpum, *Kunth.*	Tropics.
SERJANIA paucidentata, *DC.*	Trinidad, Guiana.
PAULLINIA pinnata, *L.*	Tropics.
,, vespertilio, *Swartz.*	W. Indies (Trinidad), Guiana.
CUPANIA Americana, *L.*	W. Indies (Trinidad), Tropical America.
BLIGHIA sapida, *Kœn.*	Western Africa.
SAPINDUS Saponaria, *L.*	W. Indies (Trinidad), Tropical America.

SAPINDUS	Indicus, *Poir.*	India.
,,	emarginatus, *Vahl.*	India, Ceylon.
,,	fruticosus, *Rox.*	Moluccas.
,,	sp.	Bengal.
NEPHELIUM	Litchi, *W. et A.*	China.
,,	Mora,	China, Japan.
,,	erectum,	India.
,,	sp.	
MELICOCCA	bijuga, *L.*	W. Indies (Trinidad).
HYPELATE	trifoliata, *Sw.*	Trinidad, Guiana.
DODONEA	viscosa, *L.*	Tropics.
FELICIUM	decipiens, *Thwaites.*	Ceylon.
URVILLEA	ferruginea, *H.B.K.*	

MALPIGHIACEÆ.

BYRSONIMA	spicata, *Rich.*	W. Indies (Trinidad).
,,	crassifolia; *Kunth.*	W. Indies (Trinidad).
BUNCHOSIA	polystachya, *DC.*	W. Indies (Trinidad).
,,	sp.	Trinidad.
MALPIGHIA	glabra, *L.*	W. Indies, Tropical South America.
,,	coccigera, *L.*	W. Indies.
,,	urens, *L.*	W. Indies.
,,	punicifolia, *L.*	W. Indies.
STIGMAPHYLLUM	diversifolium, *Tuss.*	W. Indies (Trinidad).
HETEROPTERIS	macrostachya, *Tuss.*	W. Indies (Trinidad).

ERYTHROXYLEÆ.

ERYTHROXYLON	ovatum, *Cav.*	W. Indies (Trinidad).
,,	Coca, —	Brazil, Peru.

OLACINEÆ.

XIMENIA Americana, *L.*	W. Indies, Tropical Africa and India.

MELIOIDEÆ.

MELIA sempervirens, *L.*	Tropics.
,, Azadarachta, *L.*	Tropics.
TRICHILIA hirta, *L.*	W. Indies (Trinidad), New Grenada.
PHOLACILIA Trinitensis, *Grise.*	Trinidad.
,, diversifolia, *Grise.*	Trinidad, Dominica.
MOSCHOXYLON Swartzii, *Juss.*	W. Indies (Trinidad).
CARAPA Guianensis, *Aubl.*	Trinidad, Tropical South America, Senegambia.
,, sp.	Trinidad.
CEDRELA odorata, *L.*	W. Indies (Trinidad), Tropical South America.
SWEITENIA Mahogani, *L.*	Honduras, Jamaica.

AURANTIACEÆ.

TRIPHRASIA trifoliata, *DC.*	China.
LIMONIA acidissima, *L.*	India.
MURRYA exotica, *L.*	India, Ceylon.
BERGERA Kœnigii, *L.*	South India, Ceylon.
COOKIA punctata, *Retz.*	China.
FERONIA elephantum, *Corv.*	India, Ceylon.
ÆGLE Marmelos, *Corv.*	India, Ceylon.
CITRUS decumana, *L.*	Moluccas.
,, Medica, *L.*	Asia.
,, limonum, *L.*	Asia.
,, ,, var. Brazilian Lemon.	

CITRUS limetta, *L.*		Asia.
,, limetta vars.	St. Michaels.	
,, ,, ,,	Bengal.	
,, ,, ,,	Persian.	
,, aurantium, *Riss.*		Asia.
,, ,, vars.	Sweet Seville.	
,, ,, ,,	Prolific.	
,, ,, ,,	Navel.	
,, ,, ,,	Silver.	
,, ,, ,,	Maltese blood-orange.	
,, nobilis, *H. R.*		
,, ,, minor.		
,, hystrix, *DC.*		India.

AMPELIDEÆ.

CISSUS discolor, *Blume.*	Java.
,, quadrangulare, *L.*	Cape Good Hope.
,, sicyoides, *L.*	W. Indies (Trinidad), Tropical America.
,, rhombifolia, *V.*	Trinidad.
,, trifoliata, *L.*	W. Indies (Trinidad), New Grenada.
,, sp.	Trinidad.
,, sp.	Singapore.
VITIS caribæa, *DC.*	W. Indies (Trinidad), Tropical America.
,, vinifera, *L.*	
,, ,, vars. Muscadine.	
,, ,, ,, Black Hambro.	
,, ,, ,, Muscat of Alexandria.	
LEEA coccinea,	India.

LEEA hirta, *Banks.*	Bengal.
,, sanguinea,	Bengal.
,, sambucina, *Wild.*	India.
,, horrida,	Sandwich Islands, India.

GERANIACEÆ.

PELARGONIUM cuspidatum, *Ait.*	Cape Good Hope.
,, crithmifolium, *Sm.*	
,, graveolens, *Ait.*	
,, cucullatum, *Ait.*	Cape Good Hope.
,, zonale, *Ait.*	Cape Good Hope.
,, ,, varieties.	
,, inquinans, *Ait.*	Cape Good Hope.
,, ,, varieties.	

OXALIDEÆ.

OXALIS Martiana, *Lucc.*	Western Tropics.
,, corniculata, *L.*	Tropical and most Temperate Regions.
,, Barrelierii, *Jacq.*	Panama to Brazil (Trinidad).
,, pleuperifolia,	Sandwich Islands.
AVERRHOA Bilimbi, *L.*	India, China.
,, Carambola, *L.*	India, China.

BALSAMINEÆ.

IMPATIENS latifolia, *Hook.*	India.
,, Balsaminia, *Hort.*	India.

TROPEOLEÆ.

TROPEOLUM majus, *L.*	Peru.

TROPEOLUM sp.	Venezuela.

ZYGOPHYLLACEÆ.

ZYGOPHYLLUM sp.	Trinidad.
GUAIACUM officinale, *L.*	Cuba to Venezuela (Trinidad).

RUTEÆ.

LEMONIA spectabilis, *Lindl.*	India.
ESENBECKIA attenuata, *Grise.*	Trinidad.
,, castanocarpa, *Grise.*	Trinidad.
METRODOREA atropurpurea, *St. Hil.*	Brazil.
RUTA graveolens, *L.*	South Europe.

ZANTHOXYLACEÆ.

ZANTHOXYLON clava-herculis, *L.*	W. Indies (Trinidad).
,, aromaticum, *Wild.*	W. Indies (Trinidad).

SIMARUBEÆ.

SIMABA Cedron, *Aubl.*	New Grenada.
QUASSIA amara, *L. f.*	W. Indies (Trinidad), Guiana, Venezuela.
SPATHELIA simplex, *L.*	Jamaica.

OCHNACEÆ.

GOMPHIA nitida, *Swartz.*	W. Indies (Trinidad).
,, Guianensis, *Rich.*	Guiana, Trinidad.
OCHNA squarrosa, *L.*	South India, Ceylon.
,, atropurpurea, *Decsne.*	Cape Good Hope.

AMYRIDEÆ.

BALSAMODENDRON corticosum,	India.

ICICA heptaphylla, *Aubl.*	W. Indies (Trinidad), Guiana.
BURSERA gummifera, *L.*	W. Indies (Trinidad), Guiana.
HEDWIGIA balsamifera, *Swartz.*	W. Indies (Trinidad), Guiana.
CANARIUM commune, *L.*	Moluccas.
AMYRIS balsamifera, *L.*	Jamaica, Trinidad, Venezuela.
,, maritima, *Jacq.*	Trinidad, Cuba.
,, sylvatica, *Jacq.*	Tropics.

ANACARDIACEÆ.

COMOCLADIA, ilicifolia, *Swartz.*	St. Kitts, Antigua.
ASTRONIUM obliquum, *Grise.*	Trinidad.
MANGIFERA Indica, *L.*	India.
,, ,, vars.	Great Malda.
,, ,,	Small Malda.
,, ,,	Gordon.
,, ,,	Martinique.
,, ,,	Peters.
,, ,,	Strawberry.
,, ,,	Sierra Leone.
ANACARDIUM occidentale, *L.*	Western Tropics.
SEMECARPUS anacardium, *L.*	Coromandel.
SPONDIAS lutea, *L.*	Western Tropics.
,, purpurea, *L.*	Jamaica, New Grenada.
,, dulcis, *Forst.*	Society Islands.
,, emarginata,	India.
,, sp.	Bengal.

LEGUMINOSÆ.

CROTALARIA stipularis, *Desv.*	W. Indies (Trinidad).
,, retusa, *L.*	W. Indies (Trinidad).
HYMENOCARPUS inebrians.	
INDIGOFERA violacea,	India.
,, hirsuta, *L.*	E. Indies, Naturalized in Western Tropics.
,, tinctora, *L.*	India.
,, Anil, *L.*	India, Naturalized in Western Tropics.
,, Saundersii,	South Africa.
,, viscosa, *L.*	W. Indies (Trinidad).
TEPHROSIA toxicaria, *Pers.*	Mexico to Brazil.
,, candida, *D. C.*	India.
SABINEA carinata, *Grise.*	W. Indies (Trinidad).
COURSETIA arborea, *Grise.*	W. Indies (Trinidad).
SESBANIA occidentalis, *Pers.*	W. Indies (Trinidad).
AGATI grandiflora, *Desv.*	E. Indies.
,, coccinea, *Desv.*	E. Indies.
PISUM sativum, *L.*	S. Europe.
ARACHIS hypogæa, *L.*	Tropics.
PICTETIA squamata, *Poir.*	Brazil.
ZORNIA diphylla, *Pers.*	Tropics.
ÆSCHYNOMENE Braziliana, *D. C.*	Western Tropics.
ASLYICARPUS vaginalis, *D. C.*	E. Indies.
LOUREA vespertilionis, *Desv.*	India.
,, sp.	Australia.
DESMODIUM gangeticum, *D C.*	Tropical Asia.

DESMODIUM	latifolium, *DC.*	Tropical Asia.
,,	gyrans, *DC.*	Eastern Tropics.
,,	gyroides, *DC.*	E. Indies.
,,	barbatum, *Benth.*	Western Tropics.
,,	triflorum, *DC.*	Western Tropics.
,,	ascendens, *DC.*	Western Tropics.
,,	axillare, *DC.*	Western Tropics.
,,	scopiuris, *Desv.*	Western Tropics.
,,	spirale, *DC.*	Western Tropics.
CLITORIA	Ternatea, *L.*	Tropics.
,,	glycinoides, *DC.*	Western Tropics.
,,	arborescens, *Ait.*	Trinidad, Guiana.
CENTROSEMA	Plumieri, *Benth.*	Western Tropics.
,,	virginianum, *Benth.*	Western Tropics.
,,	Braziliensis,	Trinidad, Brazil.
STENOLOBIUM	cæruleum, *Benth.*	Western Tropics.
GALACTIA	filiformis, *Benth.*	Trinidad.
DIOCLEA	violacea, *Benth.*	Trinidad, Guiana.
,,	Guianensis, *Benth.*	Trinidad, Guiana.
CANAVALIA	obtusifolia, *DC.*	Tropics.
,,	altissima, *DC.*	Jamaica, Trinidad.
MUCUNA	pruriens, *DC.*	Tropics.
,,	altissima, *DC.*	Western Tropics.
,,	urens, *DC.*	Western Tropics.
ERYTHRINA	corrallodendron, *L.*	Western Tropics.
,,	umbrosa, *L.*	W. Indies, Venezuela.
,,	velutina, *Wild.*	Trinidad, Jamaica.
,,	ovalifolia, *Roxb.*	Ceylon.
,,	monosperma, *Lam.*	Java, Sandwich Islands.

ERYTHRINA caffra, *Thumb.*	North Africa.
,, herbacea, *L. ?*	
BUTEA frondosa, *Roxb.*	India, Ceylon.
PHASEOLUS semierectus, *L.*	Tropics.
,, lunatus, *L.*	Tropics.
,, lasiocarpus, *Mart.*	Trinidad, Trop. South America.
VIGNA luteola, *Benth.*	Western Tropics.
,, vexillata, *Rich.*	Tropics.
DOLICHOS lablab, *L.*	Tropics.
,, lignosus, *L.*	Tropics.
PACHYRRHIZUS angulatus, *Rich.*	Tropics.
CAJANUS Indicus, *Spreng.*	India.
ERIOSEMA violacea, *Mey.*	Trinidad, Guiana.
RHYNCHOSIA minima, *DC.*	W. Indies (Trinidad).
,, phasicloides, *DC.*	W. Indies (Trinidad).
FLEMINGIA strobolifera, *R. Br.*	India.
,, semialata, *Roxb.*	India.
ABRUS precatorius, *L.*	Tropical Asia, W. Indies.
HECASTOPHYLLUM Brownii, *Pers.*	Tropics.
,, monetaria, *DC.*	Western Tropics.
PTEROCARPUS Rohrii, *Mey.*	Western Tropics.
,, dalbergioides, *Roxb.*	Adaman Islands.
,, Marsupium, *Roxb.*	South India.
,, Draco, *L.*	Trinidad, Trop. South America.
CENTROLOBIUM Parceanum, *Hill.*	Guiana, Trinidad.
DREPANOCARPUS lunatus, *Mey.*	Western Tropics.

MACHÆRIUM robinifolium, *Vog.*	Western Tropics.
LONCHOCARPUS latifolius, *Kunth.*	Western Tropics.
,, sericeus, *Kunth.*	Western Tropics.
,, violaceus, *Kunth.*	Western Tropics.
PLATYMISCIUM platystachyum, *Benth.*	Trinidad, Guiana.
PISCIDIA erythrina, *L.*	Western Tropics.
ANDIRA inermis, *Kunth.*	W. Tropics, Senegambia.
,, sp.	Trinidad.
DIPTERYX odorata, *Wild.*	Guiana, Venezuela.
,, sp.	Venezuela.
SOPHORA tomentosa, *L.*	Tropics.
ORMOSIA dasycarpa, *Jacks.*	W. Indies.
DIPLOTROPIS brachypetala, *Ful.*	W. Indies, T. S. America.
MYROSPERMUM frutescens, *Jacq.*	Trinidad, Guiana.
,, peruiferum, *D C.*	Peru.
HÆMATOXYLON Campeachianum, *L.*	Yucatan, Jamaica.
PARKINSONIA aculeata, *L.*	W. Indies.
POINCIANA regia, *Boj.*	Madagascar.
,, pulcherrima, *L.*	Tropics.
,, Gilliesii, *Hook.*	Chili.
COULTERIA Guianensis,	Guiana.
CÆSALPINIA Sappan, *L.*	India.
,, sepiaria, *Roxb.*	India.
,, paniculata, *Desf.*	India.
,, paucijuga, *Benth.*	Venezuela.
,, ferruginea,	India.
LEBIDIBIA coriaria, *Schlect.*	W. Indies, Tr. S. America.

COLVILLEA racemosa, *Boj.*	Madagascar.
CASSIA fistula, *L.*	India, China.
,, baccillaris, *L.*	W. Indies (Trinidad).
,, viminea *L.*	W. Indies (Trinidad).
,, grandis, *L.*	W. Indies (Trinidad).
,, spectabilis, *DC.*	W. Indies, S. America.
,, multijuga, *R.*	W. Indies, Guiana.
,, occidentalis, *L.*	Tropics.
,, glandulosa, *Vogt.*	W. Indies (Trinidad).
,, obtusifolia, *L.*	Java.
,, glauca, *Lam.*	W. Indies (Trinidad).
,, patellaria, *DC.*	Western Tropics.
SWARTZIA grandiflora, *Wild.*	Trinidad, Tr. S. America.
,, pinnata, *Wild.*	Trinidad, Guiana.
,, sp.	Trinidad.
BROWNEA Rosa, *Berg.*	Trinidad, St. Vincent, Venezuela.
,, latifolia, *Jacq.*	Trinidad, Venezuela.
,, grandiceps, *Jacq.*	Venezuela.
,, capitella, *Jacq.*	Venezuela.
,, sp.	Venezuela.
AMHERSTIA nobilis, *Wall.*	Burmah.
JONESIA Asoca, *Roxb.*	S. India, Ceylon, Java.
,, minor, *Zoll.*	Java.
SCHOTTIA speciosa, *Jacq.*	South Africa.
EPERUA falcata, *Aubl.*	Guiana.
PARIVOA grandiflora, *Aubl.*	Guiana.
TACHIGALIA bijuga, *Aubl.*	Guiana.
TAMARINDUS Indicus, *L.*	Asia.

VOUAPA bifolia, *Aubl.*	Guiana.
MACROLOBIUM multijugum,	Venezuela.
PELTOGYNE paniculata, *Aubl.*	Guiana, Brazil.
,, porphyrocardia, *Grise.*	Trinidad, Guiana.
HYMENÆA Courbaril, *L.*	W. Indies, Tr. S. America.
,, verrucosa,	
CASPAREA porrecta, *Kunth.*	Jamaica, Trinidad.
PHANERA purpurea, *Benth.*	India, Ceylon, China.
,, Vahlii, *Benth.*	India.
,, diphylla, *Benth.*	Burmah.
BAUHINIA variegata, *L.*	E. Indies (Trinidad).
,, megalandra, *Grise.*	W. Indies, Venezuela.
,, ungula, *Jacq.*	W. Indies, Venezuela.
,, Bredemeyeri, *Vog.*	Venezuela, Trinidad.
,, sp.	Trinidad.
,, auguina, *Roxb.*	Malaba, Sylhet.
,, Mexicana,	Mexico, Venezuela.
SCHNELLA excisa, *Grise.*	Trinidad, Panama.
PRIORIA copaifera, *Grise.*	Trinidad, Jamaica.
COPAIFERA officinalis, *Jacq.*	Trinidad, St. Vincent, Venezuela.
,, sp.	Trinidad.
CRUDYA oblonga, *Benth.*	Trinidad, Guiana, Venezuela.
CYNOMETRA cauliflora, *L.*	S. India, Java, Sumatra.
DETARIUM senegalense, *Gmel.*	Venezuela.
MORA excelsa, *Benth.*	Trinidad, Guiana.
GLEDITCHIA sp.	Ceylon.
PENTACLETHRA filamentosa, *Benth.*	W. Indies (Trinidad).

PARKIA Africana, *R. Br.*	E. Africa.
ENTADA polystachya, *DC.*	W. Indies (Trinidad), Trop. S. America.
ADENANTHERA pavonina, *L.*	India.
NEPTUNIA plena, *Benth.*	Western Tropics.
,, oleracea, *Lour.*	Tropics.
DESMANTHUS virgatus, *Wild.*	Tropics.
MIMOSA pudica, *L.*	Tropics.
,, asperata, *L.*	Tropics.
,, polydactyla, *Humb.*	St. Vincent, Trinidad.
,, ceratonia, *L.*	W. Indies (Trinidad).
,, floribunda, *Wild.*	Trinidad.
,, sp.	Trinidad.
SCHRANKIA brachycarpa, *Benth.*	Trinidad, Tr. S. America.
LEUCÆNA glauca, *Benth.*	Tropics.
ACACIA Catechu, *Wild.*	India.
,, tortuosa, *Wild.*	Tropics.
,, Farnesiana, *Wild.*	Tropics.
,, Arabica, *Wild.*	India, Egypt & S. Africa.
,, leucophlæa, *Wild.*	India, Burmah.
,, Julibrissin, *Wild.*	Asia.
,, Lebbek, *Wild,*	E. Tropics.
,, cornigera, *Wild.*	North Tropical America.
,, eburnea, *Wild.*	India.
,, sarmentosa, *Desv.*	Western Tropics.
,, macracantha, *H. B.*	Western Tropics.
,, Lophanta, *Wild.*	Australia.
,, leptophylla, *DC.*	Brazil.
,, laurifolia, *Wild.*	N. S. Wales.
,, cultriformis, *A. Cunn.*	S. Australia.

CALLIANDRA Portoricensis, *Benth.*	Jamaica, Porto Rico.
,, Creugerii, *Grise*	Trinidad, Venezuela.
,, tergemina, *Benth.*	W. Indies.
,, Guildingii, *Benth.*	St. Vincent.
,, latifolia, *Grise*	Trinidad.
,, sp.	
,, sp.	Mexico.
,, Saman, *Grise.*	Caracas, Nicaragua.
ENTEROLOBIUM cyclocarpum, *Grise.*	Jamaica, Venezuela.
PITHECOLOBIUM unguiscati, *Benth.*	W. Tropics.
,, oblongum, *Benth.*	W. Indies (Trinidad), Venezuela.
INGA laurina, *Wild.*	W. Indies (Trinidad).
,, heterophylla, *Wild.*	Guiana, Trinidad.
,, setifera, *Benth.*	Trinidad, Brazil.
,, vera, *Wild.*	W. Indies (Trinidad).
,, ingoides, *Wild.*	W. Indies (Trinidad).
,, purpurea, *Benth.*	W. Indies, Venezuela.
,, pulcherrima, *Paxt.*	Mexico.

MORINGACEÆ.

MORINGA pterygosperma, *Gærtn.*	Tropical Asia.

ROSACEÆ.

ROSA microphylla, *Rox.*	China.
,, rubiginosa, *L.*	England.
,, centifolia mucosa, *Ser.*	South Europe.
,, Indica, *L.*	China.
,, ,, Archduke Charles.	
,, ,, Cramoisie Supérieure.	
,, ,, Fabvier.	
,, ,, Gonda.	

ROSA Indica, *L.* Lawrenceana.
,, ,, L'Eblouissant.
,, ,, Louis Philippe.
,, ,, Mdme. Bosanquet.
,, ,, President d'Olbeque.
,, ,, Œillet.
,, ,, Vicomtesse d'Aubergne.
,, ,, Old China.
,, ,, odoratissima, *Lindl.*
,, ,, Adam.
,, ,, Aurora.
,, ,, Adoration.
,, ,, Blanche.
,, ,, Bougere.
,, ,, Boutin d'Or.
,, ,, Caroline.
,, ,, Clothilde.
,, ,, Comte de Paris.
,, ,, Comte Osmunde.
,, ,, Devoniensis.
,, ,, Eliza Sauvage.
,, ,, Gloire de Dijon.
,, ,, Isabella Sprunt.
,, ,, Lais.
,, ,, Lady of the Lake.
,, ,, Modeste.
,, ,, Mdme. Paul.
,, ,, ,, William.
,, ,, ,, Falcott.
,, ,, ,, Villermoz.

ROSA I. odoratissima, *Lindl.*
Mdme. Maurin.
,, ,, ,, Pauline Labonte.
,, ,, ,, Lacharme.
,, ,, Marechal Bugeaud.
,, ,, ,, Niel.
,, ,, Narcisse.
,, ,, Nephetos.
,, ,, Odorata.
,, ,, President.
,, ,, Reine de Portugal.
,, ,, Souvenir d'un Ami.
,, ,, Sophrano.
,, ,, Smithii.
,, ,, Sombreuil.
,, ,, Triomphe de Luxembourg.
,, ,, Vicomtesse de Cazes.
,, ,, Bourboniana.
,, ,, Acidalie.
,, ,, Armosa.
,, ,, Catherine Guillot.
,, ,, Charles Duval.
,, ,, Comte Bobrinsky.
,, ,, Dupetit Thouars.
,, ,, Edouard.
,, ,, Gloire de Rosemenes.
,, ,, Empress Eugénie.
,, ,, L'Avenir.
,, ,, La Reine Bourbon.
,, ,, Mdme. Bréon.
,, ,, ,, Desprez.

ROSA I. Bourboniana.

		Modèle de Perfection.
,,	,,	Paul Joseph.
,,	,,	Princess Royal.
,,	,,	Prince Albert.
,,	,,	Prince Imperial
,,	,,	Souvenir de la Malmaison.
,,	,,	Vorace.
,,	,, Noisettiana.	
,,	,,	Amiée Vibert.
,,	,,	Caroline Marniesse.
,,	,,	Celine Forestier.
,,	,,	Cloth of Gold.
,,	,,	Du Luxembourg.
,,	,,	Fellenberg.
,,	,,	La Biche.
,,	,,	Lamarque.
,,	,,	Mdme. Massot.
,,	,,	Miss Glegg.
,,	,,	Ophirie.
,,	,,	Solfaterre.
,,	,,	Triomphe de Rennes.
,,	Portlandica perpetua.	
,,	,,	Abd-el-Kader.
,,	,,	Abraham Lincoln.
,,	,,	Achille Gonod.
,,	,,	Alex. Dumas.
,,	,,	Alfred de Rougemont.
,,	,,	André Leroy.
,,	,,	Anna da Diesbach.
,,	,,	Antoine Duchère.

ROSA P. perpetua. Augusta Mie.
" " Auguste Rivière.
" " Baron Hallez.
" " Baronne de Rothchild.
" " Baronne Prevost.
" " Beauty of Waltham.
" " Belle Normande.
" " Cardinal Patrizzi.
" " Caroline de Sansol.
" " Charles Lefevre.
" " Comte de Nanteuil.
" " Deuil de Prince Albert.
" " Dr. Andry.
" " Dr. Marx.
" " Duc de Cazes.
" " Duchesse de Cambaceres.
" " Duchesse de Morney.
" " Duke of Wellington.
" " Empéreur de Moroc.
" " François Treyoe.
" " Geant des Batailles.
" " Genl. Jacqueminot.
" " Washington.
" " George Paul.
" " Gloire de Montplaisir.
" " Jean Rosenkrantz.
" " Ipswich Jem.
" " J. G. Veitch.
" " Jules Margottin.
" " La Brillant.

ROSA P. perpetua. La Reine.
,, ,, Lady Suffield.
,, ,, Leon des Combats.
,, ,, Lord Raglan.
,, ,, Louis Chaix.
,, ,, Mrs. Ward.
,, ,, Mdme. Verschaffelt.
,, ,, Mdme. Boll.
,, ,, Mdme. Campbell d'Islay.
,, ,, Mdme. Wood.
,, ,, Mdme. Clémence Joigneaux.
,, ,, Mdme. Domage.
,, ,, Mdme. Fillion.
,, ,, Mdme. Laffay.
,, ,, Mdme. Schmidt.
,, ,, Mdme. Rivers.
,, ,, Mdme. Rival.
,, ,, Mdme. V. Verdier.
,, ,, Mdme. Vidot.
,, ,, Mdlle. Peyronny.
,, ,, Mdlle. Jean Marie.
,, ,, Maurice Bernardine.
,, ,, Mons. Boncenne.
,, ,, Mons. Norman.
,, ,, Mon Plaisir.
,, ,, Oderic Vital.
,, ,, Ornement des Jardins.
,, ,, Pauline Lansezeur.
,, ,, Pierre Notting.
,, ,, Pius Ninth.

ROSA P. perpetua. Prince Noir.	
,, ,, Princess Alice.	
,, ,, Princess Marie of Cambridge.	
,, ,, Professor Koch.	
,, ,, Reine de Violettes.	
,, ,, Senateur Vaise.	
,, ,, Sœur des Anges.	
,, ,, Souvenir de Leveson Gower.	
,, ,, Souvenir de la Reine d'Angleterre.	
,, ,, Souvenir de la Reine des Belges.	
,, ,, Thorin.	
,, ,, William Griffith.	
,, ,, William Jesse.	
,, ,, William Paul.	
RUBUS Jamaicensis, *Swartz.*	Jamaica.
,, sp.	Martinique.
FRAGARIA vesca, var. *L.*	Europe.
POTENTILLA sp.	Sandwich Islands.
SPIRÆA Reevesii—alba-plena.	China.
CYDONIA sinensis, *Tourne.*	China.
ERIOBOTRYA Japonica, *Lindl.*	Japan.
PYRUS malus, var. *L.*	Britain.
AMYGDALUS Persica, *L.*	Persia.
PRUNUS occidentalis, *Swartz.*	Jamaica, Trinidad.
CHRYSOBALANUS Icaco, *L.*	W. Indies (Trinidad), Tropical Africa & America.
,, pellocarpus, *Mey.*	Trinidad, Guiana.
HIRTELLA racemosa, *Lam.*	Western Tropics.
,, paniculata, *Sw.*	W. Indies, Guiana.
,, triandra, *Swartz.*	Cuba to Brazil, Trinidad.

LICANIA pyrifolia, *Grise.*	Trinidad.
,, hypoleuca, *Benth.*	Trinidad.
PARINARI campestre, *Aubl.*	Guiana, Trinidad.

MYRTACEÆ.

BEAUFORTIA decussata, *R.Br.*	N. Holland.
MELALEUCA Cajeputi, *Herit.*	Amboyna.
EUCALYPTUS corymbosus, *Herit.*	Australia.
,, Globulus, *Labill.*	Australia.
METROSIDEROS vera, *Rumph.*	India.
,, florida, *Sm.*	New Zealand.
PUNICA Granatum, *L.*	Asia Minor, North Africa.
,, ,, var. flore pleno.	
CAMPOMANESIA aromatica, *Grise.*	Trinidad, Venezuela.
MARLIERIA elliptica, *Grise.*	Trinidad.
CALYPTRANTHES sericea, *Grise.*	Trinidad.
PSIDIUM Guava, *Radd.*	Western Tropics.
,, Cattleyanum, *Sabine.*	China, Brazil.
,, polycarpum, *Lam.*	Trinidad, Guiana, Brazil.
,, Several improved varieties.	
MYRCIA multiflora, *DC.*	Trinidad, Guiana.
,, splendens, *DC.*	Western Tropics.
MYRTUS communis, *L.*	South Europe.
,, ,, mucronata,	
PIMENTA vulgaris, *W.A.*	W. Indies
,, acris, *W.A.*	Jamaica, Venezuela.
SYZYGIUM Jambolanum, *DC.*	Java, India.
CARYOPHYLLUS aromaticus *L.*	E. Indies.
JOSSINIA buxifolia, *DC.*	Mauritius.

EUGENIA	Poirettii, *DC.*	Trinidad, Hayti.
,,	Surinamensis, *Schat.*	Trinidad.
,,	Gregii, *DC.*	Dominica, Trinidad.
,,	ligustrina, *Wild.*	W. Indies.
,,	sp.	Trinidad.
,,	rufescens, *DC.*	
JAMBOSA	Aquea, *Rumph.*	E. Indies.
,,	vulgaris, *DC.*	E. Indies.
,,	Malaccensis, *DC.*	E. Indies.

BARRINGTONIACEÆ.

BARRINGTONIA	speciosa, *L.*	India, Ceylon, Java.
,,	acutangula, *Gært.*	Ceylon, Moluccas.
GUSTAVIA	augusta, *L.*	Trinidad, Surinam, New Granada.
GRIAS	cauliflora, *L.*	Jamaica.

LECYTHIDACEÆ.

COURATARI	sp.	Trinidad, South America.
LECYTHIS	Idatimon, *Aubl.*	Trinidad, Guiana.
,,	minor, *Jacq.*	Brazil.
,,	lævifolia, *Grise.*	Trinidad.
,,	sp.	Trinidad.
BERTHOLETIA	excelsa, *H.B.*	Brazil.
COUROUPITA	Guianensis, *Aubl.*	Trinidad, Guiana.

MELASTOMACEÆ.

LOREYA	trinitensis, *Creug.*	Jamaica, Trinidad.
MEDINILLA	magnifica, *Lindl.*	Formosa, Japan.
CYANOPHYLLUM	magnificum,	Brazil.

CLIDENIA hirta, *Don.*	W. Indies (Trinidad).
,, spicata, *DC.*	Western Tropics.
,, Creugeriana, *Grise.*	Trinidad.
,, latifolia, *DC.*	W. Indies (Trinidad).
,, rubra, *Mart.*	Western Tropics.
TSCHUDYA lanata, *Grise.*	Trinidad, Dominica.
,, rufescens, *DC.*	Trinidad, Brazil.
HENRIETTA succosa, *DC.*	Trinidad, America.
DAVYA ciliata, *DC.*	Trinidad.
HETEROCENTRUM Mexicanum,	Mexico.
DIPLOCHITA parviflora, *Benth.*	Trinidad.
,, tomentosa, *Grise.*	Trinidad, Brazil.
CONOSTEGIA subhirsuta, *DC.*	Western Tropics.
MICONIA Peruviana, *DC.*	Western Tropics.
,, argyrophylla, *DC.*	Western Tropics.
,, holosericea, *DC.*	Western Tropics.
,, prasina, *DC.*	Western Tropics.
,, myriantha, *Benth.*	Western Tropics.

LYTHRARIEÆ.

CUPHEA Trinitatis, *DC.*	St. Vincent, Trinidad.
,, platycentra, *Lindl.*	Brazil.
GRISLEA tomentosa, *Rox.*	India.
,, sp.	India.
LAWSONIA alba, *Lam.*	Egypt, India.
LAFŒNSIA microphylla, *Vaudl.*	Brazil.
LAGERSTRŒMIA regina, *Rox.*	Ceylon, Malabar.
,, Indica, *L*	India, Java.

ONAGRARIEÆ.

JUSSIÆA variabilis, *Mey.*	Western Tropics.

JUSSIÆA suffruticosa, *L.*	Tropics.
,, hirta, *Vaudl.*	Western Tropics.
ŒNOTHERA procumbens, *L.*	Brazil.

COMBRETACEÆ.

BUCIDA Buceras, *L.*	W. Indies (Trinidad).
TERMINALIA Catappa, *L.*	South Europe, Tropical Asia, Africa, Naturalized in Western Tropics.
,, Belerica, *Rox.*	India, Ceylon.
,, Mauritiana, discolor,	Mauritius.
,, Fatræa, *DC.*	Madagascar.
,, laurina,	Mauritius.
,, sp.	Trinidad.
PENTAPTERA coriacea, *Rox.*	South India.
CHUNCOA obovata, *Poir.*	W. Indies (Triuidad).
,, sp.	Trinidad.
CONOCARPUS erectus, *L.*	W. Indies (Trinidad).
LAGUNCULARIA racemosa, *G.*	Western Tropics, Africa.
COMBRETUM laxum, *Lœfl.*	Trinidad, America.
,, eriopetalum, *Don.*	West Indies.
CACOUCIA coccinea, *Aubl.*	Trinidad, Guiana.
POIVREA coccinea, *DC.*	Madagascar.
QUISQUALIS Indica, *L.*	South India, Pegu, Malay Islands.

RHIZOPHORACEÆ.

RHIZOPHORA Mangle, *L.*	Tropical Sea Shores.
CASSIPOUREA elliptica, *Poir.*	Western Tropics.
,, Guianensis, *Aubl.*	Trinidad, S. America.

CRASSULACEÆ.

CRASSULA arborescens, *Wild.*	Cape G. Hope.
BRYOPHYLLUM calycinum, *Salis.*	Tropics.
ECHEVERIA sp.	Mexico.

PAPAYACEÆ.

CARICA Papaya, *L.*	Tropical South America.
,, sp.	

PASSIFLORACEÆ.

RYANIA speciosa, *Vahl.*	Trinidad, Guiana.
SMEATHMANNIA lævigata,	Sierra Leone.
PASSIFLORA alata, *Ait.*	W. Indies, Trinidad.
,, cærulea racemosa,	South America.
,, ,, Impératrice	Eugénie.
,, quadrangularis, *L.*	Jamaica.
,, gracilis, *Link.*	Jamaica.
,, tetragona,	Cape G. Hope.
,, laurifolia, *L.*	Trinidad, America.
,, biflora, *Lam.*	W. Indies, (Trinidad), Venezuela.
,, suberosa, *L.*	Trinidad, Jamaica.
,, fætida, *L.*	Western Tropics.
,, sp.	
,, hederacea, *Cav.*	W. Indies (Trinidad).
,, ciliata, *Ait.*	Jamaica, Bahamas.
,, serrata, *L.*	Trinidad, Dominica, Martinique.
TACSONIA sanguinea, *DC.*	Trinidad, Guiana.

BELVISIACEÆ.

NAPOLEONA Imperialis, *Palis.*	Sierra Leone.

CACTACEÆ.

MAMILLARIA angularis,	Tropical America.
,, polyhedra,	Mexico.
,, simplex, *Haw.*	Jamaica, Venezuela.
MELOCACTUS communis, *L.*	Mexico, W. Indies, Central America.
ECHINOPSIS multiplex, *Pf. et Ott.*	Brazil.
,, Eyriesii, *Pf. et Ott.*	Buenos Ayres.
CEREUS albispinus, *S. Dyck.*	Tropical America.
,, repandus, *Haw.*	W. Indies (Trinidad).
,, gemmatus, *Zucc.*	Mexico.
,, tetragonus, *Haw.*	Tropical America.
,, serpentinus, *Lag.*	Tropical America.
,, variabilis, *Pf.*	Tropical America.
,, grandiflorus, *Mill.*	Jamaica, Trinidad.
,, triangularis, *Haw.*	Jamaica, Trinidad.
,, tortuosus, *Forbes.*	Buenos Ayres.
,, Mc Donaldeæ, *Hook.*	Honduras.
,, Peruvianus, *Tabern.*	Peru, Central America.
,, strigosus,	Mexico.
,, flagelliformis, *Mill.*	Western Tropics.
,, strictus, *DC.*	Western Tropics.
,, Curtisii, *Otto.*	Tropical America.
RHIPSALIS pentaptera, *Pf.*	Brazil.
,, funalis, *Salm.*	W. Indies (Trinidad).
,, Cassytha, *Gart.*	Tropical America.
OPUNTIA Tuna, *Mill.*	Tropical America.
,, Ficus-indica, *Mill.*	Jamaica.
,, coccinellifera, *Mill*	Mexico.
,, cylindrica, *Juss.*	Mexico.

OPUNTIA vulgaris, *Haw.*	South Europe.
,, ferox, *Haw.*	Mexico.
,, nigricans, *Haw.*	Mexico.
,, stricta, *Haw.*	Brazil.
,, decumana, *Haw.*	Brazil.
PEIRESCIA aculeata, *Mill.*	Western Tropics.
,, subulata, *Muhl.*	
,, Bleo, *DC.*	New Grenada.
,, sp.	W. Indies.
PHYLLACACTUS latifrons, (?)	Tropical America.
,, phyllanthoides, (?)	Brazil.

CUCURBITACEÆ.

FUEILLIA cordifolia, *Swartz.*	Jamaica, Trinidad, Guiana.
MELOTHRIA pervaga, *Grise.*	Western Tropics.
CERATOSANTHES tuberosa, *Spreng.*	West Indies.
ANGURIA umbrosa, *Kunth.*	Trinidad, Venezuela.
,, trilobata, *Wild.*	Trinidad, Venezuela.
,, trifoliata, *L.*	West Indies (Trinidad).
,, sp.	Trinidad.
MOMORDICA Charantia, *L.*	Tropics.
,, Balsamina, *L.*	Tropics.
LUFFA acutangula, *Rox.*	Tropics.
LAGENARIA vulgaris, *Ser.*	Tropics.
CUCURBITA Melopepo, *L.*	Levant.
,, Pepo, *L.*	Levant.
,, citrullus, *L.*	S. Europe.
,, ovifera, *L.*	Astracan.
,, verrucosa, *L.*	Levant.

CUCUMIS sativus, *L.*	Asia.
,, Anguria, *L.*	W. Indies (Trinidad).
,, Melo, *L.*	Asia.
,, moschata, *Duch.*	
,, anguinus, *L.*	E. Indies.
TRICHOSANTHES anguina,	W. Indies, South America.
CIONANDRA racemosa, *Grise.*	Hayti to Brazil, Trinidad.
SECHIUM edule, *Swartz.*	Jamaica.

CELASTRINEÆ.

EUONYMOS Japonicus variegatus, *Thumb.*	Japan.
,, ,, aureo-variegatus,	
CATHA edulis, *Forst.*	South Africa.
CELASTRUS serratus (?)	Japan.
,, stylosus, *Wild.*	Himalaya.
ELÆODENDRON orientale, *Jacq.*	Mauritius.
ILEX Europea variegata,	Europe.
,, latifolia,	Japan.
,, Paraguayensis, *Lam.*	Paraguay.
,, sp.	Japan.
,, foveata,	Japan.
,, cornuta,	Japan.
,, Macoucoua, *Pers.*	Western Tropics.

RHAMNACEÆ.

ZIZYPHUS Lotus, *Lam.*	Arabia, South Europe.
,, rugosus, *Lam.*	India.
RHAMNUS utilis, *Decsne*	China, Japan.
COLUBRINA Asiatica, *Brong.*	India, Ceylon.
,, reclinata, *Brong.*	W. Indies (Trinidad).

UMBELLIFERÆ.

HYDROCOTYLE umbellata *L.*	W. Indies (Trinidad).
SPINANTHE paniculata, *Jacq.*	W. Indies (Trinidad).
ERYNGIUM fœtidum, *L.*	W. Indies (Trinidad).
PETROSELINUM sativum, *Hoffm.*	Europe.
HELOSCIADUM leptophyllum, *DC.*	W. Indies (Trinidad).
DAUCUS Carota, *L.*	Europe.
ARACACHA esculenta, *DC.*	W. Indies.
CORIANDRUM sativum, *L.*	Europe.
ANETHUM Fœniculum, *L.*	Britain.

ARALIACEÆ.

PANAX Morototoni, *Aubl.*	Trinidad, Guiana, Brazil.
,, cochleatum, *DC.*	Java, Amboina.
SCIADOPHYLLUM capitatum, *Grise.*	W. Indies (Trinidad), Venezuela.
TUPIDANTHUS calyptratus, *Hook f.*	Khasia.
ARALIA Duncanii,	Mauritius.

CORNACEÆ.

AUCUBA Japonica, *Thumb.*	Japan.
,, ,, variegata,	Japan.

RUBIACEÆ.

MUSSÆNDA frondosa, *L.*	India, Ceylon, Java.
,, tenuiflora, *Benth.*	West Africa.
,, luteola, *Delil.*	West Africa.

POSOQUERIA longiflora,	Tropical America.
OXYANTHUS Natalensis, *H.K.*	Natal.
GENIPA Caruto, *Kunth.*	Trinidad, St. Vincent.
,, Americana, *L.*	W. Indies (Trinidad), Guiana.
GARDENIA florida, *L.*	China, Japan.
,, lucida, *Rox.*	India.
,, macrocarpa, *Cav.*	India.
,, Thunbergii, *L.f.*	Cape G. Hope.
,, radicans, *Thunb.*	China.
,, Fortunei, *Lindl.*	China.
,, Plantii, *Lindl.*	China.
,, Stanleyana, *Hook.*	Sierra Leone.
RHODOSTOMA gardenioides, *Schir.*	
RANDIA longiflora, *Lam.*	India.
,, ,, minor.	W. Indies (Trinidad).
,, aculeata, *L.*	W. Indies (Trinidad).
,, Mussænda, *DC.*	Western Tropics.
,, armata, *DC.*	Trinidad, St. Lucia, New Grenada.
COCCOCYPSELUM repens, *Swartz.*	Trinidad, Guiana.
,, mumularifolia, *Chamb.*	Trinidad, Guiana.
HIGGINSIA regalis,	New Grenada.
,, porphyrophylla,	Brazil.
,, refulgens,	Brazil.
COUTAREA speciosa, *Aubl.*	Western Tropics.
HYMENODICTYON thyrsiflorum, *Wall.*	India.
NAUCLEA undulata, *Rox.*	Moluccas.
MANETTIA coccinea,	Western Tropics.
CHIMARRHIS cymosa, *Jacq.*	Trinidad, Jamaica.

PORTLANDIA grandiflora, *L.*	Jamaica.
,, coccinea, *Swartz.*	Jamaica.
RONDELETIA speciosa, *Lodd.*	Jamaica, Hayti.
,, ,, minor.	
PENTAS carnea, *Benth.*	Brazil.
,, rosea,	Brazil.
GONZALEA spicata, *DC.*	Western Tropics.
,, Potesia, *Grise.*	Trinidad, Jamaica.
ISERTIA parviflora, *Vahl.*	Trinidad, Guiana.
SABICEA hirsuta, *Wild.*	W. Indies (Trinidad), Guiana.
HAMELIA patens, *Jacq.*	Western Tropics.
,, lutea, *Rohr.*	Western Tropics.
,, latifolia, *Rochb.*	Western Tropics.
VANGUERIA edulis, *Vahl.*	Madagascar.
,, spinosa, *Roxb.*	Bengal.
MORINDA Royoc, *L.*	Jamaica, Trinidad.
,, citrifolia, *L.*	India.
CHIOCOCCA racemosa, *Jacq.*	Western Tropics.
,, pavifolia, *Wullsch.*	Western Tropics.
MALANEA macrophylla, *Benth.*	Trinidad, St. Vincent.
IXORA coccinea, *L.*	India.
,, ,, superba,	
,, Bandhuca, *Roxb.*	Central & West India.
,, rosea, *Wall.*	Khasia Hills.
,, acuminata, *Rox.*	India, Ceylon.
,, longiflora, *Rich.*	Madagascar.
,, Javanica, *DC.*	Java.
,, salicifolia, *DC.*	Java, Borneo.
,, crocata, *Lindl.*	China.

IXORA liniflora,	India.
,, alba, *Roxb.*	India.
,, affinis	India.
,, Amboynensis, *DC.*	Amboyna.
,, Griffithii,	Singapore.
,, Lobbii,	Java, Borneo.
,, undulata, *Rox.*	Bengal.
,, lanceolaria,	Java, Borneo.
PAVETTA Borbonica, *L.*	Bourbon.
,, angostifolia, *Thwaites.*	Ceylon.
,, Caffra, *Thunb.*	South Africa.
SIDERODENDRON triflorum, *Vahl.*	W. Indies (Trinidad).
FARAMEA vaginata, *Grise.*	W. Indies (Trinidad), Guiana.
COFFEÆ Arabica, *L.*	Mountains of Arabia.
,, ,, Moka,	
,, Bengalensis, *Rox.*	India.
,, laurina, *Leroy.*	Africa.
RUDGEA Hostmaniana, *Benth.*	Trinidad, Guiana.
PSYCHOTRIA brachiata, *Swartz.*	West Indies.
,, arcuata, *Benth.*	Trinidad, Guiana.
,, cornigera, *Benth.*	Trinidad, Guiana.
PALICOUREA Mexicana, *Benth.*	Western Tropics.
,, crocea, *DC.*	Western Tropics.
,, triphylla, *DC.*	Western Tropics.
CEPHÆLIS Ipecacuanha, *L.*	Brazil.
,, tomentosa, *Swartz.*	Western Tropics.
,, Swartzii, *DC.*	Western Tropics.
RICHARDSONIA scabra, *L.*	Western Tropics.
DIODIA sarmentosa, *Swartz.*	Trinidad, Guiana, Brazil.

SPERMACOCE tenuior, *Lamb.* Trinidad, Guiana.
BORERA lævis, *Grise.* W. Indies (Trinidad).
,, podocephala, *DC.* Western Tropics.
,, Perotetii, *Benth.* Western Tropics.
,, parviflora, *Benth.* Western Tropics.
SERISSA fœtida, *Comm.* Japan.
AMAIOUA Guianensis, *Seeman.* Trinidad, Panama, Brazil.

CAPRIFOLIACEÆ.

LONICERA Japonica, *Desv.* Japan.
VIBURNUM tinus, *L.* South Europe.
,, ,, lucidum,
,, ,, variegatum,
SAMBUCUS nigra, *L.* Europe.

DIPSACACEÆ.

SCABIOSA atropurpurea, *L.* Sauth Europe.

COMPOSITÆ.

OLIGANTHES condensata, *Schultz.* Trinidad, Guiana.
VERNONIA divaricata, *Swarts.* Western Tropics.
,, arborescens, *Swartz.* Cuba, Nicaragua.
CENTRATHERUM muticum, *Less.* Trinidad, Venezuela.
MONANTHEMUM Crugerii, *Gries.* Trinidad.
ELEPHANTOPUS scaber, *L.* Louisiana to Brazil.
,, mollis, *L.* Western Tropics.
DISTREPUS spicatus, *Cass.* Western Tropics.
ROLANDRA argentea, *Rott.* W. Indies (Trinidad) Brazil.
HEBECLINIUM macrophyllum, *DC.* Brazil.
,, ianthium, *Hook.* Brazil.

BRICKELIA diffusa, *A. Gray.*	Western Tropics.
PECTIS elongata, *H. B. K.*	Western Tropics.
AGERATUM conyzoides, *L.*	Tropics.
,, muticum, *Griesb.*	Cuba to Peru.
,, Mexicanum, *Wild.*	Mexico.
CRITONIA Dalea, *DC.*	Western Tropics.
,, parviflora, *DC.*	Western Tropics.
CALEA solidaginea, *Kunth.*	Mexico (W. Indies) Trinidad.
ECLIPTA erecta, *L.*	W. Indies (Trinidad).
EUPATORIUM lævigatum, *Lamb.*	Trinidad, Panama.
,, odoratum, *L.*	Trinidad, Guiana.
,, conyzoides, *Vahl.*	Cuba, Trinidad.
,, paniculatum, *Schreb.*	W. Indies (Trinidad)
MIKANIA scaber, *DC.*	Trinidad, Guiana.
,, glechomæfolia, *Schreb.*	Trininad, Guiana.
,, scandens, *Wild.*	Trinidad, Guiana.
,, umbellifera, *Hook.*	Guiana, Trinidad.
,, Orinocensis, *Kunth.*	Cuba, Trinidad, Brazil.
CLIBADIUM asperum, *DC.*	Mexico to Brazil (Trinidad)
DAHLIA variabilis, *Desf.*	Mexico.
PARTHENIUM hysterophorus, *L.*	Cuba to Patagonia.]
AMBROSIA artemisifolia, *L.*	Canada to Brazil.
ZINNIA elegans, *Jacq.*	Mexico, New Grenada, St. Vincent.
WEDELIA Caracasana, *DC.*	Trinidad, Venezuela.
COREOPSIS hirta, *Hook.*	California, Mexico.
,, Drummondii, *T. & Gr.*	California, Mexico.
BIDENS bipinnatus, *L.*	Tropics.
,, leucantha, *Wild.*	Western Tropics.

COSMOS caudatus, *Kunth.*	Western Tropics.
,, sulphurea, *Cav.*	Trinidad, Venezuela.
SYNEDRELLA nodiflora, *Gries.*	Western Tropics.
CHRYSANTHELLUM procumbens, *Rich.*	Tropics.
CLEMENOCOMA montana, *Cass.*	Peru.
POROPHYLLUM ruderale, *Cass.*	Mexico to Buenos Ayres.
GAILLARDIA picta, *Don.*	California.
CHRYSANTHEMUM Indicum, *DC.*	China.
GNAPHALIUM lanuginosum, *H.B.*	Brazil.
,, Americanum, *Mill.*	W. Indies (Trinidad).
NEUROLÆNA lobata, *R. Br.*	Cuba to Ecuador (Trinidad)
ERECHTITES heracleifolia, *Raf.*	U. States to Buenos Ayres.
LACTUCA sativa, *L.*	Europe.
SONCHUS oleraceus, *L.*	All Countries.

GOODIACEÆ.

SCÆVOLA Lobelia, *L.*	Seashores of Tropical Asia, Madagascar, and Pacific Islands.

LOBELIACEÆ.

LOBELIA cardinalis, *L.*	Virginia.
" Trinitensis, *Gries.*	Trinidad.
CENTROPOGON Surinamensis, *Presl.*	Trinidad, Guiana.
,, lucyanum,	Brazil.

PONGATIEÆ.

PONGATIUM Indicum, *Lam.*	Tropics.

ERICACEÆ.

CALLUNA vulgaris, *Salis.*	Europe.
ARBUTUS Unedo, *Tournc.*	South Europe.
AZALIA Indica, *L.*	India, China.

RHODODENDRON Japonicum, Japan.

OLEACEÆ.

OLEA	Europea, *L.*	Levant, Persia.
OSMANTHUS	ilicifolius, *Thunb.*	Japan.
,,	,, vareigatus,	Japan.
NORONHIA	emarginata, *Poir.*	Madagascar.
LIGUSTRUM	Japonicum, *Thunb.*	Japan.

JASMINEÆ.

JASMINUM	Sambac, *L.*	India, Arabia.
,,	,, flore plene,	
,,	undulatum, *Wall.*	India.
,,	gracile, *Andre.*	Asia.
,,	ligustrifolium, *Wall.*	Malabar.
,,	officinale, *L.*	Pacific Islands.
,,	fruticans, *L.*	South Europe.
NYCTANTHES	Arbor-tristis, *Juss.*	India, Ceylon.
FONTANESIA	Fortunei,	China.

PLANTAGINEÆ.

PLANTAGO lanceolata, *L.* Europe.

PLUMBAGINACEÆ.

PLUMBAGO	Capensis, *Thunb.*	Cape G. Hope.
,,	rosea, *L.*	Moluccas.
,,	scandens, *L.*	Western Tropics.

SALVADORACEÆ.

SALVADOREA	Persica, *L.*	Persia, Palestine.
MONETIA	barlerioides, *L'Her.*	India.

MYRSINEÆ.

MYRSINE læta, *L.* Western Tropics.

ARDISIA decipiens, *DC.*	Trinidad, Panama.
,, crenulata, *Vent.*	Mexico.
,, acuminata, *Wild.*	W. Indies (Trinidad) Venezuela.
,, Wallichii,	India.
,, sp. ex	Calcutta.
JACQUINIA ruscifolia, *Jacq.*	Tropical America.
,, armillaris, *L.*	W. Indies (Trinidad).
,, sp.	Mexico.
THEOPHRASTA Jussiæ, *Lindl.*	Hispania.
,, regalis,	Brazil.
,, latifolia,	Brazil.
CLAVIJA ornata, *Don.*	Trinidad, Guiana.
,, undulata,	Brazil.

EBENACEÆ.

DIOSPYROS discolor, *Wild.*	Philippines.
,, tetrasperma, *Swartz.*	Trinidad, Panama.
,, sp.	Trinidad.
,, ebenum, *Retz.*	Sumatra, Moluccas.
STYRAX sp.	Trinidad.

SAPOTACEÆ.

CHRYSOPHYLLUM albidum,	South America.
,, Caimito, *Wild.*	W. Indies (Trinidad).
,, glabrum, *Jacq.*	W. Indies (Trinidad) Guiana.
,, oliviforme *L.*	W. Indies.
POUTERIA Guianensis, *Aubl.*	Trinidad, Guiana.
LUCUMA obovata	Tropical South America.

LUCUMA multiflora, *DC.*	Jamaica, Trinidad.
,, deliciosa,	Guiana, Trinidad
SAPOTA Achras, *Mill.*	Western Tropics.
SIDEROXYLON Mastichodendron, *Jacq.*	Trinidad, Tropical America.
BASSIA longifolia, *L.*	India, Ceylon.
MIMUSOPS globosa, *Grise.*	Trinidad, Venezuela, Guiana.
,, sp.	Trinidad.
,, Elengi, *L.*	India.
,, cyanocarpa, *L.*	India.

LOGANACEÆ.

SPIGELIA Anthelmintica, *L.*	W. Indies.
STRYCHNOS potatorum, *Rox.*	India.
,, Nux-vomica, *L.*	India.
FAGRÆA obovata, *Wall.*	India, Ceylon.
,, Zeylanica, *Thunb.*	Ceylon.

GENTIANACEÆ.

SCHULTZIA stenophylla, *Mart.*	Tropical America, Trinidad.
ERYTHREA ramosissima, *Pers.*	Western Tropics.
LASIANTHUS alatus, *Aubl.*	Western Tropics.
TACHIADENUS carinatus.	
LIMNANTHEMUM Humboltianum, *Grise.*	Mexico to Brazil.
SLEVOGTIA occidentalis, *Grise.*	W. Indies (Trinidad).

APOCYNACEÆ.

ALLAMANDA cathartica, *L.*	Tropical America, Trinidad.

ALLAMANDA Schotti, *Pohl.*	Rio Janeiro.
,, violacea,	Brazil.
CARISSA Carandas, *L.*	India, Ceylon, China.
,, Arduina, *Lam.*	Cape G. Hope.
RAUWOLFIA canescens, *L.*	W. Indies.
,, heterophylla, *R. et Schultz.*	
THEVETIA neriiformis, *Juss.*	W. Indies (Trinidad).
KOPSIA fruticosa, *DC.*	Burmah, Tavoy.
TANGHINIA venifera, *Poir.*	Madagascar.
ROUPELLIA grata, *Wall.*	Sierra Leone.
TABERNAMONTANA coronaria, *R. Br.*	Tropical Asia, C. G. Hope.
,, laurifolia, *L.*	Trinidad, Jamaica.
,, undulata, *Vahl.*	W. Indies (Trinidad).
,, jasminoides,	Cape G. Hope.
,, psychotrifolia, *Kunth.*	Trinidad, Venezuela.
,, capensis,	Cape G. Hope.
,, sp.	Trinidad, Venezuela.
,, citrifolia, *Jacq.*	Mexico, W. Indies (Trinidad).
DIPLADENIA Harrisii, *Hook.*	Guiana, Venezuela, Trinidad.
,, amabile,	Brazil.
,, urophylla,	Brazil.
VINCA rosea, *L.*	Western Tropics.
,, ,, alba,	
PLUMIERIA alba, *L.*	W. Indies.
,, rubra, *L.*	Western Tropics.
,, obtusa, *L.*	Bahamas, St. Thomas.
BEAUMONTIA grandiflora, *Wall.*	E. Indies.

WRIGHTIA mollissima, *Wall.*	Tropical Himalayas.
ALSTONIA scholaris, *R. Br.*	India.
NERIUM Oleander, *Lour.*	Palestine, India.
,, ,, album,	
HUNTERIA corymbosa, *Roxb.*	Penang.
RHYNCHOSPERMUM jasminoides,	Japan.
VALLARIS dichotoma, *Wall.*	Bengal.
AGANOSMA caryophyllata, *Don.*	India.
ECHITES symphytocarpa, *Mey.*	Trinidad, Guiana, Brazil.
,, subsagittata, *Ruiz et Pav.*	Western Tropics.
HEMYDICTYON venosum, *Lindl.*	Western Tropics.
FORSTERONIA corymbosa, *Mey.*	Tropical South America.

ASCLEPIADEÆ.

CRYPTOSTIGIA grandiflora, *R. Br.*	Behar.
CALOTROPIS gigantea, *R. Br.*	India, Ceylon.
,, procera, *R. Rr.*	India, Ceylon, N. Africa.
ASCLEPIAS curassavica, *L.*	W. Indies.
SCHUBERTIA graveolens, *Lindl.*	Brazil.
MARSDENIA maculata, *Hook.*	Trinidad, Panama, New Grenada.
PERGULARIA odoratissima, *R.Br.*	India, Java, Timor.
STEPHANOTIS floribunda, *Brong.*	Madagascar.
HOYA carnosa, *R. Br.*	Burmah.
,, ,, variegata,	
,, longifolia,	Borneo.
,, bella, *Hook.*	China.
,, imperialis, *Lindl.*	Borneo.

HOYA fraterna,	Sumatra.
CENTROSTEMMA multiflora, *Decne.*	Java.
CEROPEGIA Gardnerii, *Thwaites.*	Ceylon.
GONOLOBUS rostratus, *R. Br.*	Trinidad, Venezuela.
,, pubesceus, *Grise.*	Trinidad, Jamaica.
FISCHERIA multiflora, *Decne.*	Trinidad.

POLEMONIACEÆ.

PHLOX Drummondii, *Hook.*	Texas.

HYDROPHYLLACEÆ.

HYDROLEA spinosa, *L.*	Mexico to Brazil (Trinidad)
WIGANDIA Caracasana, *Hook.*	Caracas.

CONVOLVULACEÆ.

EVOLVULUS alsinoides, *L.*	W. Indies (Trinidad).
CONVOLVULUS violaceus, *Vahl.*	Western Tropics.
,, pentanthus, *Jacq.*	Western Tropics.
,, micranthus, *R.S.*	Western Tropics.
JACQUEMONTIA tamnifolia, *Grise.*	Western Tropics.
IPOMEA bona-nox, *L.*	Tropics.
,, pterodes, *Chois.*	Trinidad, Panama to Brazil.
,, dissecta, *Pursh.*	Tropics.
,, pentaphylla, *Jacq.*	Tropics.
,, glabra, *Chois.*	Western Tropics.
,, Batatas, *Lam.*	Tropics.
,, ,, a & b, *Grise.*	
,, digitata, *L.*	Tropics.
,, umbellata, *Mey.*	Tropical Africa & America.
,, pes-capræ, *Swartz.*	Tropics.

IPOMEA	quamoclit, *L.*	Western Tropics.
,,	coccinea, *L.*	Tropics.
,,	nil,	Tropics.
,,	tuberosa, *L.*	Tropics.
,,	arborescens,	Martinique (?).
,,	murucoides,	Martinique (?).
,,	alatipes, *Hook.*	Trinidad.
ARGYRIEA	splendens, *Swartz.*	India, Ceylon.
,,	Colieri,	India.
PORANA	paniculata, *Roxb.*	Southern India, Ceylon.

SOLANACEÆ.

CESTRUM	fœtidissimum, *Jacq.*	W. Indies (Trinidad).
SOLANUM	nodiflorum, *Jacq.*	Tropics.
,,	Seaforthianum, *Andr.*	W. Indies (Trinidad).
,,	triste, *Jacq.*	Western Tropics.
,,	Radula, *Vahl.*	Western Tropics.
,,	Juripeba, *Rich.*	Western Tropics.
,,	stramonifolium, *Jacq.*	Western Tropics.
,,	mammosum, *L.*	Western Tropics.
,,	aculeatissimum, *Jacq.*	Western Tropics.
SOLANUM	Melongena, *L.*	Tropical Asia.
CAPSICUM	frutescens, *L.*	India, Tropical America.
,,	arboreum,	India.
,,	annum, *L.*	South America.
SOLANDRA	grandiflora, *Swartz.*	Mexico to Brazil (Trinidad)
MARCKIA	longiflora, *Mrs.*	Trinidad.
BRUGMANSIA	arborea, *Wild.*	Tropical South America.
,,	suaveolens, *Wild.*	Peru.
NICOTIANA	Tobacum, *L.*	
,,	,,	var. Shiraj, Persia.

NICOTIANA	Tobacum var. Latakia, Lebanon.	
,,	glauca, *L.*	Buenos Ayies.
ACNISTUS	arborescens, *Schlet.*	W. Indies (Trinidad).
PETUNIA	nyctaginiflora, *Juss.*	South America.
,,	violacea, *L.*	Buenos Ayres.
PHYSALIS	minima, *L.*	Tropics.

CORDIACEÆ.

CORDIA	gerascanthus, *Jacq.*	Trinidad, Venezuela.
,,	alba, *R. S.*	Western Tropics.
,,	Sebestana, *Jacq.*	W. Indies (Trinidad), Guiana, New Grenada.
,,	Collococca, *L.*	Western Tropics.
,,	macrophylla, *Mill.*	Jamaica, Trinidad.
,,	sulcata, *DC.*	W. Indies (Trinidad), Guiana.
,,	speciosa, *Wild.*	W. Indies.
,,	Myxa, *L.*	South India, Ceylon.
,,	cylindrostachya, *R.S.*	California to Uraguay.

BORAGINEÆ.

TOURNEFORTIA	hirsutissima, *L.*	Western Tropics.
,,	bicolor, *Swartz.*	Western Tropics.
,,	laurifolia, *Vent.*	Western Tropics.
,,	Caribæa, *Grise.*	Trinidad, Dominica.
,,	tomentosa, *Mill.*	W. Indies (Trinidad).
HELIOTROPIUM	Indicum, *L.*	Tropics.
,,	parviflorum, *L.*	Western Tropics.
,,	Peruvianum, *L.*	Andes.
,,	inundatum, *Swartz.*	Western Tropics.

CYNOGLOSSUM pictum, *L.*	Madeira.
MYOSOTIS Azorica,	Azores.

LABIATEÆ.

OCIMUM Basilicum, *L.*	Tropical Asia and Africa.
COLEUS Amboinicus, *Lour.*	Amboyna.
,, Verschafelti,	Java.
,, Blumei, *Benth.*	Java.
,, ,, nigricans.	
MARSYPIANTHES hyptoides, *Mart.*	W. Indies (Trinidad).
HYPTIS brevipes, *Poit.*	Tropics.
,, spicata, *Poit.*	Western Tropics.
,, capitata, *Jacq.*	Mexico to Brazil.
MENTHA veridis, *L.*	Europe.
,, ,, crispa,	
,, aquatica,	Britain.
SALVIA splendens, *Sell.*	Rio Janeiro.
,, coccinea, *L.*	Florida to Brazil.
,, serotina, *L.*	W. Indies (Trinidad).
,, pratensis.	
,, lamiifolia, *Jacq.*	W. Indies (Trinidad).
ROSMARINUS officinalis, *L.*	South Europe.
THYMUS vulgaris, *L.*	South Europe.
LEONURUS Sibericus, *L.*	Tropical, and most temperate Countries.
LEONITIS nepetæfolia, *R. Br.*	Tropics.
SCUTELLARIA purpurascens, *Swartz.*	W. Indies (Trinidad).
,, Ventenantii,	Sta. Martha.
,, Costaricensis,	Costa Rica.
,, Mexicana,	Mexico.

TEUCRIUM Cubense, *L. var.*	Trinidad.
POGOSTEMON Patchouli, *Pell.*	India.

VERBENACEÆ.

VERBENA radicans, var.	Chili.
,, Tweediana,	Chili.
,, Venosa,	Buenos Ayres.
PRIVA echinata, *Juss.*	Brazil.
STACHYTARPHA Jamaicensis, *Vahl.*	W. Indies (Trinidad).
,, strigosa, *Vahl.*	Trinidad, Antigua.
,, mutabilis, *Vahl.*	W. Indies (Trinidad), Guiana.
LIPPIA betulifolia, *Kunth.*	Trinidad, Tropical South America.
,, gemminata, *Kunth.*	Western Tropics.
LANTANA camara, *L.*	W. Indies (Trinidad), Tropical South America.
,, reticulata, *Pers.*	Cuba, Jamaica.
,, Sellowiana,	Monte Video.
,, involucrata, *L.*	Trinidad, Jamaica, Panama.
CITHAREXYLON quadrangulare, *Jacq.*	Western Tropics.
,, cinereum, *L.*	Jamaica, Cuba, Trinidad.
DURANTA Plumieri, *Jacq.*	W. Indies, Tropical South America.
,, stenostachys,	*Hort. Bot.* Martinique.
,, turbinata,	
,, Ellisia, *Jacq.*	
PETREA volubile, *Jacq.*	Venezuela, Trinidad.
,, erecta,	W. Indies, Venezuela.

PETREA arborea, *Kunth.*	Venezuela, Mexico.
CONGEA tomentosa, *Roxb.*	India, West Africa.
TECTONA grandis, *L.*	India.
CLERODENDRON hastatum, *Wall.*	Silhet.
,, fragrans, *Vent.*	China.
,, Kempferii,	South America.
,, tomentosum,	India.
,, splendens, *Don.*	China.
,, Thompsonæ, *Hook.*	West Africa.
,, volubile,	Guinea.
AMASONIA erecta, *L.*	Trinidad, Venezuela.
GMELINA arborea, *Roxb.*	India.
VITEX capitata, *Vahl.*	Trinidad, Guiana, Brazil.
HOMLSKIOLDIA sanguinea, *Retz.*	Himalaya, Silhet.

ACANTHACEÆ.

THUNBERGIA alata, *Bojer.*	Mosambique, India, Cey-
,, ,, var. alba,	lon.
,, Vogeliana,	India.
,, Hawtaynii, *Wall.*	India, Ceylon.
,, fragrans, *Roxb.*	India.
,, Harrisii,	Madagascar.
HEXACENTRIS Mysorensis,	Mysore.
,, lutea,	Moulmeine.
DIPTERACANTHUS Herbstii, *Hook.*	Brazil.
RUELLIA geminiiflora, *Kunth.*	W. Indies, Venezuela.
HENFREYA scandens, *Lindl.*	Sierra Leone.
ASYSTASIA Gangetica, *T. Ander.*	Tropical Asia & Africa.
STEPHANOPHYSUM Baikei,	

BARLERIA	cristata, *L.*	Ceylon, Java, China.
,,	Prionitis, *L.*	India, Ceylon, Abysinia.
,,	Arnottiana, *N. ab. E.*	Ceylon.
,,	Gibsoni, *Dalz.*	India.
,,	lupulina.	India.
CROSSANDRA	infundibuliformis, *N. ab. E.*	South India, Ceylon.
GEISSOMERIA	aurantiaca, *Lindl.*	Brazil.
ALPHELANDRA	tetragona, *N. ab. E.*	Equatorial America, Trinidad.
,,	cristata, *H.K.*	W. Indies.
,,	pulcherrima,	Brazil.
,,	Leopoldii,	Brazil.
PACHYSTACHYS	coccinea, *Nees.*	Trinidad, Guiana to Brazil.
GRAPTOPHYLLUM	hortensis, *Nees.*	Islands of Pacific.
,,	,, vars, versicolor,	
,,	,, bicolor,	
CYRTANTHERA	magnifica, *Nees.*	Brazil.
,,	catafræfolia,	Brazal.
,,	Pohliana,	Brazil.
,,	velutina,	Brazil.
,,	sp.	Trinidad (Aripo).
JUSTICIA	Adhatoda, *L.*	India, Ceylon.
,,	decussata, *Rox.*	Burmah.
,,	secunda, *Vahl.*	W. Indies, S. America.
,,	androsæmifolia, *T. Anders.*	W. Indies (Trinidad).
ERANTHEMUM	nervosum, *R.Br.*	India.
,,	leuconervum,	Brazil.
,,	rubronervum,	Cordilleras.
BELOPEROME	nemorosa, *Nees.*	Jamaica, Trinidad.

DICLIPTA Martinicensis, *Juss.*	Martinique, Trinidad.
BRAVAISIA floribunda, *DC.*	Western Tropics.

PEDALIACEÆ.

MARTYNIA diandra, *Glox.*	Cuba to Mexico.
SESAMUM orientale, *L.*	Tropical Asia & N. Africa.

BIGNONIACEÆ.

BIGNONIA æquinoctialis, *L.*	Western Tropics.
,, Martinii, *DC.*	Trinidad.
,, unguis, *L.*	W. Indies (Trinidad).
,, rufinervis, *Hoff.*	St. Vincent, Trinidad, Venezuela.
,, venusta, *Ker.*	Minas Gereas.
MILLINGTONIA hortensis, *L.*	Burmah.
CALOSANTHES Indica, *Blume.*	India, Ceylon, China.
MACFADYENA uncinata, *A. DC.*	Guiana, Trinidad.
ARABIDÆA Sieberii, *DC.*	Trinidad.
PETHECOCTENIUM Aubletii, *Splitz.*	Mexico to Brazil, (Trinidad).
SPATHODEA stipulata, *Wall.*	Burmah.
,, Indica,	India.
STEREOSPERMUM chelonoides, *A. DC.*	India, Ceylon.
PHYLLARTHRON Comorense, *Boj.*	Comoro Islands.
COLEA cauliflora, *A. DC.*	Madagascar.
CRESENTIA Cujeti, *L.*	Mexico to Brazil (Trinidad)
,, alata, *H. B. K.*	Mexico.
,, Curcubitina, *L.*	W. Indies, Venezuela.
,, macrophylla,	Venezuela.
PARMENTIERA cerifera, *DC.*	Panama.

KIGELIA pinnata, *A. DC.* Mozambique.

GESNERIACEÆ.

COLUMNEA longiflora,
,, scandens, *L.* Dominica, Trinidad, Guiana.
,, hirsuta, *Swartz.* Trinidad.
BESLERIA lutea, *L.* Western Tropics.
EPISCEA melittifolia, *Mart.* W. Indies (Trinidad).
GESNERIA corymbosa, *Swartz.* Jamaica.
ISOLOMA hirsuta, *Reg.* Trinidad, Venezuela.
ACHIMENES longiflora, *Decsne.* Guatemala.
,, grandiflora, *Decsne.* Mexico.
,, coccinea, *Pers.* Jamaica.
,, vars.—Amhoise Verschaplt,
,, ,, Beaumanniana,
,, ,, Carl Woolfarth,
,, ,, Dazzle,
,, ,, Estella,
,, ,, Grandis,
,, ,, Georgeana Discolor,
,, ,, Margarette,
,, ,, rosea magnifica.
GLOXINIA Passinghami, Rio Janeiro.
,, nebra, Rio Janeiro.
,, speciosa, Rio Janeiro.
,, vars.—Acton Green,
,, ,, Alico Mande,
,, ,, A. de Kimbler,
,, ,, Cerise violet,
,, ,, Emerald,

GLOXINIA vars.—Empératrice Eugenie,
,, ,, Espérance,
,, ,, Indienne,
,, ,, Leander,
,, ,, Lord Lyon,
,, ,, Mdme. de Smet,
,, ,, Mon. Borsig,
,, ,, Princess Mary,
,, ,, Rose et cochinille.
RYTIDOPHYLLUM grande, *Mart.* Jamaica, Trinidad.
ÆSCHYNANTHUS grandiflorus, *G. Don.* Bengal.
,, speciosus, *Hook.* Java.
,, pulcher, *Decsne.* Java.
,, Lobbianus, *Hook.* Java.
,, Albicans, Borneo.

SCROPHULARIEÆ.

BROWALLIA demissa, *L.* W. Indies (Trinidad), Tropical South America.
BRUNSFELSIA Hopeana, *Benth.* Trinidad, Brazil.
,, eximia, *Scheid.* Brazil.
,, acuminata, Rio Janeiro.
,, calycina major, Brazil.
,, confertiflora,
,, Americana, *Swartz.* W. Indies (Trinidad).
ANGELONIA salicarifolia, *Bonpl.* Trinidad, Tropical South America.
ANTERRHINUM majus, *L.* Europe.
MAURANDIA Barclayana, *Lindl.* Mexico.
PENSTEMON congestus, Mexico.
LOPHOSPERMUM scandens, *Don.* Mexico.

MYOPORINEÆ.

BONTIA	daphnoides, *L.*	Barbadoes, Trinidad.
AVICENNIA	nitida, *Jacq.*	Western Tropics and Tropical Africa.

UTRICULARIEÆ.

UTRICULARIA	montana, *Jacq.*	Western Tropics.
,,	angustifolia, *Benj.*	Trinidad, Guiana.
,,	myriocysta, *St. Hil.*	Trinidad, Guiana.

POLYGALACEÆ.

POLYGONUM	acre, *Kunth.*	
,,	acuminatum, *Kunth.*	Western Tropics.
COCCOLOBA	uvifera, *Jacq.*	Western Tropics.
,,	latifolia, *Lam.*	Trinidad, Guiana.
,,	crescentiifolia, *Cham.*	Trinidad, Brazil.
,,	Guianensis, *Meisn.*	Trinidad, Guiana.
,,	punctata, *L.*	W. Indies (Trinidad), Venezuela.
ANTIGONON	leptopus, *Hook. et Arn.*	Mexico.

NYCTAGINEÆ.

BOERHAAVIA	erecta, *L.*	Western Tropics.
,,	paniculata, *Rich.*	Western Tropics.
MIRABILIS	Jalappa, *L.*	Western Tropics.
BUGAINVILLEA	glabra, *Chois.*	Rio Janeiro, Minas Gereas.
,,	spectabilis, *Wild.*	Brazil.
,,	warsewiczii,	
PISONIA	alba, *Spank.*	Timor.
,,	inermis, *Jacq.*	Western Tropics.
,,	aculeata, *L.*	Western Tropics, & Madagascar.

CHENOPODIACEÆ.

CHENOPODIUM ambrosioides, *L.* Western Tropics.

AMARANTACEÆ.

CELOSIA cristata, *Moy.* India, Java.
AMARANTHUS oleraceus, *Rox.* Tropics (cultivated).
,, ,, tricolor, Japan.
,, sanguinens, *L.* Tropics.
,, caudatus, India.

PHYTOLACCACEÆ.

PETIVERIA alliaceæ, *L.* Western Tropics.
RIVINA lævis, *L.* Western Tropics.
PHYTOLACCA icosandra, *L.* Western Tropics.

LAURINEÆ.

CINNAMOMUM Zeylanicum, *Breyn.* Ceylon.
,, nitidum, *N. ab. E.* Sumatra.
,, sp.
CAMPHORA officinarum, *Bauh.* Japan, China.
PERSEA gratissima, *N. ab. E.* Tropical America.
AYEDENDRON citrifolium, *Nees.* Trinidad, Brazil.
NECTANDRA mollis, *Nees.* Western Tropics.
,, sanguinea, *Rottb.* Western Tropics.
LAURUS nobilis, *L.* Asia Minor, shores of Mediterranean.
,, aggregata, *Sims.* China.

SANTALACEÆ.

SANTALUM album, *L.* Malabar, Islands of Malayan Archipelago.

THYMELEÆ.

DAPHNOPSIS tinifolia, *Grise.*	Jamaica.
LAGETTA linearis, *Lam.*	Jamaica.
,, funifera,	Brazil.

HERNANDIEÆ.

HERNANDIA sonora, *L.*	E. Indies, Pacific Islands.

PROTEACEÆ.

GREVILLEA robusta, *Cunn.*	Moreton Bay.
RHOPALA Skinnerii,	Guatemala.
,, De Tonghii,	Guatemala.
,, crenata,	
,, montana, *Aubl.*	Panama toBrazil,Trinidad.
HAKEA lissospermum,	Australia.
,, salicifolia,	Australia.
,, acicularis,	Australia.

ELEAGNACEÆ.

ELEAGNUS reflexus,	China, Japan.
,, ,, variegatus,	China, Japan.

MYRISTICEÆ.

MYRISTICA fatua, *W.*	Surinam.
,, fragrans, *Houtt.*	Moluccan Archipelago.
,, Surinamensis, *Roland.*	Trinidad, Guiana, Brazil.
,, sp.	Trinidad.

ARISTOLOCHIACEÆ.

ARISTOLOCHIA grandiflora, *Swartz.*	Jamaica, Trinidad.
,, odoratissima, *L.*	Jamaica, Trinidad, Venezuela.

ARISTOLOCHIA	barbata, *Jacq.*	Trinidad, Venezuela.
,,	triloba, *L.*	Western Tropics.

NEPENTHACEÆ.

NEPENTHES	Rafflesiana, *Jack.*	Singapore, Sumatra.
,,	gracilis major,	Singapore, Sumatra.
,,	lævis,	Singapore, Sumatra.
,,	ampullacea,	Singapore, Sumatra.

BEGONIACEÆ.

BEGONIA	humilis, *Dryand.*	Trinidad.
,,	ulmifolia, *Wild.*	Trinidad, Venezuela.
,,	glandulifera, *Grise.*	Trinidad.
,,	scandens, *Swartz.*	Dominica, Trinidad, Guiana to Brazil.
,,	fagifolia, *Fish.*	Brazil.
,,	Malabarica, *Dryand.*	India.
,,	Mærhingii,	India.
,,	nitida, *Dryand,*	Jamaica.
,,	Ingramii, *Moore.*	Peru.
,,	Diswilliana	Peru.
,,	fuschioides, *Hook.*	New Grenada.
,,	acrifolia, *Kunth.*	Mexico.
,,	Natalensis,	Natal.
,,	manicata, *Brong.*	Brazil.
,,	heracleifolia, *S. & C.*	Mexico.
,,	Rex, *J. Pz.*	Assam.
,,	,, Sambo,	
,,	,, Princess Marie,	
,,	riciniifolia,	Mexico.
,,	hydrocotylifolia, *Hook.*	Tropical South America.
,,	nelumbæfolia,	Brazil.

BEGONIA	velutina,	
,,	crassicaulis, *Lindl.*	Guatimala.
,,	macrophylla, *Wild.*	Jamaica.
,,	muricata, *Scheidw.*	Brazil.
,,	longipes, *Hook.*	Mexico.
,,	sp.	Cuba.
,,	dichotoma *Wild.*	Caracas.
,,	argyrostigma, *Fisch.*	Brazil.
,,	undulata, *Schott.*	Mexico to Brazil.
,,	sp.	Mexico.

Beautiful hybrids raised in the Botanic Garden, Trinidad.

,,	hybrida,	B. velutina, B. riciniifolia,	*a.* Attorney-General.
,,	,,	B. Malabarica, B. acerifolia,	*a.* Zuleika.
,,	,,	,,	*b.* Mrs. C. W. Warner.
,,	,,	B. Mærinhgii, B. argyrostigma,	*a.*
,,	,,	hybridization uncertain,	*a.*
,,	,,	,, ,,	*b.*
,,	,,	,, ,,	*c.*
,,	,,	,, ,,	*d.*

EUPHORBIACEÆ.

HEIRONYMA	alchornoides, *Allem.*	Jamaica, Trinidad.
CICCA	disticha, *L.*	Cultivated in Tropical Gardens.
PHYLLANTHUS	Conami, *Swartz.*	Western Tropics.
,,	Niruri, *L.*	Tropics.

JATROPHA gossypifolium, *L.*	W. Indies (Trinidad).
,, hasta, *Jacq.*	Cuba, Trinidad.
,, Curcas, *L.*	Tropics.
,, podagrica, *Hook.*	New Grenada.
,, panduræformis, *Wild.*	Cuba.
,, multifida, *Wild.*	Tropical South America.
JANIPA Mainhot, *Kunth.*	Tropics.
,, utilissima, *Pohl.*	Tropics.
ALEURITES triloba, *Forst.*	Moluccas, Timor.
RICINUS communis, *L.*	E. Indies.
CROTON eleuteria, *Swartz.*	W. Indies (Trinidad).
,, urticifolius, *Lam.*	W. Indies (Trinidad).
,, hirtus, *L'Her.*	W. Indies (Trinidad).
,, gossypifolium, *Vahl.*	W. Indies (Trinidad).
,, tiglium, *L.*	India, China.
,, discolor,	India.
CODIÆUM pictum, *Hook.*	
,, variegatum, *Blume.*	Philippine Islands.
,, ,, var. longifolium,	
,, ,, ,, elegans,	
,, ,, ,, medium,	
,, ,, ,, premorsum,	
TRIGONOSTEMON nemoralis, *Thwaites,*	Ceylon.
CÆLEBOGYNE ilicifolia, *J. Sm.*	Australia.
MABEA occidentalis, *Benth.*	W. Indies (Trinidad).
ACALYPHA macrostachya, *Jacq.*	Trinidad, Caracas.
TRAGIA volubilis, *Lindl.*	Western Tropics.
SAPIUM aucuparium, *Jacq.*	Western Tropics.
HIPPOMANE Mancinella, *L.*	Western Tropics.
,, spinosa,	

HURA crepitans, *L.*	Western Tropics.
OMPHALEA triandra, *L.*	Trinidad, Jamaica, Guiana
DALECHAMPIA scandens, *L.*	Western Tropics.
,, Roezliana,	New Grenada.
EUPHORBIA hypericifolia, *L.*	Western Tropics.
,, splendens, *Boj.*	Bourbon, Madagascar.
,, Canariensis, *L.*	Canary Islands, C.G.Hope.
,, lophagona,	South Africa.
,, tetragona,	South Africa.
ROTTLERA tinctora, *Roxb.*	India.
SAUROPUS Gardnerii,	India.
STILLINGIA sebifera, *Juss.*	China.
BUXUS sempervirens, *L.*	Britain, South Europe, Persia.
PUTRANJIVA Roxburghii, *Wall.*	India.

SALICINEÆ.

SALIX Babylonica, *L.*	Levant.
,, Humboltiana, *Wild.*	Mexico to Peru.

URTICACEÆ.

URERA Caracasana, *Gaud.*	Western Tropics.
,, baccifera, *Gaud.*	Western Tropics.
LAPORTEA magnifica,	India.
FLEURYA æstuans, *Gaud.*	Tropics.
PILEA micromera, *Liebm.*	Western Tropics.
,, inæqualis, *Wedd.*	W. Indies (Trinidad).
URTICA sp.	Martinique.
BŒHMERIA nivea, *Gaud.*	India, Ceylon, China, Malay Islands.
,, cylindrica, *Wild.*	W. Indies (Trinidad).
,, ramiflora, *Jacq.*	W. Indies (Trinidad).
PHENAX vulgaris, *Wedd.*	Martinique, Trinidad, Brazil.

MORACEÆ.

MORUS alba, *L.*	Asia Minor, Himalaya.
,, nigra, *Wild.*	Italy.
BROUSSONETIA papyrifera, *Vent.*	China, Japan.
MACLURA zanthoxylon, *Eudl.*	Western Tropics.
FICUS nymphæfolia, *L.*	Trinidad, Tropical America
,, laurifolia, *Lam.*	Jamaica, Trinidad.
,, crassinerva, *Desf.*	W. Indies (Trinidad).
,, populnea, *Wild.*	Trinidad, Antigua.
,, carica, *L.*	Asia Minor.
,, ferruginea	Brazil.
,, pallida, *Vahl.*	Trinidad.
,, religiosa,	India, Ceylon.
,, elastica, *Roxb.*	India.
,, comosa, *Roxb.*	India.
,, indica, *L.*	India, Ceylon.
,, elastica, *Roxb.*	Tropical Sikkim, Assam.
,, repens, *Wild.*	Bengal, Assam.
,, congomerata, *Roxb.*	Tropical Himalaya.
DORSTENIA Contrajerva, *L.*	Western Tropics.

ARTOCARPACEÆ.

BROSIMUM Aubletii, *Poepp.*	Western Tropics.
,, Alicastrum, *Swartz.*	Jamaica.
CECROPIA peltata, *L.*	W. Indies, Venezuela.
ARTOCARPUS incisa, *L.*	Pacific Islands.
,, ,, var.,	
,, integrifolia, *L.*	India.
,, Lakoocha, *Roxb.*	India, Ceylon, Java.

CANNABINIÆ.

CANNABIS sativus, *L.*	Central Asia, Himalaya.

CASUARINACEÆ.

CASUARINA	equisetifolia, *Forst.*	Moluccas.
,,	torolosa, *Ait.*	New South Wales.
,,	leptoclada, *Miquel.*	New South Wales.
,,	quadrivalvis, *Labill.*	New South Wales, New Zealand.
,,	sp.	West Australia.

PIPERACEÆ.

PIPEROMIA	mimularifolia, *Kunth.*	W. Indies (Trinidad).
,,	exilis, *Grise.*	W. Indies (Trinidad).
,,	tenella, *Dict.*	Western Tropics.
,,	pellucida, *Kunth.*	Jamaica, Trinidad, Brazil.
,,	répens, *Kunth.*	W. Indies (Trinidad).
,,	obtusifolia, *Miq.*	Mexico to Brazil.
,,	incana, *Haw.*	Brazil.
,,	rubella, *Haw.*	W. Indies.
,,	clusiæfolia,	Brazil.
,,	arifolia, variegata,	New Grenada.
ENKEA	smilacifolia, *Kunth.*	Panama to Brazil (Trinidad)
,,	Sieberi, *Miq.*	Western Tropics.
SCHILLERIA	caudata, *Kunth.*	W. Indies (Trinidad).
ARTANTHE	Bredermeyeri, *Miq.*	W. Indies (Trinidad).
,,	adunca. *Miq.*	
,,	scabra, *Miq.*	Jamaica, Trinidad, Brazil.
,,	tuberculata, *Miq.*	St. Vincent, Trinidad.
,,	æqualis, *Miq.*	Dominica, Trinidad.
PIPER	nigrum,	India, Ceylon, Malayan Archipelago.
,,	Cubeba, *L.*	Malayan Archipelago.
OTTONIA	Vahlii, *Spreng.*	Trinidad.

PINACEÆ.

PINUS Ehrenbergii,	
,, Canariensis, *Buch.*	Canary Islands,
,, Nordmanniana,	Crimea.
,, macrophylla, *Lindl.*	Mexico.
,, insignis, *Douglas.*	California.
,, Strobus, *L.*	North America.
,, Verschafeltii,	Mexico.
,, Antoniana,	Mexico.
,, maginfica,	Mexico.
,, longifolius, *Lam.*	North India.
,, parviflorus,	Japan.
,, Menzicsii, *Lond.*	California.
ARAUCARIA imbricata, *Pavon.*	Chili.
,, excelsa, *Ait.*	Norfolk Island.
,, Bidwellii, *Hook.*	Moreton Bay.
,, Cookii, *Hook.*	New Calidonia.
DAMMARA Moorei,	New South Wales.
JUNIPERUS excelsus, *Wild.*	Himalaya.
,, Chinensis,	China.
,, thurifera, *Wild.*	Spain.
,, Japonica,	Japan.
,, Barbadensis, *Wild.*	
,, sagittifolia,	
THUJA orientalis, *Tourne.*	Asia.
,, aurea,	Japan.
,, gigantea,	California.
LIBROCEDROS decurrens,	
BIOTA pendula, *Endl.*	North India.
,, Meldensis,	Garden hybrid.

THUJOPSIS	dolabrata,	Japan.
,,	borealis, *Glanca.*	California.
,,	lætevirens,	Japan.
CRYPTOMERIA	elegans,	Japan.
,,	Japonica, *Don.*	Japan.
,,	Lobbi,	
CUPRESSUS	sempervirens,	Candia.
,,	pyramidalis, *Targ.*	South Europe.
,,	horizontalis, *Mill.*	South Europe.
,,	torulosus,	California.
,,	funebris, *Endl.*	China, Japan.
,,	thyoides,	China, Japan.
RETINOSPORA	obtusa,	Japan.
,,	picifera,	Japan.
,,	squarrosa,	Japan.
,,	princeps,	Japan.
,,	leptoclada,	Japan.
,,	filifera,	Japan.
,,	ericoides,	Japan.
,,	plumosa,	Japan.
CALLITRIS	quadrivalvis, *Vent.*	South Europe, North Africa
,,	Australis,	Australia.
,,	columnaris,	Australia.
TAXODIUM	distichum,	North America.
WIDDRINGTONIA	cupressoides,	Cape G. Hope.
FRENELA	Gunnii,	Tropical Australia.
,,	Ventenanti,	New Holland.

TAXACEÆ.

TAXUS	baccata,	Europe.
,,	horizontalis,	Europe.

TAXUS drupaceus,	China.
TORREA nucifera,	Japan.
PODOCARPUS elongatus, *P. S.*	South Africa.
,, neriifolius, *D. Don.*	Nepal.
,, salicifolius, *Kunth.*	Trinidad, Jamaica, Cuba.
,, coriaceus, *Rich.*	Trinidad, Jamaica.

CYCADEÆ.

CYCAS revoluta, *Thun.*	China.
,, circinalis, *L.*	Moluccas.
,, Rumphii, *Miq.*	Moluccas.
,, sp.	South Africa.
DION edule, *Lindl.*	Mexico.
ZAMIA integrifolia, *Ait.*	Cuba, Hayti, Jamaica.
MACROZAMIA Denisoni, *Moore et Muel.*	Moreton Bay.
ENCEPHALARTOS Lehmannii,	Cape G. Hope.
,, villosus,	Cape G. Hope.
,, Barterii, *Hook.*	West Africa.

PALMEÆ.

CHAMÆDOREA excelsa,	Mexico.
HYOSPATHE pubigera, *Grise. et Wendl.*	Trinidad.
EUTERPE sylvestris,	Brazil.
,, oleracea, *Mart.*	Jamaica, Trinidad, Guiana.
,, sp.	Trinidad.
ŒNOCARPUS Batua, *Mart.*	Trinidad, Amazon.
OREODOXA oleracea, *Mart.*	W. Indies (Trinidad), Mexico to Brazil.
PINANGA maculata,	Bengal.

ARECA Catechu, *L.*	India, Ceylon, Malayan Peninsula.
,, rubra, *Bonj.*	
,, horrida, *Griff.*	Moluccas.
,, Madagascariensis, *Mart.*	Madagascar.
,, lutescens,	
,, Bauerii, *Hook.*	Norfolk Island.
SEAFORTHIA elegans, *R. Br.*	Tropical Australia.
CARYOTA urens, *L.*	India.
,, sobolifera, *Wall.*	India.
,, Cummingii,	Pacific Islands.
,, mitis, *Lour.*	China.
,, elegans,	
,, humilis, *Rein.*	
CALAMUS Roxburghii, *L.*	India.
,, viminalis,	India.
,, Jenkinsii,	India.
,, asperrimus,	Borneo, Sumatra.
,, sp.	India (Calcutta).
MAURITIA flexuosa, *Mart.*	Trinidad.
BORASSUS flabelliformis, *L.*	Eastern Tropics.
LATANIA glaucophylla,	
,, mirabilis,	
,, Borbonica, *L.*	Bourbon.
,, Commersonii, *L.*	Mauritius, Madagascar.
GEONOMA vaga, *Grise. et Wendl.*	Trinidad, Tropical South America.
,, Schottiana, *Mart.*	Brazil, New Grenada.
,, fenestrata, *Hort.*	Brazil.
,, Verschafelti,	Brazil.

MANICARIA saccifera, *Mart.*	Trinidad, Tropical South America.
PRITCHARDIA Pacifica,	Pacific Islands.
CORYPHA umbraculifera, *L.*	Ceylon, Malabar.
,, elata, *Rox.*	Bengal.
,, Australis,	Australia.
LIVISTONA Jenkinsii, *Griff.*	Assam.
LICUALA spinosa, *Warmb.*	Malayan Peninsula, Java.
SABAL umbraculifera, *Mart.*	Bahamas.
,, Palmetto,	Central America.
,, mauritiiformis, *Grise. et Wendl.*	Trinidad (?) Venezuela
,, Adansonii, *Guern.*	South United States.
,, carata, *H.P., MS.*	Trinidad.
CHAMÆROPS stauracantha,	Mexico.
RAPHIS flabelliformis, *Ait.*	Japan, China.
THRINAX parviflora, *Swartz.*	Jamaica, Trinidad.
,, radiata, *Lodd.*	Jamaica, Trinidad.
PHŒNIX dactylifera, *L.*	N. Africa, Syria, Arabia.
,, sylvestris, *Roxb.*	Bengal.
,, Leonensis, *Roxb.*	Sierra Leone.
,, farinifera, *Roxb.*	India (Sunderbund).
,, acaulis, *Roxb.*	Bengal, Behar.
,, sp.	India.
DESMONCUS major, *Creug.*	Trinidad.
,, minor, *H.P., MS.*	Trinidad.
BACTRIS simplicifrons, *Mart.*	Trinidad, Brazil.
,, acanthonemis, *Mart.*	Trinidad, Guiana, Brazil.
,, Cuesa, *Creug.*	Trinidad.
,, maraja,	Brazil.
,, sp.	Trinidad.

GUILIELMIA speciosa,	Tropical South America
,, sp.	Trinidad (Mission).
MARTINEZIA caryotæfolia,	Martinique, San Domingo.
ACROCOMIA sclerocarpa, *Mart.*	Trinidad, Panama.
,, vulgare, *L.*	Trinidad, Tropical South America.
,, Mexicana,	Mexico.
,, rostrata, *Hook.*	Jamaica, Martinique, San Domingo.
ATTALEA compta, *Mart.*	Brazil.
,, mirabilis,	Brazil.
MAXIMILIANA regia, *Mart.*	Trinidad, Tropical South America.
,, caribæa, *Grise. et Wendl.*	Trinidad, Guiana, Surinam, Venezuela.
ELAIS Guiniensis, *L.*	West Africa.
COCOS nucifera, *L.*	Naturalized in almost all Tropical Countries.
,, plumosa, *Mart.*	Brazil.
,, botryophora, *Mart.*	Brazil.
,, campestris, *Lodd.*	Tropical South America.
,, amara, *Jacq.*	Brazil.
,, coronata, *Mart.*	Brazil.
,, Romanzorffii,	Brazil.
DIPLOTHEMIUM maritium, *Mart.*	Brazil.
ARRHENGA saccharifera, *Labill.*	Malayan Islands.
WALLICHIA caryotoides, *Roxb.*	Tropical Sikkim, Assam.
PHYTELEPHAS macrocarpa, *Ruiz. et Pav.*	Guiana, Surinam, New Grenada.

PANDANACEÆ.

CARLUDOVICA	palmata,	Brazil.
,,	Plumierii, *Kunth.*	Trinidad, Demerara.
PANDANUS	odoratissimus, *L. f.*	Shores of India & Arabia.
,,	utilis, *Bojer.*	Mauritius.
,,	furcatus, *Roxb.*	Tropical Sikkim.
,,	variegatus, *Miq.*	Balie.
,,	elegans,	Isle of France.
,,	Lais,	Hab. Ignot.
,,	Australis,	Australia.
,,	humilis, *Rumph.*	Mauritius.
,,	inermis, *Roxb.*	Amboyna.

TYPHACEÆ.

TYPHA	angustifolia, *L.*	
,,	,, var. Domingensis, *Pers.*	Trinidad, (this var.) Texas to Brazil.

AROIDEÆ.

AMORPHOPHALLUS	campanulatus, *Blume.*	Tropics.
,,	bulbifer, *Blume.*	Bengal, Malay Peninsula.
CALOCASIA	odora, *Brong.*	Pegu.
,,	antiquorum, *Schott.*	Cultivated in Tropical Countries.
,,	macrorhiza variegata,	Tropical Asia.
,,	metallica,	Borneo.
,,	Veitchii,	Borneo.
,,	Lowii,	Borneo.
,,	Jenningsii,	New Grenada.
,,	gigantea,	New Grenada.

CALADIUM	bicolor, *Vent.*	Brazil.
,,	splendens,	Tropical South America.
,,	Chantinii,	
,,	Newmanii,	
,,	Wightii,	
,,	Pœcile,	
,,	Houletii,	
,,	hastatum, *Lam.*	
,,	Belleymei,	Brazil.
,,	marmorata, *Math.*	Tropical South America.
,,	argyrites, *Lamb.*	Brazil.
ACONTIAS	helliborifolius, *Schott.*	Western Tropics.
XANTHOSOMA	atrovirens, *Kunth.*	W. Indies.
,,	sagittifolium, *Schott.*	W. Indies (Trinidad).
PHILODENDRON	dispar, *Schott.*	Jamaica, Trinidad, Brazil.
,,	tripartitum, *Schott.*	Jamaica, Trinidad, Brazil.
,,	erubesceus, *Lindl.*	Jamaica, Trinidad, Brazil.
ANTHURIUM	violaceum, *Schott.*	Mexico to Brazil.
,,	Guildingii, *Schott.*	Western Tropics.
,,	cordifolium, *Kunth.*	W. Indies (Trinidad) Brazil
,,	acaule, *Kunth.*	Trinidad to Brazil.
MONSTERA	deliciosa,	Brazil.
,,	pertusa, *Grise.*	Western Tropics.
SPATHIPHYLLUM	cannæfolium, *Schott.*	Trinidad, Brazil.
AGLAONEMA	marantæfolia, *Schott.*	Brazil.
DIEFFENBACHIA	seguine, *Schott.*	Trinidad, Tropical S. America.
,,	,, variegata,	
,,	Weirii,	New Grenada.
,,	Pearcei,	New Grenada.

DIEFFENBACHIA Baraquini, New Grenada.
MONTRICHARDIA aculeata, *Creng.* Trinidad, Guiana.

PISTACEÆ.

PISTIA stratiotes, *Jacq.* Tropics.
LEMNA minor, *L.* Temperate&TropicalZones
,, trisulca, *L.* Temperate&TropicalZones

ORCHIDACEÆ.

STELIS ophioglossoides, *Swartz.* Trinidad, Mexico to Guiana
OCTOMERIA graminiifolia, *R.Br.* Dominica, Trinidad.
MICROSTYLIS umbellata, *Lindl.* W. Indies (Trinidad), Mexico.
DENDROBIUM moschatum, *Wild.* Silhet.
,, macrophyllum, *Lindl.* Manilla.
,, ,, giganteum,
,, clavatum,
,, Dayanum,
,, Dalhousianum, *Paxt.* Moulmein.
,, agregatum, *Roxb.* Arracan.
,, formosum, *Roxb.* E. Indies.
,, densiflorum, *Wall.* Nepal.
,, nobile, *Lindl.* Tropical Sikkim, Assam.
,, ,, Wallichianum,
,, tortile, *Lindl.* Moulmein.
,, fimbriatum, *Hook.* E. Indies.
,, ,, occulatum, E. Indies.
,, albo-sanguineum, *Lindl.* Moulmein.
,, chrysanthum, *Wall.* Nepal.
,, Farmeri, *Lindl.* E. Indies.
,, Pierardei, *Roxb.* Tropical Himalaya, Assam
,, Gibsoni, *Paxt.* E. Indies.

CÆLOGYNE speciosa,	Borneo.
,, cristata,	Nepal.
ISOCHILUS linearis, *R. Br.*	Mexico to Brazil (Trinidad)
EPIDENDRUM Ottonis, *G. Rchb.*	Trinidad, Venezuela.
,, rufum, *Lindl.*	Trinidad, Bahamas.
,, serrulatum, *G. Rchb.*	Trinidad, Jamaica.
,, bicornutum, *Hook.*	Trinidad, Venezuela.
,, indivisum, *Bradf.*	Trinidad.
,, ciliare, *L.*	W. Indies (Trinidad), Mexico to Grenada.
,, fragrans, *Swartz.*	Cuba to Brazil, (Trinidad)
,, Trinitatis, *L.*	Trinidad, New Grenada.
,, nutans, *Swartz.*	Trinidad, Jamaica.
,, pallidæflorum, *Hook.*	Trinidad, Jamaica.
,, nocturnum, *L.*	Western Tropics.
,, elongatum, *Jacq.*	Western Tropics.
,, Schomburgkii, *Lindl.*	Trinidad, Brazil.
,, rhizophorum,	New Grenada.
,, stroboliferum, *G. Rchb.*	Trinidad, Jamaica, Guiana.
,, ramosum, *Jacq.*	Cuba to Brazil, (Trinidad).
,, umbellatum, *Swartz.*	Cuba to Brazil, (Trinidad).
,, sthenopetalum, *Hook.*	Trinidad, Jamaica, Guiana.
,, teretifolium, *Swartz.*	Trinidad, Jamaica.
,, aurantiacum,	
,, vitellinum, *Lindl.*	Mexico.
,, macrochilum, *Hook.*	Guatimala.
,, atropurpureum,	
,, dichromum,	
,, aromaticum, *Bate.*	Guatimala.

HEXADESMIA	fusiformis, *Grise.*	Trinidad.
SOPHRONITIS	grandiflora, *Lindl.*	Organ Mountains.
BARKERIA	spectabilis, *Bate.*	Guatimala.
,,	Skinnerii, *Lindl.*	Guatimala.
,,	Lindleyana, *Bate.*	Costa Rica.
BROUGHTONIA	sanguinea, *R.Br.*	Jamaica.
LÆLIA	gigantea,	Brazil.
,,	elegans, *Morrem.*	Brazil.
,,	Perinii grandiflora,	Brazil.
,,	purpurata, *Lindl.*	Brazil.
,,	autumnalis, *Lex.*	Mexico.
,,	majalis, *Lindl.*	Guatimala.
CATTLEYA	Dowiana, *Bate.*	Costa Rica.
,,	Trianiæ,	
,,	Loddigei, *Lindl.*	Tropical America.
,,	Forbesii, *Lindl.*	Tropical America.
,,	Acklandæ, *Lindl.*	Brazil.
,,	lobata, *Lindl.*	Brazil.
,,	Skinnerii, *Bate.*	Guatimala.
,,	labiata, *Lindl.*	Tropical South America.
,,	Mossiæ, *Lindl.*	Tropical South America.
,,	superba, *Lindl.*	Demerara.
SCHOMBURGKIA	undulata, *Lindl.*	Trinidad, Venezuela.
,,	Tibicinus, *Bate.*	Honduras.
LEPTOTES	bicolor, *Lindl.*	Brazil.
BRASSAVOLA	cuculata *R.Br.*	Western Tropics.
PHAJUS	Wallichii, *Lindl.*	Khasia Hills.
,,	grandifolius, *Lonr.*	Tropics.
BLETIA	Shepperdii, *Lindl.*	Jamaica.
,,	florida, *R.Br.*	Trinidad, Venezuela.

CYOTOPERA	Woodfordii, *Lindl.*	Trinidad, Guiana.
VANDA	Roxburghii, *R. Br.*	India, Ceylon.
,,	Batemanii. *Lindl.*	Moluccas.
,,	insignis, *Blume.*	Java.
,,	suavis, *Lindl.*	Java.
,,	tricolor, *Lindl.*	Java.
,,	furva, *Lindl.*	China.
,,	cristata, *Lindl.*	Nepal, Sikkim.
,,	teres, *Lindl.*	Burmah, Sikkim.
PHALÆNOPSIS	rosea, *Lindl.*	Manilla.
,,	amabilis, *Blume.*	Philippines, & Islands of Malayan Archipelago.
SACCALABIUM	Blumei, *Lindl.*	Java.
,,	ampulaceum, *Lindl.*	Sikkim.
,,	giganteum,	
,,	guttatum, *Lindl.*	India, Ceylon, China.
ÆRIDES	Warnerii,	
,,	maculosum, *Lindl.*	E. Indies.
,,	odoratum cornutum, *Lour.*	Khasia Hills, Sikkim.
,,	suavissimum, *Lindl.*	Malacca.
,,	quinquevulnerum,	Philippines.
,,	Lobbi,	
,,	roseum, superbum, *Lodd.*	E. Indies.
,,	virens, *Lindl.*	Java.
,,	affine, *Wall.*	Nepal.
CYMBIDIUM	Mastersii, *Griff.*	E. Indies.
,,	aloifolium, *Sw.*	South India, Ceylon.
ANSELLIA	Africana, *Lindl.*	W. Africa.
ASPASIA	variegata, *Lindl.*	Tropical South America, and Trinidad.

TRICHOPELIA tortilis,	
,, suavis, *Lindl.*	Mexico.
NANODES discolor, *Lindl.*	Trinidad, Brazil.
DICHEA graminea, *Grise.*	Western Tropics.
LOCKHARTIA acuta, *Rchb.*	Trinidad, Venezuela.
,, elegans, *Hook.*	Trinidad, Brazil.
POLYSTACHYA luteola, *Hook.*	W. Indies (Trinidad).
ONCIDIUM iridifolium, *Kth.*	Mexico to Brazil, Trinidad.
,, triquetrum,	Jamaica.
,, luridum, *Lindl.*	Trinidad, Venezuela.
,, ,, guttatum,	Trinidad.
,, ampliatum, *Lindl.*	Trinidad, Venezuela.
,, ,, major,	Trinidad.
,, Lanceanum,	Trinidad, Guiana.
,, Spruceanum,	New Grenada.
,, bifolium, *H.K.*	Trop.S.America, Trinidad.
,, sanguineum,	
,, barbatum, *Lindl.*	Tropical South America.
,, pulvinatum,	New Grenada.
,, altissimum, *Sw.*	W. Indies.
,, citrinum, *Lindl.*	Trinidad.
,, flexuosum *R.Br.*	Carupano.
,, papilio, *Lindl.*	Trinidad, Venezuela.
,, Cebolleta, *Sw.*	Trinidad, Venezuela.
ODONTOGLOSSUM Cervantesii, *Llave.*	Mexico.
,, grande, *Bate.*	Guatimala.
,, gloriosum,	Guatimala.
,, pulchellum,	Guatimala.
,, sp.	Jamaica.
BRASSIA verrucosa, *Bate.*	Guatimala.

BRASSIA Wrayii,	Guatimala.
,, maculata, *R. Br.*	Jamaica, Trinidad.
,, caudata, *Lindl.*	Jamaica.
MILTONIA stellata,	Brazil.
STANHOPEA grandiflora, *Lindl.*	Trinidad, Guiana.
PERISTERIA elata, *Hook.*	Panama, New Grenada, Venezuela.
,, pendula, *Hook.*	Trinidad, Demerara.
,, sp.	Trinidad.
BATEMANIA Colleyi, *Lindl.*	Trinidad, Demerara.
GONGORA atropurpurea, *Hook.*	Trinidad, Guiana.
,, maculata, *Lindl.*	Trinidad, Guiana.
CORYANTHES maculata, *Hook.*	Trinidad, Guiana.
ORNITHIDIUM confertum, *Grise.*	Trinidad, Cuba.
HUNTLEYA violacea, *Lindl.*	Trinidad, Guiana.
,, sp.	Trinidad.
ZYGOPETALUM cochleare, *Lindl.*	Venezuela, Brazil, Trinidad.
,, Mackayii, *Hook.*	Brazil.
MAXILLARIA alba,	Jamaica, Trinidad, Guiana.
,, rufescens, *Lindl.*	Trinidad, Venezuela.
,, pallidæflora, *Hook.*	Trinidad, Cuba, Venezuela
,, sp.	Trinidad (Cedros).
,, sp.	Trinidad (Saut d'Eau).
LYCASTE Skinnerii, *Lindl.*	Guatimala.
ANGULOA Clowesii,	Columbia.
CAMARIDIUM ochroleucum, *Lindl.*	Guiana, Venezuela.
PAPHINIA cristata, *Lindl.*	Trinidad, Guiana.
CATASETUM tridentatum, *Hook.*	Trinidad, Brazil.
MORMORDES sp.	Carupano.

CLOWESIA	rosea, *Lindl.*	Venezuela.
CYCHNOCHES	ventricosa, *Lindl.*	Brazil.
CYRTOPODIUM	Andersonii, *R.Br.*	Cuba to Brazil (Trinidad)
,,	cristatum, *Lindl.*	Trinidad, Guiana.
ORNITHOCEPHALUS	gladiatus, *Hook.*	Trinidad.
,,	Creugerii, *G.Rchb.*	Trinidad.
CRYPTARRHENIA	pallidæflora, *G. Rchb.*	Trinidad, Mexico, Ecuador.
TRIZEUXIS	falcata, *Lindl.*	Trinidad.
RODRIGUESIA	secunda, *Kunth.*	Trinidad, Venezuela, Brazil
BURLINGTONIA	candida, *Lindl.*	Demerara.
IONOPSIS	utricularioides, *Lindl.*	Jamaica, Trinidad.
,,	pallidæflora, *Lindl.*.	Trinidad.
CALANTHE	vestita, *Lindl.*	Tavoy.
,,	nivalis,	
,,	Veitchii,	
,,	,, superba,	
LIMATODES	rosea, *Lindl.*	Martaban.
POGONIA	Surinamensis, *Lindl.*	Trinidad, Guiana.
VANILLA	aromatica, *Grise.*	Western Tropics.
,,	planifolia, *Aud.*	Mexico to Brazil (Trinidad)
,,	claviculata, *Sw.*	Jamaica, Hayti.
,,	lutescens,	
SPIRANTHES	picta, *Lindl.*	Trinidad, Guiana, Brazil.
,,	,, variegata,	Trinidad.
,,	,, punctata,	Trinidad.
,,	simplex, *Grise.*	
PHYSURUS	plantagineus, *Lindl.*	Trinidad.
CYPREPIDIUM	Hookerii,	
,,	barbatum, *Lindl.*	Java.

CYPREPIDIUM venustum, *Wall.*	Nepal.
,, insigne, *Wall.*	Nepal.

ZINGIBERACEÆ.

GLOBBA sp.	E. Indies.
MANTISIA saltatoria,	E. Indies.
ZINGEBER officinale, *Rosc.*	Cultivated in Tropical Countries.
CURCUMA sp.	Trinidad.
,, Roscoeana,	India.
KEMPFERIA rotundæfolia, *L.*	Cultivated in Tropical Gardens.
AMOMUM granum-paradisi, *Hook. fil.*	Sierra Leone.
,, melagueta, *Rosc.*	West Coast Africa.
ELETTARIA cardamomum, *Maton.*	Malabar.
HEDYCHIUM angustifolium, *Rox.*	India.
,, flavescens, *B. C.*	India.
,, coronarium, *Kœn.*	Bengal, Cuba.
ALPINIA nutans, *Rosc.*	India, Ceylon, Philippines.
,, mutica,	Java.
,, Allughas, *Rosc.*	Malayan Peninsula.
COSTUS cylindricus, *Jacq.*	Trinidad, Guiana.
,, spiralis, *Rosc.*	Trinidad, Brazil.
,, spicatus, *Sw.*	W. Indies (Trinidad) Brazil
,, zebrinus,	New Grenada.

CANNACEÆ.

THALIA geniculata, *L.*	Trinidad, Guiana, Brazil.
MARANTA arundinacea, *L.*	Tropical S. America.
,, Indica, *Tuss.*	Western Tropics.
,, Tonchat, *Aubl.*	Western Tropics.

PHRYNIUM setosum, *Rosc.*	Brazil.
,, Porteanum,	Brazil.
,, sagarina,	Brazil.
CALATHEA discolor, *Mey.*	Trinidad, Guiana, New Grenada.
,, Allouya, *Lindl.*	Trinidad, Dominica, Guiana.
,, comosa, *Lindl.*	Trinidad, Guiana.
,, Van den Heckei,	Brazil.
,, bicolor, *Ker.*	Brazil.
,, sp.	Trinidad (Caroni).
,, sp.	Trinidad(Caroni&St.Ann).
CANNA Indica, *L.*	Jamaica, Venezuela.
,, Lamberti, *Lindl.*	Trinidad, Guiana.
,, edulis, *Ker.*	Trinidad, Guiana.
,, glauca, *L.*	Trinidad, Guiana.
,, Warcewiczii, *L.*	Brazil.

MUSACEÆ.

MUSA paradisiaca, *L.*	Tropics.
,, sapientum, *L.*	Tropics.
,, Cavendishii, *Pax.*	India, China.
,, vittata, *Hook.*	West Africa.
,, textilis,	Manilla, Java.
,, rosacea, *W.*	Mauritius.
HELICONIA Bihai, *L.*	Trinidad, Guiana to Peru.
,, pulverulenta, *Lindl.*	Trinidad, Guiana to Peru.
,, psittacorum, *L.*	Venezuela to Brazil.
,, buccinata, *Rox.*	Sumatra, Moluccas.
RAVENALA Madagascariensis, *Sonn.*	Madagascar.
STRELITZIA augusta, *Thunb.*	Cape Good Hope.

STRELITZIA regina, *H. K.*	Cape Good Hope.
PHENACOSPERMUM Guianensis, *Endl.*	Guiana.

IRIDEÆ.

CIPURA paludosa, *Aubl.*	Tropical America.
,, Martinicensis, *Kth.*	W. Indies, N. Grenada.
,, sp.	Trinidad.
WATSONIA speciosa,	
GLADIOLUS psittacinus, *L.*	

LILIACEÆ.

GLORIOSA superba, *L.*	Bengal, Assam.
HEMEROCALLIS fulva, *W.*	Levant.
AGAPANTHUS umbellatus, *L'Herit.*	Cape Good Hope.
POLIANTHES tuberosa, *L.*	Tropical America.
PHORMIUM tenax, *Forst.*	Australia.
SANSEVIERA Guineensis, *Wild.*	Guinea.
,, teretifolia,	Guinea.
,, sessiliflora, *Gard.*	China.
ALOE Soccotrina, *Lamb.*	Soccotra.
,, frutescens,	Cape Good Hope.
,, vulgaris, *Lamb.*	Tropics.
,, spinulosus,	Cape Good Hope.
,, coarctata, *Ræm et Schultes.*	Cape Good Hope.
YUCCA gloriosa, *W.*	S. United States America, Mexico.
,, sp.	
,, aloifolia, variegata, *L.*	Jamaica, Mexico.
SCILLA maculata,	
ORNITHOGALUM lacteum, *W.*	Cape Good Hope.
TULBAGHIA alliacea, *W.*	Cape Good Hope.

TRITONIA aurea, *Pappe.*	Cape Good Hope.
ASPARAGUS officinalis, *L.*	S. Europe.
,, sp.	Natal.
CORDYLINE heliconiæfolia,	Brazil.
,, Rumphii, *Hook.*	New Zealand.
,, sp.	South Africa.
,, rubra,	Australia.
DRACÆNA Draco, *W.*	Teneriffe, Socotra.
,, tesellata,	
,, arborea,	Sierra Leone.
,, Assamica,	Assam.
,, terminalis,	E. Indies, China.
,, nobilis,	
,, ferrea, *H. K.*	China.
,, cannæfolium,	
,, fragrans, *H. K.*	Africa.
,, gracilis,	
,, vivipara,	
,, sp.	Natal.
GASTERIA sulcata,	Cape Good Hope.
,, læte-puncatata,	Cape Good Hope.
,, verrucosa,	Cape Good Hope.
,, glabra,	Cape Good Hope.

DIOSCOREÆ.

DIOSCOREA alata, *L.*	Cultivated in most Tropical Countries.
,, ,, vars. a & b, *Grise.*	
,, bulbifera, *L.*	E. Indies, China.
,, Kegeliana, *Gr.*	Trinidad.
,, multiflora, *Presl.*	W. Indies (Trinidad).

DIOSCOREA	discolor,	Tropical South America, Trinidad.

COMMELYNACEÆ.

COMMELYNA	Cayennensis, *Rich.*	W. Indies (Trinidad) to Brazil, Tropical Africa.
,,	persicarifolia, *DC.*	
,,	elegans, *Kunth.*	Cuba to Brazil (Trinidad).
TRADESCANTIA	geniculata, *Jacq.*	W. Indies (Trinidad), Mexico to Brazil.
,,	discolor, *Swartz.*	Trinidad, Guadaloupe.
,,	umbellata, *Vahl.*	Trinidad, Brazil.
,,	Warcewiczii,	Brazil.
,,	sp.	Trinidad.
RAPATEA	paludosa, *Aubl.*	Brazil, Trinidad.
DICHORIZANDRA	Aubletiana, *Rich.*	Western Tropics.
,,	thyrsiflora, *Vand.*	Brazil.
,,	vittata,	
,,	undata,	Peru.

CYPERACEÆ.

,,	polystachyus, *Rott.*	Tropics.
,,	compressus, *L.*	Tropics.
,,	viscosus, *Ait.*	Western Tropics.
CYPERUS	laxus, *Lamb.*	Western Tropics.
,,	Surinamensis, *Rott.*	Mexico to Brazil (Trinidad)
,,	trichodes, *Grise.*	Jamaica, Trinidad.
,,	odoratus, *L.*	W. Indies (Trinidad).
,,	elatus, *L.*	E. and W. Indies, Guiana.

CYPERUS	Vahlii, *Steud.*	W. Indies (Trinidad).
,,	ligularis, *L.*	W. Tropics, S. Africa.
,,	densiflorus, *Mey.*	Western Tropics.
,,	cyclostachys, *Grise.*	Trinidad, Jamaica.
,,	flexuosus, *Vahl.*	Cuba to Brazil (Trinidad).
,,	giganteus, *Vahl.*	Trinidad, Guiana.
,,	esculentus, *L.*	Tropics, Italy, C. G. Hope.
,,	rotundus, *L.*	Tropics, and warmer temperate parts.
,,	alternifolius, variegatus,	New Zealand.
SCIRPUS	retroflexus, *Poir.*	Mexico to Brazil (Trinidad).
,,	capitatus, *L.*	Tropics.
,,	ferrugineus, *L.*	Tropics.
,,	brizoides, *Swartz.*	W. Tropics.
,,	capillaris, *L.*	Tropics.
,,	juncoides, *Wild.*	Cuba to Brazil.
KYLLINGA	brevifolia, *Rott.*	
,,	var. plurifolia, *Grise.*	Cuba to Brazil (Trinidad).
FUIRENA	umbellata, *Rott.*	Tropics.
DIPLASIA	karatifolia, *Rich.*	Trinidad, Guiana, Brazil.
RHYNCHOSPORA	cephalotes, *Vahl.*	Panama to Brazil (Trinidad).
,,	comata, *Link.*	Panama to Brazil (Trinidad)
,,	curvata, *Grise.*	Trinidad.
,,	cyperoides, *Mart.*	Mexico to Brazil (Trinidad)
,,	stenorhyncha, *Grise.*	Trinidad.
,,	Surinamensis, *Nees.*	Tropics.
,,	filiformis, *Vahl.*	Trinidad, Brazil.
,,	Vahliana, *Grise.*	Western Tropics.
,,	Persooniana, *Grise.*	Mexico to Guiana (Trinidad)

SCLERIA pratensis, *Lindl.*	Cuba to Brazil (Trinidad).
,, latifolia, *Swartz.*	W. Indies.
,, bracteata, *Cav.*	Cuba to Peru (Trinidad).
CALYPTROCARYA angustifolia, *Nees.*	Trinidad, Brazil.

GRAMINEÆ.

ANDROPOGON brevifolius, *Swartz.*	Tropics.
,, condensatus, *Kunth.*	Western Tropics.
,, fastgiatus, *Swartz.*	Western Tropics.
,, Schœnanthus, *L.*	Asia.
SORGHUM vulgare, *Pers.*	Tropics, and S. Europe.
ANATHERUM muricatum, *P. B.*	E. Indies.
SACCHARUM officinarum, *L.*	E. Indies.
,, ,, var. Otaheite.	
,, ,, ,, Congo.	
,, ,, ,, Yellow Creole.	
,, ,, ,, Purple Cane.	
,, ,, ,, Bourbon.	
,, ,, ,, White Cane.	
,, ,, ,, Ribbon Cane.	
BAMBUSA gigantea, *Wall.*	Burmah.
,, regia, *Thoms.*	Burmah.
,, vulgaris, *Schred.*	E. Indies.
,, spinosa, *Rox.*	Bengal.
,, Sieberi, *Grise.*	E. Indies.
,, sp.	Trinidad.
STREPTOGYNE crinita, *P. B.*	S. United States, to Guiana (Trinidad).
ERAGROSTIS pilosa, *P. B.*	Tropics.

ERAGROSTIS ciliaris, *Link.*	Tropics.
ELEUSINE Indica, *Grise.*	Tropics.
LEPTOCHLOA mucronata, *Kunth.*	Tropics.
,, virgata, *P. B.*	Western Tropics.
,, filiformis, *R. et P.*	Trop. America (Trinidad).
CHLORIS radiata. *Kunth.*	Tropics.
,, polydactyla, *Swartz.*	Mexico to Brazil (Trinidad)
ISACHNE arundinacea, *Grise.*	W. Indies (Trinidad) Tropical South America.
ERIOCHLOA punctata, *Hamilt.*	W. Indies (Trinidad).
GYNERIUM argenteum, *H.B.K.*	Brazil.
SPOROBOLUS virginicus, *Kunth.*	Tropical Swamps (Trinidad
,, littoralis, *Kunth.*	South Canada to extreme South America.
,, Jacquemontii,	Western Tropics.
,, Indicus, *R. Br.*	Tropics.
ANTHEPHORA elegans, *Schreb.*	Mexico to Brazil (Trinidad)
CENCHRUS echinatus, *L.*	Tropics.
SETARIA glauca, *P. B.*	Temperate & Trop. Zones.
OPLISMENUS hirtellus, *R. Br.*	Guiana, Trinidad.
,, variegatus,	Pacific Islands, Australia.
PANICUM colonum, *L.*	Tropics.
,, crus-galli,	Temperate, and most Tropical Countries.
,, fuscum, *Swartz.*	Mexico to Brazil (Trinidad)
,, molle, *Swartz.*	Tropics.
,, distichum, *Lamb.*	Mexico to Brazil (Trinidad)
,, stoloniferum, *Poir.*	Guiana to Brazil (Trinidad)
,, maximum, *Jacq.*	Western Tropics.
,, brevifolium,	W. Indies (Trinidad).

PANICUM	palmifolium, *Poir.*	Jamaica, Trinidad.
,,	sulcatum, *Aubl.*	Mexico to Brazil (Trinidad)
,,	lanatum, *Swartz.*	W. Indies (Trinidad) Panama to Brazil.
,,	oryzoides, *Swartz.*	Jamaica, Trinidad, Guiana to Brazil.
,,	sordidum, *Thomp.*	Trinidad.
,,	pallens, *Swartz.*	Tropics.
OLYRA	latifolia, *L.*	W. Indies (Trinidad) Mexico to Brazil.
PASPALUM	compressum, *Nees.*	Western Tropics.
,,	conjugatum, *Berg.*	Western Tropics, Africa.
,,	distichum,	Tropics, and Australia.
,,	notatum, *Flügg.*	Tropical America, Trinidad
,,	decumbens, *Swartz.*	Trinidad, Venezuela.
,,	virgatum, *L.*	W. Indies (Trinidad) Mexico to Uruguay.
VILFA	parvana, *Steud.*	W. Indies, Trop. America.
COIX	lachryma, *L.*	Tropics.
ORYZA	sativa, *L.*	Cultivated in most Tropical and some Temp. Countries.
ZEA	Mays, *L.*	Tropics.

POLYPODIACEÆ.

OLEANDRA	nodosa, *Presl.*	W. Indies (Trinidad), Guiana.
,,	neriiformis, *Cav.*	Western Tropics.
DAVALLIA	pentaphylla, *Blume.*	Malayan Archipelago.
,,	dissecta, *J. Sm.*	Java.
,,	solida, *Sw.*	
POLYPODIUM	pectinatum, *L.*	Trinidad, Trop. America.

POLYPODIUM paradisiæ, *Lang. et Fisch.* Brazil.
LEPICYSTIS squamata, *J. Sm.* W. Indies (Trinidad).
GONIOPHLEBIUM loriceum, *J. Sm.* Trinidad, Trop. America
,, lætum, *J. Sm.* Trinidad, Brazil.
,, meniscifolium, *J. Sm.* Trinidad, Brazil.
,, dissimile, *J. Sm.* Trinidad, Jamaica.
,, neriifolium, *J. Sm.* Western Tropics.
SCHELLOLEPIS subauriculata, *J. Sm.* Malayan Archipelago
PHLEBODIUM aureum, *R. Br.* Trinidad, Trop. America.
,, sporodocarpum, *J. Sm.* Trinidad, Trop. America.
,, dictyocallis, *J. Sm.* Trinidad, Trop. America.
LOPHOLEPIS piloselloides, *J. Sm.* Western Tropics.
,, vaccinifolia, *J. Sm.* Trinidad, Brazil.
ANAPELTIS serpens, *J. Sm.* W. Indies (Trinidad).
,, lycopodioides, *J. Sm.* W. Indies (Trinidad).
,, sp. Trinidad.
NIPHOPSIS augustatus, *J. Sm.* Malayan Archipelago.
NEVRODIUM lanceolatum, *Fee.* W. Indies (Trinidad).
DICRANOGLOSSUM furcatum, *J. Sm.* Western Tropics.
PHYMATODES vulgaris, *Presl.* Ceylon, Africa.
PLEURIDIUM crossifolium, *Fee.* Trinidad, Trop. America.
,, albo-punctatum, *J. Sm.* Trinidad, Trop. America.
SELLIGUEA caudiforme, *J. Sm.* Java.
COLYSIS membranacea, *J. Sm.* E. India.
MICROSORUM irioides, *Fee.* E. Indies, Trinidad.
NIPHOBOLUS lingua, *Spruce.* E. Indies, China.
CAMPYLONEURON ensifolium, *J. Sm.* Western Tropics.
,, phyllitidis, *Presl.* Trop. America, Trinidad.
ELAPHOGLOSSUM conforme, *Schott.* Tropics.

ELAPHOGLOSSUM latifolium, *J. Sm.*	Trop. Amer., Trinidad.
,, L'Herminieri, *J. Sm.*	Trop. America, Trinidad.
,, cuspidatum, *J. Sm.*	Trop. America, Trinidad.
,, undulatum, *J. Sm.*	Dominica, Trinidad.
,, Feei, *Bory.*	Trinidad.
,, sp.	Trinidad.
HYMENODIUM crinitum, *Fee.*	W. Indies (Trinidad).
ANETIUM citrifolium, *Splitz.*	W. Indies (Trinidad).
POLYBOTRYA caudata, *Kunze.*	Western Tropics.
,, osmundacea, *Humb.*	Western Tropics.
LOMARIOPSIS sorbifolia, *Fee.*	W. Indies (Trinidad).
,, longifolia, *J. Sm.*	Western Tropics.
OLFERSIA cervina, *Presl.*	Trop. America, Trinidad.
SOROMANES serratifolium, *Fee.*	Trinidad, Venezuela.
GYMNOPTERIS aliena, *Presl.*	Trop. America, Trinidad.
,, sp.	Trinidad.
,, nicotianæfolia, *Presl.*	W. Indies (Trinidad).
NEUROCALLIS præstantissima, *Fee.*	W. Indies (Trinidad).
ACROSTICHUM aureum, *L.*	Tropics and sub-tropics of both hemispheres.
PLATYCERIUM stemaria, *Desv.*	W. Africa.
XIPHOPTERIS serrulata, *Kaulf.*	Western Tropics.
GYMNOGRAMME calomelanos, *Kaulf.*	Western Tropics.
,, tartarea, *Desv.*	Trop. America, Trinidad.
,, L'Herminieri, *Kunze.*	Guadeloupe.
,, sulphurea, *Desv.*	Jamaica.
HEMIONITIS cordifolia, *Rox.*	E. Indies.
,, palmata, *L.*	W. Indies (Trinidad).
ANTROPHYUM lineatum, *Kaulf.*	W. Indies (Trinidad).
,, lanceolatum, *Kaulf.*	W. Indies (Trinidad).

ANTROPHYUM	Cayennensis, *Kaulf.*	Trinidad, Trop. Amer.
HAPLOPTERIS	lineata, *J. Sm.*	Trinidad, Trop. America.
DRYOMENIS	plantaginea, *J. Sm.*	W. Indies (Trinidad).
MENISCIUM	giganteum, *Mett.*	Trinidad, Trop. America.
,,	palustre, *Radd.*	Trinidad, Brazil.
,,	reticulatum, *Swartz.*	Trinidad, Trop. America.
,,	dentatum, *Presl.*	Trinidad, Brazil.
,,	sp.	Trinidad (Aripo).
GONIOPTERIS	asplenioides, *Presl.*	Trinidad, Jamaica.
,,	crenata, *Presl.*	W. Indies (Trinidad).
,,	tetragona, *Presl.*	W. Indies (Trinidad).
,,	serrulata, *J. Sm.*	Jamaica, Trinidad.
NEPHRODIUM	refractum, *J. Sm.*	Trinidad, Brazil.
,,	venustum, *J. Sm.*	Trinidad, Jamaica.
,,	molle, *R. Br.*	Tropics.
,,	patens, *J. Sm.*	Trinidad, Demerara.
CYCLODIUM	confertum, *Presl.*	Trinidad, Guiana, Bahai.
FADYENIA	prolifera, *Hook.*	Jamaica.
ASPIDIUM	Plumieri, *Presl.*	Trinidad, Martinique, Dominica.
,,	trifoliatum, *Swartz.*	Trinidad, Trop. America.
,,	macrophyllum, *Swartz.*	Trinidad, Trop. America.
,,	cicutarium, *Swartz.*	Trinidad, Jamaica.
HYPODERRIS	Brownii, *J. Sm.*	Trinidad, Guiana.
LASTREA	invisa, *Presl.*	W. Indies (Trinidad).
,,	quinquangulare, *J. Sm.*	Trinidad.
,,	patens, *Presl.*	Western Tropics.
ARTHOPTERIS	obliterata, *J. Sm.*	Australia, Malayan Isles.
NEPHROLEPIS	exaltata, *Schott.*	Western Tropics.
,,	ensifolia, *Presl.*	East Indies.

DIDYMOCHLÆNA lunulata, *Desv.*	Western Tropics, Malayan Archipelago.
AMPHIDESMIUM blechnoides, *Klotsch.*	Tropical America, Trinidad.
PHEGOPTERIS ampla, *Fée.*	Martinique, Trinidad.
,, spectabilis, *Fée.*	Trinidad, Trop. America.
,, lachnopoda, *J. Sm.*	Trinidad, Jamaica.
,, divergens, *Fée.*	W. Indies (Trinidad).
,, effusa, *Fée.*	W. Indies (Trinidad).
HYPOLEPIS repens, *Presl.*	W. Indies (Trinidad).
CHEILANTHES microphylla, *Sw.*	Trop. America, Trinidad.
,, radiata, *J. Sm.*	Trop. America, Trinidad.
PLATYLOMA falcata, *J. Sm.*	E. Indies, Australia.
ADIANTUM caudatum, *L.*	E. Indies.
,, lucidum, *Swartz.*	Western Tropics.
,, obliquum, *Wild.*	Trop. America, Trinidad.
,, macrophyllum, *Swartz.*	Western Tropics.
,, pulverulentum, *L.*	Western Tropics.
,, intermedium, *Swartz.*	Trop. America, Trinidad.
,, prionophyllum, *H.B.K.*	Trop. America, Trinidad.
,, fovearum, *Radd.*	Trinidad, Brazil.
,, trapeziforme, *L.*	Western Tropics.
,, cultratum, *J. Sm.*	Trinidad, Trop. America.
,, tenerum, *Swartz.*	Western Tropics.
,, concinnum, *H. B. K.*	Tropical America.
,, cuneatum, *L. et F.*	Brazil.
PTERIS cretica, albo-lineata, *Hook.*	
,, heterophylla, *L.*	Jamaica.
,, sulcata, *Link.*	Trinidad, Brazil.
,, argyrea, *Moore.*	E. Indies.

PTERIS	tremula, *R. Br.*	New Zealand.
,,	laciniata, *Wild.*	W. Indies (Trinidad).
,,	aquilina, *L.*	Trop. and temperate zones of both hemispheres.
LITOBROCHIA	grandiflora, *J. Sm.*	Trop. America, Trinidad.
,,	macroptera, *J. Sm.*	Trop. America, Trinidad.
,,	podophylla, *Presl.*	W. Indies (Trinidad).
,,	biaurita, *J. Sm.*	W. Indies (Trinidad).
DORYOPTERIS	sagittifolia, *J. Sm.*	Brazil.
,,	pedata, *J. Sm.*	Brazil.
LONCHITIS	Lindeniana, *Hook.*	Trinidad, Trop. America.
BLECHNUM	longifolium, *H.B.K.*	Trinidad, Trop. S. America.
,,	Braziliensis, *Desv.*	Brazil.
,,	occidentale, *L.*	Trinidad, Trop. America.
,,	serrulatum, *Rich.*	Trinidad, Trop. America.
DOODIA	caudata, *R. Br.*	Australis.
LOMARIA	onocleoides, *Spreng.*	Western Tropics.
SALPICHLÆNA	volubile, *J. Sm.*	Western Tropics.
ASPLENIUM	serratum, *L.*	Trinidad, Trop. America.
,,	crenulatum, *L.*	Trinidad, Trop. America.
,,	salicifolium, *L.*	Trinidad, Trop. America.
,,	obtusifolium, *L.*	W. Indies (Trinidad).
,,	firmum, *Kunze.*	W. Indies (Trinidad).
,,	dentatum, *L.*	W. Indies (Trinidad).
,,	Belangeri, *Kunze.*	Java.
,,	Fabianum, *Homb.*	Mauritius, Australia.
,,	dimorphum, *Kunze.*	Norfolk Island.
,,	viviparum, *Presl.*	Mauritius.
,,	cicutarium, *Sw.*	South America, Trinidad.
,,	cirrhatum, *Rich.*	Trop. America, Trinidad.

ASPLENIUM	auritum, *Swartz.*	Trop. America, Trinidad.
,,	macilenta, *Kunze.*	Trop. America, Trinidad.
,,	fragrans, *Swartz.*	Jamaica, Trinidad.
DIPLAZIUM	plantagineum, *Sw.*	Trop. America, Trinidad.
,,	grandifolium, *Sw.*	Trop. America, Trinidad.
,,	juglandifolium, *Sw.*	Venezuela, Trinidad.
,,	Shepperdi, *Link.*	W. Indies (Trinidad).
,,	striatum, *Presl.*	Trop. America, Trinidad.
,,	sylvaticum, *Swartz.*	E. Indies, Trinidad.
,,	Franconis, *Lieb.*	Mexico, Jamaica, Trinidad.
NEOTTOPTERIS	Australasica, *J. Sm.*	New South Wales.
,,	nidus, *J. Sm.*	E. Indies.
HEMIDICTYON	marginatum, *Presl.*	Trinidad, Trop. America
LINDSÆA	trapeziformis, *Dry.*	Western Tropics.
,,	stricta, *Dry.*	Western Tropics.
,,	Guianensis, *Dry.*	Trinidad, Guiana.
SACCOLOMA	elegans, *Kaulf.*	W. Indies (Trinidad).
SITOLOBIUM	adiantoides, *J. Sm.*	Trinidad, Trop. America.
,,	Pavoni, *J. Sm.*	Trinidad, Trop. America.
,,	dissectum, *J. Sm.*	W. Indies (Trinidad).
CYATHEA	arborea, *Swartz.*	W. Indies (Trinidad).
,,	aculeata, *Wild.*	W. Indies (Trinidad).
HEMITELIA	speciosa, *Kaulf.*	Trinidad, Trop. America.
,,	grandifolia, *Spreng.*	W. Indies (Trinidad).
,,	horrida, *R. Br.*	W. Indies (Trinidad).
ALSOPHILA	ferox, *Presl.*	Trinidad, Trop. America.
,,	aculeata, *J. Sm.*	Western Tropics.
,,	sagittifolia, *Hook.*	Trinidad.
LOPHOSORIA	pruinata, *Presl.*	Trinidad, Trop. America.

GLEICHENIA	dichotoma, *Hook.*	Tropics and sub-tropics of southern hemisphere.
,,	furcata, *Spreng.*	E. Indies, Trinidad.
,,	longipinnata, *Kl.*	Trinidad.
HYMENOPHYLLUM	asplenoides, *Swartz.*	Western Tropics.
,,	polyanthos, *Swartz.*	Western Tropics.
,,	fucoides, *Swartz.*	Western Tropics.
,,	ciliatum, *Swartz.*	Western Tropics.
,,	hirsutum, *Swartz.*	Western Tropics.
,,	hirtellum, *Swartz.*	Trinidad, Jamaica.
,,	sericeum, *Swartz.*	Western Tropics.
TRICHOMANES	membranaceum, *L.*	W. Indies (Trinidad).
,,	muscoides, *Swartz.*	W. Indies (Trinidad).
,,	Krausii, *Hook. et Grev.*	W. Indies (Trinidad).
,,	sinuosum, *Rich.*	W. Indies (Trinidad).
,,	pyxidiferum, *L.*	W. Indies (Trinidad).
,,	trichoideum, *Swartz.*	W. Indies (Trinidad).
,,	crispum, *L.*	Trinidad, Trop. America.
,,	Kaulfussi, *Hook. et Grev.*	Trinidad, Trop. America.
,,	alatum, *Swartz.*	Trinidad, Trop. America.
FEEA	spicata, *Presl.*	W. Indies (Trinidad).
,,	nana, *Bory.*	Trinidad, Guiana.
HYMENOSTACHYS	elegans, *Presl.*	Trinidad, Guiana.
LYGODIUM	volubile. *Swartz.*	Trinidad, Guiana to Brazil.
,,	venustum, *Swartz.*	Mexico to Brazil.
ANEMIA	adiantifolia, *Swartz.*	Western Tropics.
ANEMYDICTYON	phyllitidis, *J. Sm.*	Western Tropics.
SCHIZEA	elegans, *Swartz.*	Trinidad, Trop. America.

MARATTIACEÆ.

MARATTIA	alata, *Sm.*	W. Indies (Trinidad).

DANEA	nodosa, *Sm.*	Western Tropics.
,,	elliptica, *Sm.*	Western Tropics.
,,	stenophylla, *Kunze.*	Trinidad, Jamaica.

OPHIOGLOSSACEÆ.

OPHIOGLOSSUM	reticulatum, *L.*	Tropics.
,,	palmatum, *L.*	W. Indies (Trinidad) Tropical South America.

LYCOPODIACEÆ.

PSILOTUM	triquetrum, *Swartz.*	Tropics and sub-tropics of both hemispheres.
SELAGINELLA	serpens, *Spring.*	Cuba.
,,	cuspidata, *Link.*	Tropical South America.
,,	flabellata, *Spring.*	Tropics.
,,	stolonifera, *Spring.*	W. Indies (Trinidad).
,,	ciliauricula,	W. Indies (Trinidad).
,,	Lobbi,	Borneo.
,,	felicina, *Spring.*	Columbia, Peru.
LYCOPODIUM	carolinianum, *L.*	Tropics.
,,	clavatum, *L.*	Tropics.
,,	cernuum, *L.*	Tropics.
,,	phlegmaria, *L.*	Tropics.
,,	taxifolia, *L.*	W. Indies (Trinidad), Peru
,,	verticellatum, *L.*	W. Indies (Trinidad), Brazil, Natal.

ADDENDA ET CORRIGENDA.

PAGE

251 Read scabrella for scaberella.
253 „ Nymphæaceæ for Nymphaceæ.
254 „ Cruciferæ for Crucifereæ.
255 „ volubilis for volubile ; and add after 8th line—Canella alba, *Murr.* West Indies.
259 Add after 3rd line—Bombax ellipticum, *H.B.* Tropical South America.
261 Read nuciferum for nuciferm.
267 Add after last line—CONNARACEÆ.
Connarus Guianensis, *Lamb.* Trinidad, Guiana.
292 Read Petesia for Potesia, and parvifolia for pavifolia.
293 „ angustifolia for angostifolia.
294 „ Distreptus for Distrepus.
296 „ Clomenocoma for Clemenocoma.
298 „ Cainito, *L.* for Caimito, *Wild.*
299 „ Lisianthus for Lasianthus, and after 17th line add Buddleya Madagascariensis, *Lamb.*
301 „ Hæmadictyon for Hemydictyon, Cryptostegia for Cryptostegia.
304 „ Gerascanthus for gerascanthus.
305 „ Labiatæ for Labiateæ.
306 „ volubilis for volubile ; and after 20thline add Aloysia citriodora, *Ort.* Chili.
307 Add after 27th line—Acanthus montanus, Fernando Po.
308 Read Aphelandra for Alphelandra, and Cyrtanthera catalpæfolia, Honduras, for C. Catafræfolia Brazil.
309 „ Cucurbitina for Curcubitina, and after 17th line add:

Tecoma	leucoxylon, *Mart.*	W. Indies (Trinidad), Guiana.
„	pentaphylla, *DC.*	Trinidad, Guiana, St. Vincent.
„	serratifolia, *Don.*	St. Vincent, Trinidad.
„	spectabilis, *Planch.*	St Vincent, Trinidad.
„	Stans, *Juss.*	Western Tropics.
„	jasminoides, *Lindl.*	Moreton Bay.
Jacaranda	mimosæfolia, *Don.*	Brazil.
„	paulistana, *Silv.*	Brazil.

310 Read rubra for nebra.
311 „ Scrophularineæ for Schophalarieæ, and Antirrhinum for Anterrhinum.

ADDENDA ET CORRIGENDA.

PAGE
312 Read Polygonaceæ for Polygalaceæ.
313 „ sanguineus for sanguinens, and Aydendron for Ayedendron.
314 „ De Jonghii for De Tonghii.
315 „ acerifolia for acrifolia, and Mæhringii for Mærhingii.
316 „ Mæhringii for Mæringhii.
317 „ Manihot for Mainhot, and Cœlebogyne for Cælebogyne.
318 Add after 10th line—Emblica officinalis, Moluccas.
319 Read conglomerata for congomerata, and Cannabineæ for Cannabiniæ.
320 „ torulosa for torolosa.
321 „ Menziesii for Menzicsii.
322 „ borealis glauca for borealis *glanca*.
326 Cancel Acrocomia vulgare *L.* and A. rostrata, *Hook*; and after A. Mexicana read Astrocaryum vulgare, *L.* and A. rostratum, *Hook.*
329 Add after 2nd line—BUTOMACEÆ.
Limnocharis Humboltii, Trinidad, Brazil.
332 Read Cyrtopera for Cyotopera.
334 Add after 27th line—Scuticaria Steelii, *Lindl.* Guiana.
335 Read Cycnoches for Cychnoches, Cryptarrhena for Cryptarrhenia, and Cypripedium for Cyprepidium.
336 „ Zingiber for Zingeber.
338 Add after 8th line :—AMARYLLIDEÆ.

Amaryllis equestris, *Ait.*	W. Indies (Trinidad), Guiana.
„ Belladona, *L.*	
„ carinata, *Spreng.*	Western Tropics.
Vallota purpurea, *Herb.*	Cape Good Hope.
Crinum aquaticum, *Birch.*	Cape Good Hope.
„ revolutum,	Maranham.
„ asiaticum,	China
„ amabile	East Indies.
Hæmanthus coccineus, *Wild.*	Cape Good Hope.
„ tigrinus, *Wild.*	Cape Good Hope.
Hypoxis decumbens, *L.*	Trinidad, Brazil
Pancratium caribæum, *L.*	W. Indies (Trinidad).
„ speciosum, *L.*	W. Indies (Trinidad).
„ Mexicanum, *Kunth.*	Mexico.
Alstræmia psittacina, *Lchm*	Mexico.
„ sp.	Trinidad (Carenage).
Clivia nobilis, *Lindl.*	Cape Good Hope.
„ Aitoni, *Hook.*	Cape Good Hope.

ADDENDA ET CORRIGENDA.

Page		
	Agave americana, *L.*	Mexico, W. Indies.
	„ „ variegata.	Mexico.
	„ Saundersii, *Hook.*	Mexico.
	„ sp.	Mexico.
	Fourcroya gigantea, *Vent.*	Western Tropics.
	BROMELIACEÆ.	
	Ananassa sativa, *Lindl.*	Tropical South America.
	„ „ vars Red	Antigua.
	„ „ Black	Jamaica.
	„ „ Queen.	
	„ „ South Queen.	
	„ „ Pitch Lake (Trinidad).	
	Nidularium Karatas, *Lemair.*	Cuba to Guiana.
	Bromelia pinguin, *L.*	W. Indies (Trinidad), Guiana.
	Achmea fulgens, *Paxt.*	Tropical South America.
	„ bracteata, *Grise.*	W. Indies (Trinidad).
	„ sp.	Trinidad.
	„ paniculigera, *Gr.*	Trinidad, Venezuela.
	Macrochordium melananthum, *Beer.*	Trinidad, Guiana.
	Brocchinia Plumierii, *Grise.*	W. Indies (Trinidad).
	Pitcairnia tabulæformis,	Australia.
	„ angustifolia, *Ait.*	Mexico, W. Indies.
	Tillandsia setacea, *Swartz.*	W. Indies.
	„ compressa, *Bert.*	Jamaica, Trinidad.
	„ Balbisiana, *Schultz.*	W. Indies (Trinidad).
	„ flexuosa, *Swartz.*	Trinidad, Venezuela.
	„ glutinosa, *Mart.*	Trinidad.
	„ bulbosa, *Hook.*	Jamaica, Trinidad.
	„ argentea,	Brazil.
	„ amæna, *Lodd.*	W. Indies (Trinidad).
	„ anceps, *Lodd.*	W. Indies (Trinidad).
	„ excelsa, *Grise.*	W. Indies (Trinidad).
	„ usneoides, *L.*	Western Tropics.
	Guzmannia tricolor, *R.P.*	Cuba, Trinidad, Venezuela
	Caraguata lingulata, *Lindl.*	W. Indies (Trinidad), Guiana.
339	Read Tritoma for Tritonia, and add after 23rd line—	
	PONTEDERIACEÆ.	
	Pontederia crassipes, *Mart.*	Trinidad, Guiana.
344	Add after Oryza sativa, O. latifolia, *Desv.*	
347	Read Bahia for Bahai.	
	„ Arthropteris for Arthopteris.	

PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART VII.] [JUNE 1869.

Tuesday, 12*th* *January*, 1869.

R. J. LECHMERE GUPPY, F.G.S., F.L.S., &c., President, in the Chair.

The following Visitor was introduced ;—Dr. Forbes Newsam, by Mr. Lambert.

The following donations were announced :—

1. "The Annals of the Lyceum of Natural History of New-York." April, 1868. Presented by the Lyceum.

2. "Notes on the Land Shells of Trinidad, Grenada, and Dominica." By Thomas Bland, Esq., F.G.S. Presented by the Author.

The Secretary read the following Report :—

As Secretary I have to present the following statement of the progress of the Association during the past twelve months, and of its condition at the end of that period.

The numbers of the Association do not show any augmentation since the last Report. This is in some measure owing to the fact that the names of several of our former members have been removed from the list in consequence of non-compliance with the rules.

We have elected 5 members and 2 corresponding members during the preceding year ; one of the latter has been elected a full member, and is included in the former number. Three of the previous members have been removed from the list, and three have resigned, leaving the composition of the Association as follows :—

Members	25
Honorary Member	1
Corresponding Members	11
Total	37

being a decrease of one member and an increase of one corresponding member as compared with the previous year.

The finances are, is to be noted, in a prosperous condition. The balance, however, would not have been so large had not the Fourth Part of our Proceedings fallen below the average size owing to the paucity of papers read during the first half of the year now under consideration. On the other hand during the last three months our expenses have been much increased by our meetings taking place in a room in a public building, and the necessity we have been under of providing some articles of furniture as well as refreshments for the members. Though this will be felt more in the ensuing year, I see no reason to fear that our finances will prove insufficient, a proper degree of economy being maintained.

The hope expressed by the Secretary in his last report that the sale of the Proceedings would show an increase in the year just ended, has been amply realized, and it is gratifying to see so respectable an addition to our resources under this head; much of this is due to the sale of our Proceedings in England, a publisher in London having undertaken the Agency there.

The following is the balance-sheet of the Association on 31st December last :—

Receipts.	$	c.	Payments.	$	c.
Balance, 1st Jan. 1868......	27	10	Printing, &c.	67	22
Subscriptions received......	99	90	Postage and Stationery.....	8	84
Corresponding Members ...	9	95	Expenses of Meetings.......	14	71
Sale of Proceedings	30	51	Furniture........................	12	85
			Remittances and Charges...	3	72
			Balance, 31st Dec. 1868...	60	12
	$167	46		$167	46

The following list comprises the Papers that have been read :—

1. The Annual Report of the Secretary.

2. Table of Rainfall for 1863–4–5–6–7. By T. W. Carr.

3. R. J. Lechmere Guppy, F.L.S. & G.S.—Note on the Earthquake of 7th July, 1868.

4. Capt. Henry Kelsall, A.D.C., of H.M. 16th Regt.—Notice of the occurrence of the Scarlet Tanager in Trinidad.

5. The Hon. R. Hill.—On Poisonous Fishes.

6. Dr. Günther, F.R.S., &c.—Note on Three Cyprinodontes, Small Freshwater Fishes of Trinidad.

7. The Hon. R. Hill.—On Fish-poisons.

8. R. J. Lechmere Guppy, F.G.S. & L.S.—Further additions to the catalogue of Land and Freshwater Molluska of Trinidad.

9. Henry Prestoe, Government Botanist.—Catalogue of Plants in the Botanic Garden.

The latter paper which is a valuable contribution to our stock of knowledge relative to this Island, will appear in the next Part of our Proceedings. As it will occupy much space, special arrangements have been made by which the expense of printing will not fall on the Association.

Donations of various publications have been made by the Sociedad de Ciencias of Caracas, and the exchange of our respective proceedings has been agreed-to by that Society and ourselves. It is much to be wished that other scientific bodies in this part of the world, of which there are unfortunately but few, would similarly unite with us in the diffusion of valuable information.

Allusion has already been made as to our having obtained a place of meeting in a public building. Our accommodations are, however, anything but satisfactory, and it is to be hoped that before long better arrangements on this point will be made.

I should bring under the notice of the Association the necessity which will soon arise for binding the papers and books presented to the Society, and of adopting some rules whereby such donations may be made more accessible to the members for reading and reference.

HENRY F. J. GUPPY,

Secretary & Treasurer.

The following communication was read :—

Notes of a Voyage round the Island of Trinidad in October, 1868.

By THOMAS WILLIAM CARR.

(Communicated by the President.)

PART I.

(ABRIDGED.)

Mr. William Tucker having invited me to accompany him on a coasting voyage, I gladly took advantage of his invitation, with a view to make myself better acquainted with the geography and natural history of the island. We sailed from Port-of-Spain on the 11th October last, and ran down to Monos to take in ballast. We neared that Island towards 3 p.m. during a southerly squall heralded by thunder and accompanied by driving rain, the wind veering round to east, and going down in about three-quarters of an hour as the storm passed by to the West.

We were fortunately so close to our destination that we were able to gain shelter behind Dominique Point, and run into l'Anse Maho in the bottom of Dehert Bay, anchoring just as the squall and gloom reached their height. We lay nearly landlocked ; and the storm, by the rapidity of its passage, not having had time to raise a sea in the Gulf, we were in still water.

This squall recalled to our minds that it was the anniversary of the last Hurricane by which the island had been visited : this, the only Hurricane of which I (or Mr. Tucker) had had any experience, set in near midnight of the 11th October, 1847, lasting in strong but fitful blasts for about 3 hours. Trinidad was swept by the southern skirt of a Hurricane, which having exerted its full force in passing over Tobago, ran in a path nearly parallel with our Northern shores, striking Carupano and Pampatar (Margarita.) Its influence was slight to the south of the Caroni and the Oropouche rivers, and in Naparima it was not felt at all. In Trinidad, Toco suffered most, being nearer to the heart of the storm than any other exposed quarter. In town, the Dry river ran wild, and the bridges were carried away. In the vallies running down through and from the northern range of mountains, Cacao estates suffered from the fall of the Bois Immortels ; fallen Bamboos choked the Carenage road where it passes through the Hope estate in the mouth of the Diego-Martin valley, and Plantain and Manioc fields suffered much. Beyond the injuries and the wreck of the boats and droghers in our harbor, no further notable harm was done. The larger craft held to their anchors, as they generally have done here in similar cases, thanks to our excellent holding ground (mud), to our enclosed position, and to the merely third or fourth-class character of the few Hurricanes by which we are visited. Only four Hurricanes are recorded as having touched this island within the present century ; they occurred on

18th October, 1809.
12th August, 1810.
23rd June, 1831.
12th October, 1847.

That of 1831 was the worst, and was felt throughout the Island—the wooden jetties at San Fernando and Port-of-Spain were destroyed, many feluccas wrecked and several ships were driven on shore, but the bottom being mud these were subsequently hauled back into deep water unhurt. On this occasion also the Dry River overflowed its banks.

The plants I particularly noticed in Monos were the following :—

Tecoma stans (Bois flambeau.)
Cnidoscolus napaeformis.
Lantana camara (Sage.)
L. radula.
Cordia cylindristachys (Black Sage.)
C. interrupta.
Blechum Brownei.
Stachytarpheta cayennensis } (Bastard Vervains.)
S. jamaicensis }
Cassia bacillaris.
Cosmos sulphureus.
Desmodium axillare.
D. incanum.
Crotolaria incana.
Evolvulus sericeus.
Pitcairnia angustifolia.
Anthusium Huegeli.
Wulffia havanensis.
Randia aculeata.
Chiococca racemosa var.
Pithecolobium oblongum.
Bumelia buxifolia.
Brunsfelsia fallax.
Critonia parviflora.
Peperomia obtusifolia.
Pedilanthus tithymaloides.
Solanum lanceifolium.
S. radula.
Miconia sp.
Macfadyena sp.

Ogiera ruderalis.
Wedellia caracasensis.
Paritium tiliaceum.
Sophora tomentosa.
Acacia paniculata ?
Combretum sp.
Gomphia nitida.
Dioclea guianensis.
Cypsela humifusa.
Lonchocarpus pentaphyllus.
Securidaca Brownei.

A small tree, 12-15 feet high, not unlike, in stem, branching and proportions, that I can recollect a standard Apple tree to be, and that grew pretty commonly along the cliffy shores, presented a beautiful appearance, having shed its leaves, or nearly all, and being in full blossom with delicate bright-yellow spreading-petalled flowers. The long narrow-based expanding yellow petals remind one of the orchid-like flowers of the Stigmaphyllon convolvulifolium, a wild vine running over wild shrubs in the outskirts of Port-of-Spain, or of the S. diversifolium, a scandent shrub with a smooth mangrove-like leaf very common in Mangrove swamps. It is *Gomphia nitida.* It flowers profusely on short panicles, and would be very ornamental in a garden when in flower. To my surprise, a person who accompanied us, a native of Monos, in answer to an inquiry as to its common name, said it was 'Mangle Blanc' : whereas this was stated by Mr. Crüger to be Laguncularia racemosa, a Combretad. Trivial names are applied, in this country at least, on decidedly trivial grounds and quite regardless of repetition : how many Lilacs, Vervains, Sages, Cherries, Pommes, Olives, &c., have we not ? belonging to various natural orders, widely apart—and is it not so, over the world, with Cedars, Oaks, Beefwoods, &c, ? Such confusion shows the value of a fixed systematic nomenclature, but as this can never come into common use, we should endeavor, in common names, to hold to some special and if possible the aboriginal name of a plant, as Mammee instead of Mammee-apple, Jambolan instead of Java-plum or its absurd creole alternative of Prune mariage, Avocado instead of Avocato-pear, Alligator-pear or Zaboca, and so on through numberless instances. I once asked an old black man what, if any, common name was given to a pretty pink-flowering plant (Stachytarpheta mutabilis)—pointing to it—"wha' we caal 'im, hea'about ?—Queen-Victoria dressin'-gown-bush,—da he naim,—putty flower !"

On the beach of l'Anse Caribe a Conchologist would look in vain for a single shell ; yet a friend who stayed there ten days during last month, December, brought back from it not less than 30 species, in various condition, whole, broken, and fragments. We had been talking of shells before he went down, and when there, having little occupation or variety of modes in which to pass the time, his household amused themselves with seeking shells by scraping aside the stones and fine gravel. *Columbella mercatoria*, *Nassa antillarum*, *Cerithium vulgatum*, *Cerithium versicolor and Purpura auriculata*, were numerous ; *Murex pomiformis*, *Columbella lævigata*, *Capulus intortus*, *Nerita praecognita*, *Siphonaria lineata* and the handsome *Triton pilearis* were pretty frequent—the remainder were generally single specimens or fragments—these were all what a malacologist would call dead shells, indicating nevertheless the existence of as many living species of mollusks in the sea washing that shore.

On the very narrow beach cleared of the bushes for a land-ing place, there were a number of *Trigona Mactroides*, the valves united but the animal invariably gone—they had apparently been gathered for cooking, and, after boiling, the meat had been taken out without breaking the hinge. The same remark applies to the *Asiphis rugosa* and the *Venus crenulata* also found here in considerable numbers. I saw no other shells here than those four sorts. The bottom of this bay is probably too calm to allow of shell fish or dead shells being driven ashore on its beaches.

Tuesday, 9th February, 1869.

R. J. LECHMERE GUPPY, F.G.S., F.L.S., President, in the Chair.

Edward Johnston Hammond, Esq., M.R.C.S., L. was elected a Member.

The following communication was read :—

NOTICE *of some new* MARINE SHELLS *found on the* SHORES OF TRINIDAD.—By R. J. Lechmere Guppy, F.L.S., F.G.S. &c,

Purpura trinitatensis n. sp.

A solid ovate yellowish subrimate shell adorned with numerous rounded spiral ridges which are crossed by fine imbricating striæ. Whorls about 6, with 4 spiral rows of obture elongated tubercles, of which the two upper rows are much the largest, the superior one forming the angle of the whorls. Suture hidden by a row of stout curved and reflected lamellæ, of which there are about 3 above each of the tubercles on the angle of the whorl. Spire conic, sharp. Mouth pink within and often ornamented with two or three more or less interrupted spiral red or chestnut lines corresponding to the external rows of tubercles. Aperture oval with a small and decided posterior canal forming the successive sutural lamellæ ; anterior canal open and a little reflected. Pillar lip smooth, flattened or hollowed out, bright pink ; outer lip denticulate, obsoletely striate within. Height 40 millimetres, greatest breadth 27 mill., longest diameter of aperture 26 mill.

A species somewhat resembling *P. mancinella*, but with a sharper spire and a more decided striation. The sutural lamellæ are well developed like those of *P. coronata.* There is a strong ridge round the base. Gulf of Paria.

Cardium eburniferum n. sp.

Shell a little angularly suboval, moderately tumid : externally marked with irregular orange-brown spots, and adorned with 35 narrow imbricated ribs closely covered towards the margins of the shell with numerous porcellanous semitubular tubercles, which are thicker anteriorly ; posterior edge nearly straight, strongly serrate. Hinge-teeth $\frac{1-1-1}{1-1-1}$ — strong. Interior salmon-color, growing white towards the strongly dentrate margins which are yellowish. Height 52 mill., length 45, thickness 40. South Coast of Trinidad (T. W. Carr).

Cardium haitense Sowerby.

Quart. Journ. Geol. Soc. vol. vi, p. 52, pl. x, f. 11.

An oblique subovate shell with 20—24 radiating nodose rather square ribs wider than their finely crenate interstices. Allied to *C. subovale* Brod.

This was originally described by Sowerby as a fossil from Haiti, but I have dredged two small examples of it in the Gulf of Paria.

Arca centrota Guppy.

Proceedings of the Scientific Association, p. 175 (Dec. 1867).

This species was described as a fossil, but I have since ascertained that it is likewise living on our coasts, having been collected by myself on the shores of the Gulf of Paria, and by Mr. Carr on the South Coast. Its umbones are often, pink or red, which color is visible inside as well as outside and the shell has a hairy epidermis, generally worn off at the umbones. Height 17, length 24 mill, The following is the original description :—

"Transversely subrhomboidal, with a strong wide carination running from the umbo to the posterior angle ; ornamented with many (36-38) squamosely nodose radiating ribs each with a fine subsidiary thread-like rib in the nrrow interstice ; anterior margin short, rounded ; posterior margin strongly sinuate, angulate above with the hinge-line and forming a more rounded angle with the strongly crenate lower margin. Hinge-teeth small in the middle of the straight hinge, but becoming larger and diverging considerably towards the angles ; ligamental area more or less grooved, especially anteriorly."

Thracia dissimilis.

Ovate-oblong, compressed, white, roughened by numerous fine granules which are generally arranged in lines radiating from the umbo ; transversely excentrically plaited ; anteriorly rounded, posteriorly vertically truncate, with a keel (most prominent on the smaller valve) running from the umbo to the lower posterior angle. Height 27, length 40, thickness 15 mill.

This is nearly allied to *T. plicata*, which Reeve (C. I. Thracia, 7) considered it to be. Our shell is rather intermediate between *T. plicata* and *T. magnifica*, differing from the former in ornamentation and general shape. On a tablet in the British Musenm the name *dissimilis* is applied to our species ; but I have not been able to find any authority for that name, which I now adopt for the shell.

The animal is furnished with two long siphons separate for the whole of their length and coarsely fringed. The epidermis along the posterior margin extends beyond the the shell and covers the bases of the siphons.

Tuesday, 13*th April*, 1868.

R. J. LECHMERE GUPPY, F.L.S., F.G.S., &c., President, in the Chair.

The following Donations were announced :—

"Journal of the Society of Arts"—Nos. 819, 824, 825, 826, 827, 837, 838, 832, 840. *Presented by the Colonial Government.*

The following communication was read :—

"On the Manufacture of Sugar by Evaporation." By The Hon. Henry Stuart Mitchell, M.D., Ph.D.

The last communication which I had the pleasure of submitting to tbe Association, was an examination of the methods in use or proposed for obtaining the juice of the Sugar Cane in as nearly a state of sugar and water as possible. Experience has decided clearly in favour of slicing the cane and then washing out the saccharine element with water. This may be done in more than one way, but it may be affirmed that science points out as the most perfect mode that in which the cane after the process of slicing is exposed to such a heat under 212° as will be sufficient to fix the albumen-oil and colouring matters and at the same time prevent any degenerating process from beginning through the action of the air on vegetable ferment or otherwise till ample time elapse for driving off the superfluous water and isolating the whole sugar in a state of purity. It was further stated that the next best mode of extraction, where the desiccation of the slices was undesirable, would be to macerate the slices as they fell in vessels containing water dosed appropriately with bisulphite of Lime. In either case the displacement of the sugar would be attained in the former methods entirely, and in the latter to extent of about nine-tenths of the whole but of somewhat inferior purity. Whenever the slightest impurity occurs, it should be at once removed by filtration, through charcoal, as it may be safely maintained with Dmitri Davidou, probably the best practical writer on the manufacture of Beet-root sugar, that previous to evaporation, "*the juice must be in a state of perfect purity.*" To this axiom every manufacturer who hopes for success must implicitly conform, and the planter in these colonies who chooses to incur the extra expense and trouble, will yet find it much easier to do so in the earlier stages of manufacture, than in manipulating the comparatively weak but complex juice of the Beet in Europe, or in refining, an originally low quality of Muscovado.

To attain such purity animal charcoal is the agent almost universally employed, but wood charcoal and many shales possess similar power and though in less degree have been occasionally used as substitutes. To gentlemen connected with this Colony it must be interesting and may be profitable to know, that in the Bitumen which exists so abundantly in the Pitch Lake and elsewhere, they possess a substance which carefully manipulated, equals animal charcoal in decolorising power, while it communicates no unpleasant smell to the filtrate, and as refuse becomes a valuable cane-manure. To return to the subject of these remarks, the Evaporation of Cane-juice. It is clear that whatever the mode employed, the end to be obtained is in all instances the same, namely, to get rid of the superfluous water in the shortest time, aud with least injury to the remaining sugar—in other words, to expose the largest surface of liquid to the largest heating surface under such circumstances as do not necessarily involve deterioration of the liquid. Omitting for the present any consideration of Vacuum-pan working, which is the most perfect as well as the most expensive, I shall confine these remarks to evaporation from the inclined plane and by the Shower.

The Inclined Plane or tray was originally described by its Inventor in 1837, as a shallow trough 6 metres long and 2 metres wide, made of copper and heated by steam, with the lower end at such an inclination, that the Beet-root juice when poured on the upper part in a state of "perfect purity" took two minutes and-a-half to reach the lower end, whence it fell in a continuous stream, marking 22½ degrees of Beaumé, the temperature on the surface never marking above 72° of Reaumur (167° Fahr.) This inclined plane was imperfectly divided throughout its whole extent by transverse perpendicular flanges alternately attached to the opposite sides of the tray in such a manner that the liquid in its descent had to traverse the whole breadth of the pan before escaping at the free end of each flange to course along the next one—each flange thus acting as a dam or gutter till the liquid reached its free end, descending to the next, and so on, till the liquid to be evaporated come in contact with, many hundred feet of evaporating surface. A blast of air along this surface as proposed by the inventor, but not put in execution by him, would, if heated or even dry, have more than doubled the evaporative effect. Dmitri Davidou then proceeds to state the results obtained in the following language: "Les produits bruts que j'ai obtenus l'année passée (1836) de la betterave très alterée, à l'aide de mon plan incliné (après lequel j'achevai la concentration du sirop dans un cylindre tournant) avaient la blancheur de la neige et offraient l'aspect du sucre en pains par le rapprochement compacte de leurs crystaux, mais comme les sirops n'avaient point subi l'action violente du feu, la saveur, etc."

These results are brilliant, and it is not astonishing that a pure juice (for Davidou insists on purity as essential) should when rapidly evaporated by steam in a copper vessel at a low temperature produce a white concrete, the wonder is that a system so simple and presenting such advantages, should have remained in abeyance till within the last 3 or 4 years, when it has been revived by Mr. Fryer in the introduction of the Concretor. This last, a modification of the inclined plane and cylinder of Davidou, appears to be a wonderful improvement on the carron coppers, producing in a single concrete form, easily made, handled and shipped with little or no loss, what was formerly shipped with great trouble as the two separate articles, sugar and molasses with an eventual loss on their aggregate of seldom less than 12 or 14 per cent. Mr. Fryer rates the gain at something over £4 per ton by employing the Concretor; I am inclined to place it much higher if the apparatus be worked with care, not that it will ever give or was ever intended to give a white concrete like

Davidou's, its iron surface cannot be kept as clean as that of the copper plane, nor can its open fire be as carefully regulated as a steam supply. Yet the principle is one whose adoption must lead gradually from one modification to another till it end in the production of pure concrete or loaf sugar; this was probably not intended by Mr. Fryer, but to me the conclusion appears to be inevitable and not remote.

The second method of evaporation to which I would direct your attention is the "Shower;" a process which may dispute the palm with the inclined plane of Dmitri Davidou or the more recent Fryer's Concretor—inasmuch as the surface it exposes, either to steam or heated air, is practically unlimited. and the heat does not rise high enough to scald the fingers, The application is as follows: premising as in the preceding mode that the cane-juice to be operated on is perfectly pure, it is received into a vessel heated by steam or otherwise; to this is adapted a pump, endless belt or other suitable elevator, which by its action raises the liquid to be evaporated to any given height above the receiving vessel, into which it again falls through a sieve or perforated surface in as many dropping rills as there are perforations in the sieve; through this "Shower," which gives its name to the apparatus, dry or heated air may be driven or not, according to the speed of evaporation required. It is clear that by increasing the height of the Shower and the amount of dry air driven through its particles or drops, the superfluous moisture may be driven off with such speed as to cause almost instantaneous evaporation. The action of the apparatus when used with water illustrates its power more clearly. When applied to a vessel 3 feet wide by 5 feet long 2 feet deep, in which the water was made to boil fiercely, the temperature of the water immediately sunk to 150° fahrenheit, nor could the skill of the fireman raise the heat higher, as long as the "Shower" was in action. This mechanism, including the Fanner blast, was worked successfully on a practical scale before Lord Harris, the Governor of Trinidad, and several Members of the Legislative Council, in 1849, and those present satisfied themselves, that while the Shower was in full action and the evaporation at its quickest, the syrup could be handled with impunity. The importance of using cane-juice or syrup in a state of perfect purity is so great, that you will perhaps excuse me for adding a few words on this subject, and recommending to your careful examination an automatic or self-acting process for clarifying and cleansing cane-juice or other materials in the earlier stage of evaporation. It was borrowed originally from Cuba, and subsequently patented in Trinidad and Demerara.

Tuesday, 8th June, 1869.

R. J. Lechmere Guppy, F.L.S., F.G.S., &c., President, in the Chair.

In the absence of the Secretary, Dr. Knaggs was requested to act in his place.

The following Donations were announced :—

"Journal of the Society of Arts," Nos. 834—839. *Presented by the Colonial Government.*

"Scientific Opinion," Nos. 1—20. *Presented by the President.*

NOTICE OF MEMOIR.

Hydraspis Gordoni.

Dr. J. E. Gray has described to the Zoological Society of London a new Tortoise from Trinidad, which it was proposed to call Hydraspis Gordoni, a specimen having been deposited by The Hon. Arthur Gordon in the Society's Gardens.

[R. J. L. G.]

Transf'd from P.B.D.
APR. 90
BRITISH MUSEUM NATURAL HISTORY.

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PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART VIII.—DECEMBER 1869.

CONTENTS.

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PROCEEDINGS

OF THE

SCIENTIFIC ASSOCIATION

OF

TRINIDAD.

PART VIII.] [DECEMBER, 1869.

Wednesday, 21st July, 1869.

R. J. LECHMERE GUPPY, F.L.S.,F.G.S., &c., President, in the Chair.

The following Communications were read :—

1. Notes of a Visit to Dominica. By R. J. Lechmere Guppy, F.L.S.,F.G.S., &c., &c.

Towards the end of 1867 I visited the Island of Dominica. As the geological features of the Island seem not to have been described, I venture to put together such notes of its physical structure as I was enabled to collect during a sojourn there of a few weeks.

Dominica is one of the British Antilles, in latitude 15½ N., and longitude 61½ W. It is situated between the French Islands of Martinique and Guadeloupe, and like them, it is a mass of mountains of volcanic structure. There is little that can be called level land, save the alluvial flats of the larger river valleys. The spurs of the mountains usually come down to the sea, often ending in high cliffs and precipitous headlands.

The town of Roseau, the capital of the Island, stands on its western shore, close to the mouth of the river....... The streets are narrow, and are paved with round stones, of which the largest may be 8 or 9 inches in diameter. In the middle of each street runs a gutter. There are no side-walks. The houses are irregularly disposed, and at present much decay is visible. Some of the houses are well built of trachyte, which is an abundant and easily worked material. It is of different shades of pink and grey, and its effect is decidedly pleasing, and when well selected, it is a durable stone; but some blocks decay rapidly, and buildings may fall in consequence. The town has generally an air of decay and poverty; but directly one gets beyond the houses the aspect is pleasant. The grand mountains with their precipitous gorges, through which flow rapid rivers of the clearest water upon clean pebbly beds, form a magnificent background to the picturesque little town. Immediately at the back of the town there is a hill called Morne Bruce, where the military station formerly was, but since the soldiers have been withdrawn, some of the principal inhabitants have made it their residence. This hill is composed of volcanic rocks (*d*) upon which lies a marine formation. The coral reefs of the latter furnish lime for the department of public works, whilst the volcanic deposits include fine sand, admirably suited for combination with the lime to make mortar.

The marine formation (*b* in the diagram) above alluded to, seems to have been part of an immense fringing reef, which existed when the Island was at a lower level by some 300 feet. The diagram will help to explain the principal features of these formations, and it also shows a similar coral bed at Morne Daniel. It contains the same species of shells and corals. This marine fossiliferous formation is overlain by more recent volcanic accumulations, represented in the diagram by the letter *a*. Craters do not seem to occur on the higher mountains, but small volcanic cones, often very perfect, exist on the lower ridges. A group of them is shown in the plate. I did not observe that dykes of trap or stony lava were at all frequent. Most of the rocks are varieties of trachyte of every shade of color,—pink, grey, brown, and white, rarely but occasionally passing into cellular basaltic lava containing large crystals of felspar.

On the 12th November I ascended Mount Kuliabon, stated to be 3,379 feet high. This mountain seems to be entirely composed of volcanic rocks, and its upper part is shrouded in a dense forest full of lycopods, and with immense festoons of mosses and ferns clinging to the trees. Often this cryptogamic vegetation formed a tangled mat around the smaller trunks, and was 8 or 9 inches deep. Among it I found specimens of a curious mollusk *(Amphibulima pardalina)*, the body of which is much larger than its shell. The animal was semilucent and whitish, somewhat like a bit of ice dipped in milk. In the forest I also collected other mollusks, namely, *Bulimulus laticinctus*, *Hyalina Baudoni* (or *concolor*), *Helix nigrescens*, *H. badia*,

H. dentiens, *H. Josephinæ*, *Cyclophorus amethystinus*, *Helicina plicatula*, and a small species of *Glandina* (*G. perlucens*.) On the outskirts of the forest I collected another species of *Amphibulima* (*A. patula*) and a shell, which is probably *Bulimulus virginalis*. The last is not included in the list of the terrestrial molluska of the Island, which I contributed to the "Annals and Magazine of Natural History," for June 1868; but it is mentioned in Mr. Bland's review of my paper in the American Journal of Conchology, and I believe one of my specimens may be referred to that species. Near the top of Mount Kuliabon, where the trees are much stunted, a clusia was abundant. A fine view is obtained from the summit, there being no trees—the vegetation consisting principally of large lycopodiums, a bamboo (*Arthrostylidium pubescens*) and a long grass. Some one had erected a flagstaff on the top, its remains being still visible.

On the 15th November I rode round the southern end of the Island. The roads here are mere paths cut in the sides of the mountains, and in some places it appeared quite wonderful that it should be possible to construct a path at all. Nevertheless, the roads are good of their kind, and getting about Dominica is very much easier than getting about Trinidad. In the latter there are tracks, called by courtesy roads, designed for the passage of wheeled vehicles, but which are mere quagmires the greater part of the year. In Dominica there are, I believe, no carriages whatever, and wheeled vehicles of any kind are extremely scarce: a few being used on some of the more level sugar estates for carting canes. The nearest parallel to the Dominica roads here are the tracks up Caura and Guanapo valleys; but the Dominica roads go over high mountain passes; they lead amongst highly picturesque scenery. On the hillsides are acres of tree-ferns. The rocky slopes are covered with Begonias and a bramble (*Rubus jamaicensis*) bearing a fruit much like a raspberry. Here and there were dense bushes of the *Caesalpinia horrida*, called 'wait-a-little' or *arrète-negre*, into the branches of which, if one got, one would hardly come away with a whole skin, to say nothing of dress. It is one of the most terribly armed of shrubs. I searched for seeds, but in its pods I only found small centipedes, which had evidently appreciated the defence afforded them against their enemies, the birds. I should not omit to mention a pretty primrose-like flower that appeared in abundance by the wayside; it is, I believe, *Episcia melittifolia*.

Every ravine has a stream running at the bottom of it —and there are some large rivers, but they all possess the same characters of clearness and rapidity. These streams furnish an abundant source of power, which is made available by the sugar estates for grinding their canes. The streams of Dominica suffer but little diminution in the dry part of the year, and this character, together with their great fall, renders them very advantageous as a motive power for sugar mills, and enables the planters to dispense with steam and cattle.

At Souffrière there are, as the name implies, sulphur springs and deposits of sulphur. These are situated on the banks of a ravine, and on the face of the cliff-like escarpment which forms the background of the Souffrière valley,—which indeed seems like a vast crater with its seaward side demolished. Sulphur springs are a common feature all over the Island, and I had an opportunity of examining some of them more carefully than those at

Souffrière. Some in a valley near Roseau have an intermittent action, and the steam and water is ejected in jets, accompanied by a deep sonorous noise, like that of a large steam-engine at work. The beats are about 20 a minute; and at much longer but somewhat irregular intervals, a larger jet of water is thrown out, which, in most cases, sinks back into the cavity whence it issued. These sulphur springs are usually situated in the steep banks of ravines, and the small quantities of water which flow from them mingle with the streams flowing in the ravines. In such cases as that at Souffrière, however, the springs are higher up on the hills, and are surrounded by deposits of sulphur just as I have seen in New Zealand.

I was unable to determine precisely the temperature of these sulphur springs; but in most cases it is very high, and approaches the boiling point. Their waters seem to be highly charged with sulphuretted hydrogen, judging by the odor which is distinctly perceived for some distance.

On the 18th of November an extraordinary rise of the sea took place. At Roseau the sea at the time was rather rough, and consequently the special phenomenon was not much noticed; although some damage was occasioned to the sea-wall there in course of repair. On the following day, however, I went to Prince Rupert's Bay, at the north part of the Island, and I was then shown the effects of this rise of the sea, which I at once inferred to be an earthquake wave. The first rise occurred at 4 o'clock on the 18th, and consisted of a long and gentle swell going up about 4 feet above high water mark, and descending as much below the ordinary low water—(the height of the tide at Dominica is about 2 to 3 feet.) This phenomenon recurred for about 2 hours, the waves becoming less each time. Each wave was stated to occupy about ten minutes in raising and falling. It seems to have been in the rivers that the most damage was done by this earthquake wave. It rushed up them like a bore, upsetting and filling boats and canoes, and overflowing the low banks. At this time I was of course unaware of the great earthquake at St. Thomas, but the news reached me nine days afterwards, and it was not difficult to see the connection between the phenomena.

Dr. Imray was kind enough to take me on my journey in his boat as far as his estate at Batalie. On the way we observed the volcanic strata exposed in the sea-cliffs, the most noticeable of which is a great outflow of trachyte lava at Grand Savana. We did not land, but so far as we could judge from the boat, this lava outflow must have belonged to the newer volcanic series, for it overlay and filled up the hollows of the conglomerate. We also noticed along the cliffs the traces of several former sea-levels, the most distinct of which is only about five feet above the present high water mark. Another feature of the shores is the caves, apparently worn out by the sea; one of these is remarkable for the spouting of the water out of it to some height. This cave is said to run under the Island to Lasoye Bay, a distance of several miles.

At Batalie, Dr. Imray has a lime-tree estate. The limes are cultivated, and their juice expressed and boiled down for export. In the stream running through Dr. Imray's estate, I found a Neritina in great abundance; yet the corrosive action of the water, charged with acids, and derived from strata having but little lime in their composition, is so great, that these shells had always lost their spires, and indeed the last whorl was often encroached upon, and it must have been by some physiological effort that the mollusks kept a coating of calcareous matter on

their backs. Whenever the smallest abrasion occurred in the surface of the shell, a deep hole was the result, thus exhibiting the value of the thick epidermis with which the shells of Neritines are furnished. These Neritines presented in these respects an analogy with the fossil one from the miocene of Jamaica, described by me in the Journal of the Geological Society (vol. 22.) It has, however, a differently shaped aperture, and I think the Dominican shell is probably *N. punctulata* Lam. This Neritine is the only fresh-water shell I saw in Dominica.

On arriving at Prince Rupert's Bay, I obtained the services of three men to accompany me on my ascent of Morne Diablotin, and we took provisions for four days. The first part of the journey from Prince Rupert's Bay was along a vile road of very slippery clay. I rode until we came to a ravine, only passable on foot. Here the real ascent begins. It is a very steep declivity of rocks and stones covered with trees. This is the side of the spur, the top of which, once gained, the climbing is not so rapid, but the trees are dwarfed. It was none the less necessary that every step of the way should be hewn with the cutlass. We reached the last place where water was likely to be had about 3 o'clock, having left the Bay at 11. We now built a large ajoupa, which, together with preparation for dinner and other arrangements, took us till nearly dark, when we dined. My bed was far from comfortable, and it was sometime before I could compose myself to sleep, and I was thus enabled to observe how remarkably free the woods were from noxious insects. No mosquitoes or sandflies disturbed us; and although in the early part of the evening a few insects were to be heard, later the silence was only broken by the booming croak at intervals of the tree-frog. These animals, brown and of small size, were numerous among the dead leaves and in the wild pines (*Bromelia*) which grew on the trees, and which al ways afforded us drinking water. There appeared to be few birds on the mountain, and I did not see the diablotin from which the mountain is named. The guacharo (*Steatornis*) is the bird so called in Trinidad, but judging from the description, the Dominican bird must be of another kind altogether.

We were fortunate as to weather, although it rained during the night; but our ajoupa was watertight. During the following day we were occasionally shrouded in clouds, and more often they seemed to form a sea beneath us; but generally the air was clear, so that we could take advantage of the few opportunities we had of admiring the grand prospect. We started at half-past six for the summit, taking with us only what we wanted for breakfast, which we ate at a place where nearly all the trees were dead, apparently killed by a storm. We arrived at the summit at noon, and having cleared away the bushes, we had a good view of Guadeloupe and the neighbouring Islands, and we could see Antigua and Montserrat in the distance. I gathered *Helix badia*, *Helix Josephinae*, and *Helicina conuloides* on the summit; and on the sides of the mountain I found several other shells, e. g. *Helix dentiens*, *Helix nigrescens*, *Helicina rhodostoma*, *H. plicatula*, *H. velutina*, *Amphibulima pardalina*, *Cyclophorus amethystinus* and *Glandina perlucens*.

The same small bamboo (*Arthrostylidium pubescens*), which I found on the summit of Mount Kuliabon, occurs in quantity on top of Diablotin; but the latter is not clear like the former. The trees, however, are much dwarfed—stunted no doubt by the force of the wind, as they all are,

along the windward side of the ridges, whilst on the leeward side they attain the full growth.

Dr. Imray had been good enough to lend me an aneroid barometer, with which I had hoped to have determined the altitude of this mountain, stated to be 5,314 feet high,* but from its behaviour, it was evident that no reliance could be placed upon the instrument, which was not designed for ascertaining the height of mountains. At the sea level I observed that the aneroid stood at 30.02. When we arrived at our camping place on our way up, it showed 28.16, and when we reached the same place on our way down, it was 27.82. As a monument of our visit we left a bottle at the top, and I carved my initials on a tree.

Morne Diablotin, like all the other hills of Dominica, seems to be entirely composed of volcanic rocks of different kinds, mostly trachyte, and of very variable degrees of coherence. The mountain rises abruptly from the sea; I should question if it is accessible from any other direction than the one I took—the other sides of the peak appearing to be in great part perpendicular cliffs.

I had an opportunity, before leaving the Island, of seeing some of the stone axes of the aborigines, which resemble those found in Trinidad. Mr. Howard Lloyd showed me some fine examples, one of which weighed several pounds, and had a broad groove or depression,

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* According to a fragment of an Almanack published in Dominica in 1826 or 1827, the following are the heights of the principal mountains :

Morne Diablotin or terre ferme	...	5,314
Laroche (or Laroque or Piton)	..	4,150
Kuliabon	...	3,379

I thought that there could not be more than 200 or 300 feet of difference between the first and second, and there is some confusion as to their nomenclature, probably for tying it to a handle. The larger ones were made of trachytic rock; the smaller ones appeared to be a kind of trap, and much resembled in shape those used by the Maories of New Zealand.

On the 27th November we received news of the earthquake which had taken place at St. Thomas on the 18th. The most extraordinary stories were told, and though the magnitude of the calamity at St. Thomas was not, perhaps, very greatly exaggerated, yet the truth was distorted in many ways, and the disasters were extended to places which really had not felt them.

I left Dominica this day for Barbados, sailing to the north-east of Martinique, which gave me an opportunity of seeing how like the formation of that Island is to Dominica. Subsequently I visited St. Lucia and Grenada, which are both essentially volcanic in structure; but there are possibly some local variations in the composition of the rocks. One very remarkable feature of St. Lucia is the curious conical hills called the Pitons, which rise almost perpendicularly from the sea to a considerable height. As no description can give any idea of these hills, I have engraved my rough sketches of them, which are hereto appended.

In passing St. Vincent it is not difficult to observe the volcanic nature of that Island. At the northern end the Souffrière is pointed out. It is a volcano scarcely extinct, for in 1812 it was the scene of the most considerable cruption known to have occurred in the West Indies.

At present I believe there is no other sign of activity than the sulphur springs in the old crater. From accounts and drawings furnished to me by residents there, it appears to me that in the Souffrière the beds dip outwards on all sides from the crater. Great part of the sides of the

latter are broken down and removed. The diagram I have appended will give some idea of the view I have endeavoured to explain.

An examination of the volcanic and other rocks of the Antilles, combined with what we know of the tertiaries of the Caribean area, may help to clear up some obscure points in the history of the succession of West Indian deposits.

The diagram I have given of the structure of Dominica exhibits the following stages, in descending order:

a. Newer volcanic.
b. Coral reefs.
*b*2. Conglomerate.
c. Older volcanic.

I think it not unlikely that the conglomerate *b*2 is, in great part, contemporaneous with the coral reef formation to which I have already referred in the first part of this paper.

If the view here set forth is the correct one, it would appear that two distinct periods of great volcanic activity are made out, in the interval between which the land was much depressed, and coral reefs were formed upon the previous volcanic accumulations.

Subsequently there was a re-elevation to the extent of 200-300 feet, and volcanic materials were then deposited upon the coral reefs. There is no evidence of any changes of importance having taken place in this region since that time.

The coral beds *b* have furnished to me the organic remains enumerated in the Appendix.

The great break in the succession of life between the miocene and the later tertiaries of the West Indies has been noticed by geologists.

It appears to me highly probable that this break may be accounted for by the following hypothesis.

Previously to the miocene period there was a much greater extent of land in the Caribean area than at present. This land was gradually submerged during the miocene period, and on the sinking land were formed the coral reefs with the associated shell-beds of that period. It would seem, that in this interval, nearly the whole of the West Indian chain was submerged. The sinking having proceeded to a certain point, volcanic action was developed in immense force. The volcanoes may have continued in activity for a very long time, during which the upheaval occurred, which put an end to the miocene period, and exposed the beds which had been formed. The seas probably became unfitted for the existence of many of the coral reef loving molluska of the miocene period, which became extinct. Their living analogues are now to be found in the eastern seas, whither their ancestors probably migrated during the earlier tertiary period, when perhaps the submergence of the Atlantis had left a chain of coral Islands in the ocean between meridional America and North Africa.

Upon the shores of the land now upheaved there was a renewal of coral growth; but the corals were, in few instances, identical with those of the former period, and they belong, with slight variation, to the existing coral fauna. There may have been at this time a comparative cessation of volcanic activity, during which, the old volcanic materials were formed by the waves and streams into a conglomerate. But a new outburst seems to have succeeded, during which the land was again elevated to the extent of 200-300 feet. This elevation was probably a slow process, and it may have extended into the historical period; for

we find beds belonging to the newer pliocene at various heights, and I have remarked the yet existing traces of former sea levels on the shores of Dominica.

The succession of the formations I found in Dominica seems to be paralleled by that of Guadeloupe, as described by Duchassaing in the Bulletin of the Geological Society of France, 2nd ser., vol. xii., p. 753; but in Dominica the oldest beds containing fossils, which I could discover, are the pliocene coral reefs before described.

APPENDIX.

List of Organic Remains from the Pliocene Coral Formation of Dominica.

Cypraea exanthema *Linn.*
— cinerea *Linn.*
Cassis decussatus *Linn.*
— flammeus *Linn.*
Purpura trapa *Bolt.*
Ranella cubaniana *d' Orb.*
Triton pilearis *Linn.*
Dolium pennatum *Mart.*
Pusio articulatus *Lam. var ?*
(perhaps a new species.)
Natica mamilla *Linn.*
— canrena *Lam.*
Neritina punctulata ? *Lam.*
Turbo pica *Linn.*
Conus testudinarius *Mart.*
Spondylus coccineus *Lam.*
Lucina tigrina *Linn.*
Tellina fausta *Sol.*

Tellina interrupta *Wood*
Pectunculus angulatus *Lam.*
Lithodomus cinnamomeus *Lam.*
Petricola robusta *Sow.*
Plicatula cristata *Lam.*

The above have all been identified with recent West Indian shells. There are one or two unnamed species, which are probably new.

R. J. L. G.

The following corals have been determined, but there are many others (similar to species found in Barbados), the specific names of which cannot be stated with confidence:

Favia ananas *Lam.*
— coarctata *Mich. & Duch.*
Eusmilia aspera.

LIST OF THE LANDSHELLS COLLECTED IN DOMINICA BY R. J. LECHMERE GUPPY.

(*See Ann. & Mag. Nat. Hist., June* 1868.)

Glandina perlucens *Guppy*
Stenogyra octona *Chemn.*
Hyalina concolor *Fér.* (Baudoni *Pet.*)
Helix Josephinae *Fér.*
— dentiens *Fér.*
— badia *Fér.*
— nigrescens *Wood*
Bulimulus laticinctus *Guppy*
— virginalis *Pfeiffer*
— exilis *Gmel.*
Buliminus stenogyroides *Guppy*
Amphibulima patula *Brug.*
— pardalina *Guppy*

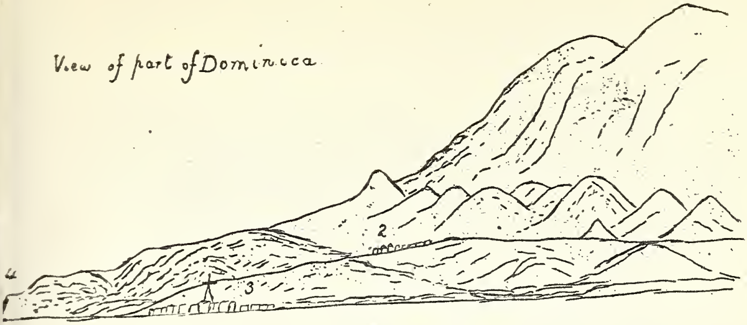
Succinea approximans *Shuttl.*
Cyclophorus amethystinus *Guppy*
Helicina epistilia *Guppy*
— humilis *Guppy*
— velutina *Guppy*
— rhodostoma *Gray*
Helicina conuloides *Guppy*
— plicatula *Pf.*
Neritina punctulata *Lam.*

Explanation of the Diagrams.

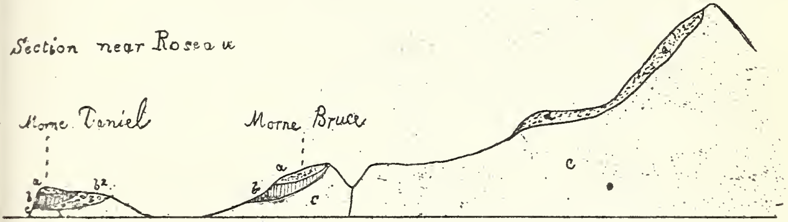
In the upper figure of the first diagram 1 refers to a row of volcanic cones; 2 is Morne Bruce; 3 the Town of Roseau; 4 Morne Daniel. The second figure is a section near Roseau; *a* represents the newer volcanic accumulations; *b* the coral formation; *b*2 the conglomerate; *c* the older volcanic formations. The third figure is a sketch of Dominica from the south, to show the hilly character of the Island. The fourth figure is intended to exhibit the dip of the beds of volcanic matter in the Souffrière at St. Vincent. The fifth figure illustrates the theory of the relations of the formations of Dominica as given in the preceding paper; *f.* being the former sea level (that is, the extreme extent of the subsidence (which took place probably during the miocene volcanic period); *p* the present sea level. The other letters *a*, *b*, *c*, have the same meaning as in the second figure, explained above.

The second diagram gives sketches of the remarkable Pitons of St. Lucia from three different points of view.

View of part of Dominica



Section near Roseau



Dominica 6 miles N.

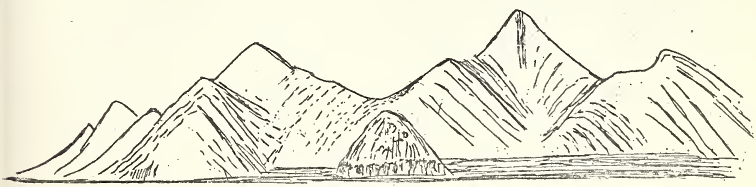
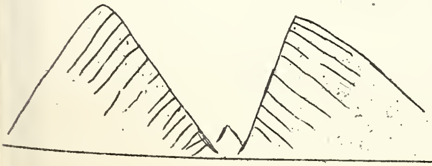
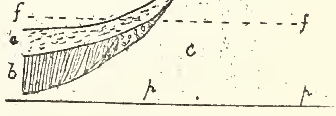
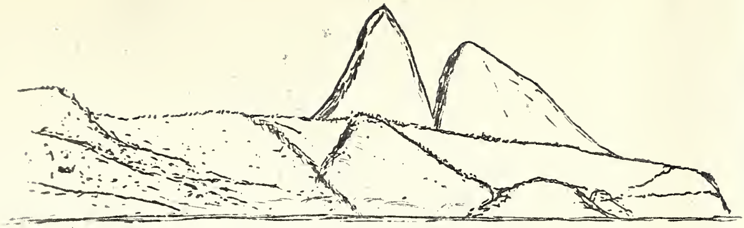


Diagram of the Souffriere St Vincent

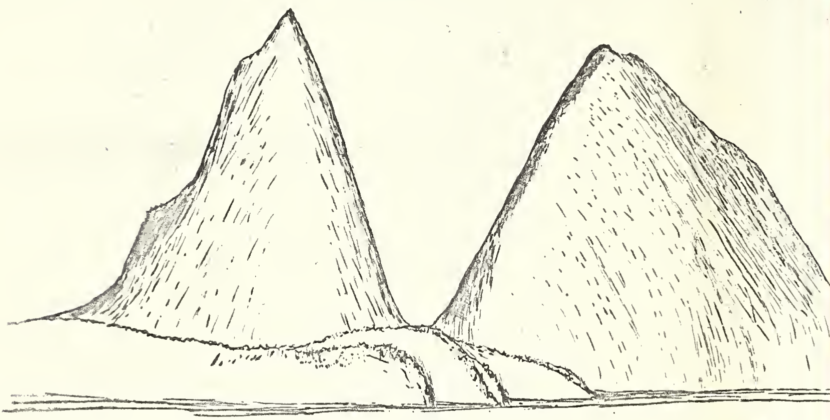


Theory of the Formations of Dominica

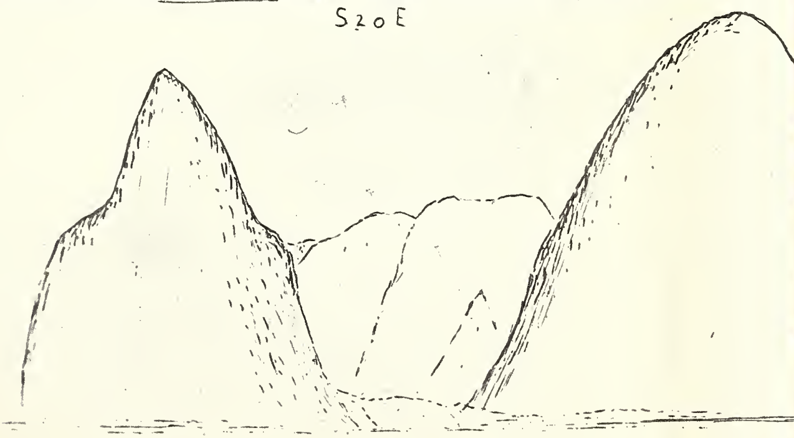




SSE



S 20 E



NE b E

The PITONS   St LUCIA

2. *Continuation of Notes of a Voyage round the Island of Trinidad in October*, 1868.

By Thomas William Carr.

(Communicated by the President.)

Part II.

(Abridged.)

The length of the North Coast is stated, on the authority of old marine surveys, to be 46 nautical miles (=53½ Eng. m.); for less than half of this, from the Boca to Point Chupara, 18½ nautical miles, the coast is, with a few breaks to be noticed presently, closely locked by an uneven line of dark forest-clad mountains, whose highest points are 1,800 to 2,250 feet high, the culminating peak behind Las Cuevas Bay rather exceeding 3,000 feet. When a mile and a half outside of the Boca, we sighted round Corozal Point the high conical wood-clothed Islet off the windward point of Saut d'Eau Bay, commonly called Saut d'Eau Island, but in the old Spanish Chart, Isla de Maravaca. In the later surveys by English naval officers, Saut d'Eau has been translated into Waterfall, and Saut d'Eau Island into Waterfall Island, terms never heard in the colony. The Geologists retained in their excellent maps the local term Saut d'Eau for the bay (and abandoned hamlet), and Maravaca for the Islet. Seeing that the

newer surveys shew a second Islet within the seaward one, and little shorter than it, I propose to retain or restore to the larger and outer one the fine old Spanish name, probably of Indian etymology, and baptise the landward one Saut d'Eau. In the old surveys Maravaca was stated as 230 feet high; a naval authority, repeated by Captain Chimmo, raised it to 380; we were not near enough to it to allow of a satisfactory opinion being formed. It was certainly a much more prominent object than its place and promise on the Chart led one to look for.

The very distinct manner in which the large valley of Carenage is indicated to the voyager when abreast of it, off our northern coast, by the long slopes of the mountains on either side, yet gives no impression of an actual break in the chain; nor is this to be observed in a southern approach. It is not until one has turned sharply round the point of the overlapping ridge, probably a hundred feet high or more, that this curious feature, unique in our northern chain, is discovered. This overlap shelters a small cove in which coasting vessels may come to anchor in 8 to 3 fathoms. The beach is short, of soft sand and steep, terminated at either end by perpendicular cliffs, and backed abruptly by a precipitous face of semi-indurated yellowish argillaceous sand, about 50 or 60 feet high. In going up the valley from Carenage Bay to its head, one is scarcely aware of a rise, so easy and gradual is the ascent, and without mounting over the slightest dyke that could claim pretence for the term watershed, one finds oneself, on turning an angle, looking down from a small shrubby-faced precipice into a cove of the Caribean sea. So far from there being a watershed, even a foot back from the edge, every drop of rain that falls upon the plateau runs or would run into the valley: *would* run, but that a late manager of the 'Prospect' Estate, which includes all the upper portion of the valley, cut a deep drain to the face of the declivity to draw off the surface waters of the farthermost end of the vale, which tended to create some marshiness in the upper part of the estate, then being laid down in canes. In fact the only natural watershed here is the edge of the precipice. This little bay is spelt on all the maps Macaripe, but is always pronounced Matchereep, as if the original word had been Maqueripe; the qu in our words of aboriginal origin is, in creole, always converted into tch, as in Carapiquaime, now Carapichaima,—Quiauan or Quiauanas, gallicised into Quiaouane, then dropping the i, creolised into Chaguane (pronounced Tchawann, and often Shawanne), but spelt officially, for a generation back at least, Chaguanas, as if under the impression that this was the original and correct Spanish spelling,—also in Quemada (Spanish signifying burnt, scorched), creolised into tchemadde, the correct spelling having been, however, in this instance retained.

Were the land to sink 20 feet in the Bocas Islands and the adjacent portion of Trinidad, Monos would be cut into two by the insulation of the Morris peninsula. Huevos would permanently separate into two, not as now only at high tide. Chacachacaré would be two good-sized lofty Islets, with a good channel between, and the peninsula of Point Gourde would become an Island with a broad channel between it and the Chaguaramas land, while Carenage swamp would be a bay running probably 2 or 3 miles up the present valley. If the land in the latter were sunk 40 feet lower, the Chaguaramas mountain group would be converted into an Island as big as all the actual Boca Islands in one, and a new Boca would run through the Carenage depression, finding its exit in the present Maca-

ripe cove. Chaguaramas is the aboriginal and Spanish name of our queenly Palmiste or Cabbage tree, the *Oreodoxa oleracea, Mart.* It may be noted here that Carenage is only a modern misnomer as applied to the large valley now known by this name; even the large and very shallow bay in front of its mouth, popularly called the Carenage, is no Carenage at all, and could not be. The true Carenage or Carenero was one of the wedge-shaped inlets of Point Gourde peninsula on the south side of the so-called Carenage or Carenage Bay. The old and proper name of the valley is Cuesa, after the palm of that name, described as a species of *Bactris* (having long black spines and a comparatively thin stem.) Nor is Point Gourde named, as popularly believed, after the sunken dollars of Apodaca's squadron, but is a corruption of Punta Gorda, the big or broad Point, which describes it very appropriately, as any one who has helped to pull a boat round the long gloomy promontory will acknowledge.

Four nautical miles beyond Macaripe occurs another depression in the chain of mountains, indicating a valley running southward on the other side of the range which, for some distance, falls to less than half its usual height, and at the North Post, near its lowest point, is only 740 feet high; a mile and a half or thereabouts to W, it had been 1860 feet, and 3 nautical miles E. of the post it rises to 2230 feet in the Saut d'Eau or Mal d'estomac mountains. The valley now alluded to is the Diego Martin, one of the finest valleys in the Island. The next valley to the eastward, Maraval, was in the old Spanish time Mararaval, having been so called after a Palm tree, the Mararávé, meaning the place of the Mararávés (as Cocal from Coco, the Coconut palm, Corozal from the Corozo palm, Palmal from the great wild palm, Temichal, from Temiché, our serviceable Timite, so much valued for its uninflammable leaves as a thatching material, Morichal from Moriché (the Mauritia palm, found in differing species from the Pitch Lake of LaBrea to the Llanos of Nueva Andaluçia, and through the Canos or Delta of the Orinoco to the swampy Savanas of British Guiana, and perhaps further); Cacao, the chocolate tree, forms Cacagual (pronounced Cacawal), and Muro, the old Spanish and Indian name in Trinidad of the Mora tree, Mural, now apparently quite fixed into Mora and Moral. These aggregative words are so economical, expressive and convenient, that they should not be allowed to fall into disuse, and might even be usefully imported into the English language, with power of extension. We can make room for them with thanks; would that we could as easily annex the Spanish wealth in augmentatives and diminutives! The Mararavé is the Grigri palm, whose large bunches of nuts looking like enormous clusters of coral-red grapes, may be seen in the fruit-trays in town, usually towards the end of the dry season.

The Mal d'estomac or Saut d'Eau mountains are directly north of this town and of the Maraval valley, and having some cotters with small cultivations dotted along the track passed over by the fishermen and fisherwomen who used to furnish the town with fish from Saut d'Eau bay, a good bridle road has, I am assured, been formed from Maraval valley to these upland settlements. I am told that some European vegetables that cannot come to perfection in the high temperature of our low lands, do exceedingly well there.

The mountains intervening, there is no indication of the valley to the south of them, looking from the sea at the north, nor do I suppose there is of Santa Cruz valley look-

ing from the sea, though having passed this part of the Coast in the night, I cannot speak positively to the point; looking over the range from the south, it is deeply notched between the head of the valley and the sea; yet the range is continuous, and its points high, perhaps 1,500 or 1,600 feet. At Piedra Blanca on the further side of the valley's head, over which passes the bridle road to Maracas Bay, the peak is stated in a recent Admiralty Chart as 1,956 feet high. The coast north of Santa Cruz is La Vaca Bay, a curve of the shore protected to windward by a neck of high land of some size, but the shore being rocky and precipitous, and stretching to the west, a considerable surf continually breaks against it, and it has no value. I was informed by Mr. Michinaux, proprietor of the "Prosperidad" Cacao Estate in Santa Cruz on the 1st February, on my return from Las Cuevas and Maracas Bay, of a curious and interesting fact, and one that may be usefully kept in mind in coasting about for good and *easily approached* localities for sanitaria, namely, that the ascent up the hills at the head of Santa Cruz is exceedingly gradual and easy to walk (or drive, if a road was laid out to the top).

La Vaca Bay takes its name from a rock of that name off its windward point. It is now creolised generally into La Vache. Between it and Maracas Bay, which opens at 2 nautical miles further west, is a fine bay not marked on the old charts or maps; it is ¾ of a mile wide, and the same in depth, and widening a little within the heads; there is good anchorage within in 6 to 8 fathoms water. Unfortunately, having no beach and no level land, it is nothing more than an anchorage. It is the first real bay met with since leaving the Bocas, Macaripe being but a cove, and Saut d'Eau and La Vaca being quite open to the north and west, not running into the land, but formed by projecting spurs and points on their eastern side. It is simply called 'The Bay' by the people who occasionally visit it, and may perhaps be not ill termed the WestBay, or Maracas West Bay.

The fine Bay of Maracas is nearly one nautical mile across the entrance by the same in depth; it is divided by high steep-sided spurs clothed with thick forest, which come down to the bay in high and broken cliffs on which the surf always breaks, into three distinct beaches and properties; the westernmost and much the largest of which is "Maracas" proper, the central one "Taïrico," while that in the south east bight, the smallest, is called "Damian." The west point of the bay is called Maracas Point, and the east is Point Charasca, which name is also borne by a large rock lying off it. In the mouth of the Bay there is 20 fathoms water, and the anchorage is off Damian beach in 6 to 9 fathoms. The great or "Maracas" beach proper, is at least half a mile long. The "Taïrico," also a fine broad sandy beach, is about a quarter of a mile in extent. These are the firmest beaches I ever walked on. The "Damian," which I saw only from that of Taïrico, is the shortest and narrowest of the three; it is backed by what seemed an earthen scarp, on which rested the small plateau, no part of which appeared to be level. The cultivatible land behind each beach has its separate owner, cultivations and cottages. "Maracas," filling the greater part of the low land enclosed by the encircling ring, is a large property, but the only cultivation we could espy from the mountain road were some rather small cane patches or pieces in the north-west part of the low land. The remainder is in bush; even the pasture is overgrown; the mountain slopes are covered with an abundance of such timber as is usually found on these hills; almost

everywhere near the beach we could see, through the trees and bushes, ponds, or probably connected lines of brackish water. It was impossible to judge in its present state of jungle and water what extent or character of useful surface there was. It looked the character it bore for health, that of being a feverish, sickly place. It would make a large Cacao estate, and must have abundance of fertile land behind the lagoons or swamps, to insure it being a productive one. In one of the dells near the path we saw an old cacao cultivation. Maráca was the Indian name of the rattle or shak-shak, the fruit of the wild calabash tree, the *Crescentia latifolia*, a tall erect forest tree, very unlike its congener the common calabash tree of our gardens; it bears a small spherical calabash (in Spanish Totumo), into which, when dry, hard, and cleaned out, was dropped through the small hole through which it has been cleaned, a number of Indian shot (the hard black shot-like seed of the Tuloma or Toulema (creole, Tous-les-mois) a species of Canna, called by Schomburgk *C. achiras*, *Gillies*. The further end of a short stick was then run through the shak-shak, and with one of these sticks in each hand, the chef d'orchestre, properly oiled, painted and refreshed no doubt, was ready to commence operations. Time was sharply and exactly marked by him, accompanied by an action reminding one of castanets. This place, I have been assured, is the true Marácas, the valley south of Tocutché now called the Valley of Maracas, being properly the Valley of St. Joseph, anciently San José, after the Village of that name; the river is yet called the St. Joseph River. Tocutché was long called in the maps the Maracas Mountain, and this, seen as at the head of the St. Joseph Valley, in turn gave the same name to it also. This at least seem the more probable way the name must have travelled from the land or the bay to the valley over the mountains.

Taïrico is a small cacao estate of about six quarrées, say 19 acres, lately established, and is all rising ground, easy at first; the name is that of our black corn-bird, the *Scaphidurus ater*, called in creole *Merle cavalier*; it is a large handsome boat-tailed bird, of the Starling family (STURNIDÆ); the feathers of its body reflect beautiful blue, green, and other colors as it disports itself; the total length is 14 or 15 inches, 6 of which belong to the tail. The name given to it by the Spanish creoles, and very generally by the English also, Taïrico (in 4 syllables), is the cry of the bird.

There is more surf on the beach in Maracas Bay in the best season than its depth and horse-shoe form leads one to expect. The best landings are, I believe, in Damian's bay, and at the north-west end of Maracas beach. Set in a dark frame of forest-covered mountains that seem to rise from the water's edge, this bay has a gloomy and unpromising aspect from the sea. Maracas and Las Cuevas being the leading bays on this coast, and often spoken about in town, and ignorance of them leaving a serious hiatus in one's knowledge of the north coast, I determined, after my return, to visit them overland, which I did on the last day of January.

The details given in these pages connected with these two bays were chiefly obtained during this journey. The botanical specimens brought back were all gathered in going over Piedra Blanca, or at its foot on either side. They were as follows:

Palicourea crocea, *D.C.*, var. tenuifolia
Psychotria uliginosa, *Sw.*
Nepsera aquatica, *Naud.*

Spennera kappleriana, *Naud.*
Mikania scabra, *D. C.*
Wulffia havanensis, *D. C.*
Acanthospermum humile, *D. C.*
Micromeria obovata, *Benth.*
Mentzelia aspera, *L.*
Begonia humilis, *Dryand.*
Passiflora *sp.*
Anguria umbrosa, *Kth.*
Croton balsamifer, *L.*
Cassia sericea, *Sw.*
Thalia geniculata, *L.*
Herpestis—2 sp.

Tree ferns were abundant in the Gasparillo ravine, but none were seen over 6 or 8 feet high (in stem). In many places considerable numbers of an orange colored fruit were met with beneath tall erect trees; they were of the size and shape of a Portugal orange, invariably hard, and one I brought home showed no disposition to soften by keeping, though I kept it for weeks, and till it turned very dark, and had lost all vitality; these proved to be the fruit of the Contrevint, a pretty large tree, some 60 feet high, erect, with dark shining leaves, a Sapotad, and thus related to our Balata, Sapodilla, and Star-apple. Frequent examples of a tree of a very rare form in our woods were met with, a tree common on the mountains, and there only I believe, and of which there are two examples in our gardens, one in the Botanic Garden, and the other in the hon. the Attorney-General's. It throws out horizontally a close whorl of thin branches, which shorten as they shoot out from the trunk one over another; the outline of the tree thus becomes pyramidal, like a Fir. It was provisionally and doubtingly labelled *Xanthochymus pictorius* at St. Ann's by Mr. Crüger. It is not in Grisebach, at least under that name. It grows no higher than a good standard apple tree, say not over 20 feet, seems of slow growth, and is probably a hard and heavy wood; it puts out when blooming a quantity of small, unattractive, sessile or subsessile flowers, yellowish I think, set all along the branches; the bark is coarse, and I think I remember it bleeding a thick yellowish gum when wounded. It is in the deep glens and on the steep cool shady sides of these mountains, near water-runs, that one meets with the lovely *Warszewiczia coccinea*, with its long outstretching arms of gorgeous scarlet bracts, ranged, alternate, in double file, and in gradually diminishing size and compacter order along the graceful curve of those excessively tough branches; this is another of those plants which can never be seen in p[illegible] its native recesses. I have found at vari[illegible] these northern vallies, on partially clear[illegible]ng some sun, but near a streamlet, and [illegible]n a humid atmosphere, always on poor [illegible]ly ground, and where vegetation had f[illegible]h at least been left to run riot, a vari[illegible]elastomads. Among those of our more [illegible] trees which peculiarly affect the moun[illegible] Purpleheart—the most elastic wood kn[illegible] colony, Leopard wood (more commonly kn[illegible] as Letter wood), Cyp (i. e., Cypre, Cypress —from a fancied resemblance to the scent of that wood when freshly cut), the Mahoe tree (*Sterculia caribæa*, which must not be confounded with the *Paritium tiliaceum*, found on all shores round the tropical belt, and whose inner bark is applied to so many uses by the poorer natives of various regions), Tapana, Guatapana (our beefwood), Locust, Laurier cypre, Acoma (our Mastic), Poui

(especially the Black Poui, *Tecoma spectabilis*—a golden glory when in full burst, and almost worth a voyage across the Atlantic to behold), Yoke (a handsome furniture wood), Monkey Balata, Olivier, and some others, to which I have been recently assured by a wood-cutter who works on the Diego Martin heights, may be added Greenheart and Wallaba; he speaks very positively on this novel piece of intelligence, but the opinions and credos of this class of persons must be received with extreme caution; they will name a tree sometimes from its bark, sometimes from the smell, and sometimes from the grain or color of the timber, leaving out of consideration all the other various points that have to be taken into account in determining kindred, or classifying a plant. Constant familiarity with the nobles of the forest enables any of these men, however, to tell with unerring accuracy what such a tree is in their habitual nomenclature (however erroneous that in itself may be) by simply cutting a chip out of a growing tree with his cutlass; for in three seconds he is able to note its habit of growth and size, the character of the bark, color, hardness, smell and taste of the wood, and he even obtains some idea of its grain. These are sufficient data to allow an intelligent woodman to declare that the tree he has just cut a chip from is such and such a tree with which he is familiar, and no other; but when, in comparing a tree he knows as a living tree with the wood of another which he has never seen but in a wood-yard, from a resemblance in color, grain and weight, he decides that they are identical, he may be entirely at fault.

Some of our good timber trees are found equally on hill and plain, as the Balata, Cedar, Balsam tree (Capivi), but are more abundant in the latter.

Others affect the plain exclusively, or nearly so, at least so far as my observation and information go at present; these are the Mora, Galba, Carápa or Carapo (vulgarised into Crapeau in creole, and in other English Colonies into Crabwood), Watercaire (from Guataquero), Roble, Fiddlewood, (Bois Lézar), Poirier, Red-wood (Bois rouge, a wood of a deep crimson red, and said to be allied to Mahogany and our Red or common Cedar), and many others. But as I am not writing a paper on our woods at present, no more need be said than that the wood of the mountains having grown on firmer, sometimes stony or rocky, yet a drier, better drained soil, in a cooler temperature, and been more buffetted by the winds, has a slower growth, and is heavier, tougher, sounder than the corresponding species in the low flat lands, and if it be a furniture wood, as Cedar or Balsam, will be closer, finer, wavier in the 'grain' or fibre, and much richer in the 'feather' or embranchment.

On Maracas beach, at the extreme north-west end, I collected 14 species of bivalves, and 23 of univalves; among the former a fine Arca Adamsii, and many A. squamosa, Cardita dactylus and Trigona mactroides. Among the univalves were a good many good limpets (6 species), a small Crepidula, Columbella lævigata, Bullia aciculata, and Oliva nitidula.

The Las Cuevas estate is variously stated at 400 or 500 quarrées (1,300 to 1,600 acres), and its cacao trees were formerly stated at 100,000; they are now roughly estimated at 60,000, for the estate has not long been taken over by the present proprietor, and is not reduced into thorough order. It had been for many years in a semi-abandoned state, the absentee owner being unable to meet with a purchaser who would settle in a place so remote, and cut off from easy communication with the town;

probably the difficulty of inducing laborers to go and *remain* there was even a more serious matter than any other, for the situation not only cuts them off from gossip and relaxation with their fellows, but has an evil repute for the prevalence of marsh fever. This malarious condition is likely to exist in those bays 'till the value of land in the colony so rises in course of time, and communications so improve as to induce the owners to drain off the stagnant waters.

Here I found 19 species of bivalves, and 23 of univalves, among which were the following: Cardita dactylus, Arca squamosa, Mytilus brazilianus, Arca reticulata, A. occidentalis. I was presented with a specimen of Pecten nodosus, one of Pinna ramulosa, and a large and perfect Arca occidentalis. The univalves contained a good many large shells, most of them dull or worn specimens; Turbo tuberosa, Bulla ampulla, Triton sp., Conus musicus, Imperator digitatus, Cyprœa exanthema (called in the Virgin Islands the ground sea shell, from a murmur as of the distant surf when the shell is held close to the ear.) My guide, when along this coast, on the 21st November and 4th December last, had brought back 43 species of bivalves, and 57 of univalves from Las Cuevas alone, and he declares, that on each occasion he has been here, he has found the beach much altered, and with different shells.

Tuesday, 10*th August,* 1869.

R. J. Lechmere Guppy, F.L.S.,F.G.S., &c., President, in the Chair.

Specimens of Miniature Painting and other Works of Art were exhibited to the Meeting by André Knox, M.A.

Wednesday, 13*th October,* 1869.

R. J. Lechmere Guppy, F.L.S.,F.G.S., President, in the Chair.

The following donations were announced :—

"Scientific Opinion"—Nos. 21-23 : *Presented by the President.*

"Journal of the Society of Arts"—Nos. 850-853, 863, 865-875 : *Presented by the Colonial Government.*

"Vargasia"—No. 5 : *Presented by the Sociedad de Ciencias de Caracas.*

The following Address was then delivered by the President:—

ANNUAL ADDRESS OF THE PRESIDENT,

R. J. Lechmere Guppy, F.L.S., F.G.S., &c., &c.,

On the present condition *of the* Trinidad Public Library; *with* Suggestions *for the* Improvement *and* Development *of that* Institution.

> "We allow that if we were to assume a power of drawing a more perfect straight line or circle than any one else by superior steadiness of hand, or acuteness of eye, it would lead to a comparison of talent; but if one merely assert that he can draw a more perfect line or circle with a ruler or compasses than another can by his unassisted hand or eye, he surely cannot be said to boast of much."—*Nov. Org.* I, cxii.

I propose, by way of address, on the occasion of vacating the chair, which I have had the honor to fill during the past twelvemonths, to call your attention to some matters of high interest to all who desire the advancement of our community. As the progress of the human race is shown by science and history to be inevitable, we shall only be consulting the interests and happiness of ourselves in endeavouring to follow in the footsteps of those nations which are confessedly the foremost in civilization. It has before been mentioned that this Association has, without any aid from public funds, carried out, so far as its small means allowed, most of the objects for which the Corresponding Committee of the Society of Arts was instituted in this Island with an annual grant from the public funds of £400 a year. As the means of the Association are very limited, and do not allow of its hiring a building for meetings, and for the deposit of books and other property, I have no doubt, that when a building is erected for a Public Library and Museum, some provision of the kind will be made for the Association. In the meantime it may be hoped that the Committee of the Trinidad Public Library, now that they have acquired better accommodation, will allow to the Association the use of one of the rooms. This will be a step to the union, in one building, of our scientific and literary collections—for the use of the books and papers of the Association, will, I have no doubt, be readily granted to readers at the Library.

Our collections have been augmented during the past year by the exchange of our Proceedings with the Lyceum of Natural History of New-York, the Sociedad de Ciencias de Caracas, and the Smithsonian Institute of Washington. We have also had the usual number of donations of separate memoirs.

The local Government has presented to us, for some time, copies of the Journal of the Society of Arts, but, apparently through indifference, the series is not continuous. One of the great functions to be filled by Scientific Societies in the future seems already plainly sketched out—it is the exchange and preservation of Scientific publications. One public institution has carried out this useful work on a grand scale, and in whatever part of the world a United States Consul is to be found, there is also the Agent of the institution I refer to; the Smithsonian Institute of Washington, which performs the functions of a national library and museum, and a scientific society, with a liberality worthy of its founder's intentions, "For the increase and diffusion of knowledge among men."

The Public Library of Trinidad was founded in 1851,

under an Ordinance of the local Government, which granted to it £300 a year. Previous to that time, it appears, that some persons joined themselves together under the name of the Trinidad Library Association. They purchased a number of books, many of which were subsequently bought for the existing Library.

The constitution conferred upon the Public Library by the Ordinance 2 of 1851 is, with a few modifications subsequently introduced, the same it now has.

By the Ordinance 3 of 1852 the subscription was made £1 instead of £2 a year. This Ordinance expired without confirmation, but was renewed by 2 of 1855 for five years. By Ordinance 9 of 1861 the enactment was made perpetual.

The following are the names of the Librarians:

Francis Joseph Danglade, 1851-1860 (resigned.)
Sebastien Cipriani, 1861-1868 (died.)
Léon DeGannes, 1868, the present Librarian.

In tracing an outline of the history of the Library, it is impossible to avoid the recognition of the heavy debt the Island owes to the Honorable William George Knox. It is mainly to his Honor's exertions that we owe the establishment of this institution, and the interest and minute care he has always taken in its promotion and well-being cannot be sufficiently acknowledged. Not only has he freely given his personal exertions and the weight of his influence in its behalf, but he has at various times been a liberal donor of books to the institution. Very soon after the founding of the Library, His Honor made a donation to it of 59 volumes. In the records we find entries of subsequent donations, namely, of 66 numbers of unbound periodicals, and 147 bound volumes. On another occasion His Honor contributed 10 volumes. Amongst his contributions were a set of that useful work, the Annual Register. Pre-eminent among the other benefactors of the Library, we find the name of His Excellency Lord Harris. In 1851 he presented Story's Works, 10 volumes; Froissart's Chronicles, 4 volumes; Gibbon's Rome, 6 volumes; Pictorial History of England, 8 volumes; and other works, altogether 30 volumes, besides 16 volumes of Trade Circulars, and Price Lists of the Exhibition of 1851, and a collection of Silicified Woods. Among other acquisitions by donation, the Library owes to Mr. Alexander Fitzjames a gift of 105 volumes of Journals and Reports of the House of Commons: to Archdeacon Cummins a present of 12 volumes, including Dictionnaire de Theologie de Berger; Gilly's Waldensian Researches; Sims' Historical Defence of the Waldenses, and D'Anville's Ancient Geography. Mr. A. DeBarres presented in 1859 the Dictionnaire des Découvertes en France, in 17 volumes; and in 1860 a library of the Fathers in 39 volumes was subscribed for and presented to the Library. In 1856, at the request of the managing body, the chairman of the Public Library put himself into communication with the Commissioners of Patents in order to obtain copies of their publications. These valuable works are now stored in the Library in a very inadequate manner, and it is to be feared that they will become deteriorated by the want of proper accommodation. The acquisitions by purchase were steadily pushed forward from the commencement of the Library. 145 volumes were purchased at the sale of Mr. Clogstoun's effects. Other books were purchased at Mr. Rostant's sale, and I have before referred to those bought from the Trinidad Library Association. The managing body was no less diligent in the selection of books in Europe, and the result of their zeal is the well-chosen if small library of 8,000 volumes. And here I should be doing scant jus-

tice to the gentlemen who have at various times been entrusted with the selection of books, if I did not acknowledge the great care and ability with which their task has been accomplished, and any one who takes the trouble to glance over the catalogues will find that, as a whole, the Library is provided with a great number of the works of the greatest thinkers, the perusal of which cannot fail to have a most beneficial effect upon our community. The gentlemen referred to may feel assured, that whatever estimate has been, or is now made of their disinterested labors, they have sown good seed which will in due time bear fruit, and confer lasting benefits upon the people of our Island.

The Library was at first lodged in a building on the site of the present Townhall. The rent was $600 a year. On the 1st of April, 1856 the Library was removed to Finlay's house, opposite the Court-House, where the rent was $120. On the 1st June 1869 the Library was removed to its present quarters, the rent paid being $460, a part of which, however, is returned in the rent of the basement rooms. This building, situated at the corner of Lower Prince Street and Edward Street, is fairly suitable for the purpose, but endeavors should be made to secure a home of its own for the Library. The committee have already had under their consideration a plan for effecting this, and I shall advert to the subject again. I have appended hereto a statement of the receipts and expenditure of the Library, so far as I have been able to obtain an account of them from the published reports of the committee.

It may easily be understood, that in a Library containing only 8,000 volumes, the deficiencies must be numerous. I believe that, considering the character of our Library, and the objects it is intended to subserve, the most noticeable deficiencies may be ranged under the following heads :

1.—Newspapers published in the Island : I believe the Library possesses none.*

2.—Local Publications and Pamphlets relating to the West Indies : In this department I am sorry to say a very great neglect has been evinced. No pains have been taken to obtain such works, and where the authors or publishers have been at the trouble to present them to the Library, they have not always been properly acknowledged, nor have they been duly preserved, bound and recorded in the catalogues. In this way papers of great interest and future value have been lost to the Library.

3.—Publications of the local Government, including the Council Papers, Ordinances and Royal Gazette. The only expense that would fall on the Library in respect of these would be the binding, for I feel assured that, on application, copies of these papers would readily be granted by the Government.

4.—Parliamentary Papers : There are a number of these in the Library, some presented and some purchased. A few are bound, but the majority lie in a heap, inaccessible to any one save the insects.

5.—Scientific Works : The Scientific Works in the Library may be counted on the fingers. This remark does not apply to Manuals, of which there is a moderate supply ; but these are books which the student usually procures for himself, and their purpose in a Library is rather for the perusal of casual

* I am glad to observe, that since this paper was read, the Public Library has obtained, for the moderate sum of $47, forty-four volumes of the Port-of-Spain Gazette, and three of the Trinidad Gazette,—R. J. L. G.

readers than for the student. A noteworthy deficiency under this head is that of the great works relating to the West Indies and Tropical America. The following are, I consider, indispensable :

The series of Works relating to Humboldt's voyage.

D'Orbigny's Amerique Meridionale—Spix and Martius's Work on Brazil—the Works of the Castelnau expedition—the fine series of Works contained in Ramon de la Sagra's Histoire de Cuba, of which the Library possesses only the political portion.

A number of Works relating to the Natural History of the West Indies, and particularly to Botany, are included in the Crüger collection, now lodged at the Botanic Gardens. The Leotaud collection contains part of Cuvier's Regne Animal, together with Gray's Genera of Birds, Gosse's Birds of Jamaica, and other works of great value.

The chief objection made to the purchase of Scientific Works is the withdrawal of funds from the purchase of books more interesting to the general reader, and to those who use the Library as a circulating library. I admit the force of those objections, but I am compelled to qualify he admission by a reference to the fact, that large sums have been spent on the raw material of History, chiefly of Europe, of no interest, and comparatively little value here ; and that when the revenue of the Library was greater than it is now, no efforts were made to supply the deficiencies in Works relating to our own part of the world.

Had £20 a year been set apart from the beginning for the purpose, some little might have been done, for costly books of the kind are not produced every day or every year. Now that the Borough Council have withdrawn their contribution, I think it is the duty of the Government not to let the Library suffer, or its usefulness become impaired, because a municipal body has no sense of the public wants of the age. My proposition is, therefore, that an additional grant be made to the Library (say about £100 a year), specially for the purpose of procuring Works on the Natural Sciences. For some years this grant will do no more than supply the existing deficiencies in Works relating to the Natural History of the West Indies and Tropical America.

We find that when the late Dr. Leotaud offered his collection of Birds for deposit in the Library (to be vested in the Crown), he made the stipulation "that a fair amount of books on Natural History should be annually got from Europe." The committee agreed to this, but the subsequent placing of the Birds at Government-House seems to have relieved the committee of the condition. This shows, however, the willingness of the committee to have the deficiencies in this respect made good, and the sole question with them now seems to be the matter of funds.

I should further recommend that publishers in the Island should be required to send one copy of every publication, including newspapers, to the Public Library, such books and papers not in any case to be taken out of the Library nor to be lent to readers within the Library until bound. All pamphlets and works of every kind, Parliamentary papers included, to be properly bound, and where presented, the gift to be duly acknowledged, and duly recorded in the catalogues. As to binding, private experience alone is sufficient to show that no books can be preserved in this country unless they are bound.

At Government-House there is a collection of newspapers and Parliamentary papers, which will be of great utility to the future historian of the Island. There is also a set of the London Gazette. From time to time

various works have been received at Government-House, though owing to the frequent use of that building for balls and concerts, great destruction and loss have occurred among the books, which, in great part, are neither shelved nor catalogued. All these may eventually be deposited at the Public Library, when that institution shall have been placed on a proper footing.

It was very properly laid down at the foundation of the Library, that it was the duty of the Librarian to compile and keep a catalogue. The result of this regulation was the first printed catalogue, a copy of which was sold for five cents. As the Library grew, a more complete catalogue was required, and in 1856 the manuscript of one drawn up by the Librarian was sent to Hamburg and printed. It was in two parts, one French and one English, an unnecessary division, and one that added to the expense. Subsequently, lists of the books acquired were, from time to time, published in the newspapers, and slips containing the lists were generally to be had at the Library. It seems, however, that there must have been great irregularity in the compilation of these lists, and they scarcely subserved the purpose of a complete catalogue. The committee therefore resolved in 1862 upon the compilation of supplementary catalogues. It should be borne in mind that the Librarian's duty should have been, from the commencement—to keep a manuscript catalogue, into which the title of every book should be properly entered upon its arrival in the Library. Owing to the neglect of this obvious piece of library-economy, it was necessary to examine every one of the books in detail, in order to the compilation of a new catalogue. This work was performed in a most conscientious manner, not by the Librarian, but by one of the elected committee-men. Such, indeed, was the condition of things, that the committee had to pay for the transcription of the catalogue, instead of that work being done by the Librarian. Even then the work of superintendence and of correction of the press devolved upon the gentleman I have already referred to, and it is to his labor that we are principally indebted for the due performance of the task. No proper manuscript catalogue of the books of the Library, however, exists up to the present day. In 1862 Mr. Thomas F. Stuart brought this important point under the notice of the committee, and it was decided that such a catalogue should be made. In 1867 I served on the committee; and brought forward at the suggestion of several gentlemen, interested in the Library, some propositions for the improvement of the Library. Of these some were rejected, namely, a proposition that the books should be arranged according to subjects and have press marks affixed, and another for regulating the mode of issuing books to subscribers. But that relating to the compilation of a manuscript catalogue was agreed to by the committee, and also a recommendation that cases should be provided for pamphlets. No steps have been taken to carry out these decisions. Any general catalogue of the Library must be alphabetical in the order of the author's names, but this would not preclude the compilation of classified catalogues if the means are available.

A point of detail which ought to be referred to, is the due stamping of the books, a matter which it will be more necessary to look to when the usefulness of the Library shall have increased. Every book should be stamped with a neat stamp, and preferably with red ink, at the beginning and at the end, and every plate and map therein should also be stamped.

A word or two should be said as to the classification of the books in the Library. The only classification now in use is that into I, English—II, French and other languages. I would recommend that this classification be made entirely subordinate to the classification into subjects of which many schemes will be found in Edward's work; the one proposed by himself at p.p. 814-15 of his 2nd vol., with a few modifications, will probably be most suited to our Library. The economy and management of Libraries has been so ably treated by Edwards, that it is unnecessary for me to go at any length into the subject. But it will be well to bear in mind that our Library unites in several particulars the characters of a Town Library and those of a National Library. That it was the object of its founders to make it so, appears clearly from the sources of revenue proposed for it. It was enacted that an annual grant of £300 a year should be made by the Government, and that the Borough Council of Port-of-Spain should contribute such sum as they thought fit. I have before alluded to the fact, that for several years the Town contributed £100 a year, and that that grant had been withdrawn in 1862.

The public nature of the funds by which the Library is supported is sufficient evidence that the Library is purely a public one. Nevertheless, from the first the practice of the Library has been, more and more, to restrict the use of the Library to subscribers only, and at present the general impression is, that the Library is maintained entirely for their use; but in fact the subscriptions are solely intended to confer the privilege of taking books out of the Library. The effect of the subscriptions upon the conduct and management of the Library seems to have been by no means an unmixed good, for we find that many subscribers are continually clamoring for an increase of novels and light literature.

The committee have gradually yielded more and more to this demand, and at present nearly if not quite half the books (including serials), imported by the Library, belong to light literature. Nevertheless, to show the fallacy of giving way to such a matter, the subscriptions have actually declined. This I take to be due, however, not to the character of the works imported, but to a diminution of interest in the Library—interest I mean of a purely personal kind, and bearing no reference to books.

If, however, as some seem to think, the light literature business will yield a profit which can be applied to the purchase of more solid works, I would recommend the formation of a separate branch for that department. If separate accounts be kept of such a branch, it will soon be seen what the real state of the case is. The competition of the Library, aided by public funds, has already, I believe, had some influence in breaking down a private circulating library here. I think it very doubtful, therefore, how far any great attention is to be paid to that most useless class of readers who read only novels. In the first place, the whole amount contributed by subscribers is, in round figures, only $600 out of $2,000, and it would not be fair to assume that more than one-half the subscribers belong to the class indicated. But at any rate, bearing in mind the public character of the Library, it is clear that it is not its proper function to act as a mere circulating library. Let private enterprise supply such wants as this. There is an ample field for the utility of the Library to develop itself within its own proper sphere, but its regulations must be such as to ensure its benefits to every class. According to the principles laid down by Edwards as in-

dispensable for the guidance of a Public Library, it must be unrestrictedly open to every visitor, and be made alike useful to every class of the community. It must be governed by a truly liberal spirit, and freed from all dependence either on gifts or on current subscriptions for its permanent support.

Having cleared the way so far, I think I may lay before you some further suggestions drawn from the work of Mr. Edwards before referred to. I should propose that the reforms already brought before the committee be carried out, and that the Library be divided into two departments—the reference division and the lending division. The germ of such an arrangement already exists—imported, like many other wholesome principles, by the wise founders of our Library.

The reference department should be largely increased, and it should include all expensive and bulky books. All accessions by bequest or donation should be included in this department, unless specially exempted. It would, of course, include the Crüger and Leotaud collections, and all scientific works to be purchased hereafter, excepting manuals or similar works.

To the reference department thus constituted, the admittance should be by ticket granted by the committee, on the recommendation of one of its members, and available for at least a year; such ticket should be renewable on simple application to the Librarian, and should be withdrawable only for breach of the regulations. The rules in force for the issue of tickets to the British Museum Library would be available here. Every provision should be made for the comfort and convenience of readers in this department, and the readers should be allowed to take down any book from its shelf without application to the Librarian, It should be understood that readers in the reference department could have books from the lending department, by applying for them on the ticket provided for the purpose, and readers in the lending department could also have books from the reference department by complying with the same formality.

In the lending department the chief points would be arrangements to facilitate the delivery of books, and their arrangement and classification. For the privilege of taking books out of the Library, it would be desirable that the borrowers should, as at present, pay a subscription; but it is a question for consideration whether the amount ought not to be reduced? It should be distinctly understood that such payment is merely for the privilege of taking out books, and that every person is of right entitled to read the books within the Library without any payment whatever. In this branch, no book should be delivered without a written requisition, such as that in use in the British Museum and most public and Scientific Libraries; but the admission to this department should be entirely unrestricted.

In these suggestions I am advocating nothing but what is recognized in all Public Libraries. The same principles evidently presided at the formation of our Library; but restrictions have practically operated to render the liberality of those regulations almost nugatory. Thus, in the rules established on the formation of the Library, provision is made for the admission of non-subscribers. They were admissible on a ticket to be granted by the committee, available for three months; we find that in 1856, on an application from Mr. Laurie, on behalf of the Churchman's Library Association, to be allowed to read in the rooms of the Library, it was decided by the com-

mittee that "it was nothing more than what was already conceded to the public by the regulations of the Library." This decision, of which I have given the very words, whilst admitting that the applicants could have admission as any one could, conveys a false impression in two ways: First, it ignores the vexatious renewal of ticket every three months, necessary under the Library regulations: Second it conveys the idea, that that which is a public right, acknowledged in the Ordinance constituting the Library, is a concession to the public. I would not quarrel with words unnecessarily; but I think that in this matter the words lead to wrong inferences, and the appearance of grudging to the public the privilege of reading in the Library seems to have had prejudicial effect. At any rate the practice of our Library is anything but encouraging to readers: the general impression being that no one but subscribers have a right of admission into the Library. It should henceforth be a recognised principle of the Library management, that the use of the institution is primarily designed for readers, and not for subscribers. The benefit of the former should be studied in preference to that of the latter. In fact the reason for retaining the class of subscribers is merely the greater convenience found by many in having the books at their own houses. For this privilege they should pay a subscription. Bearing however in mind that the subscribers are not the class for whose exclusive or principal benefit the Library was founded and is maintained, I should recommend that they should elect a fixed number not exceeding four of the members of the Board of Directors. It would indeed be far better that the subscription should be abolished altogether, than that the benefits of so useful a public institution should be confined to a favored few.

Of the working of Public Libraries in the West Indies, I have been able to glean but scanty information. The Public Library and Museum of St. Lucia was entirely a government establishment, and some years ago it was proposed to hand it over to subscribers, a step which was severely criticised, as it had previously been working fairly, and it was rightly deemed, that to vest it in private persons would prove a fatal blow. I have not heard anything of it, or if it still exists. The Public Library and Museum of Grenada was founded on the same plan as that of St. Lucia, but I have no details of its working. The Library at Barbados is not, I believe, of the utility it should be, owing to the want of liberal regulations. It was established by Act of the Legislature, but I am unacquainted with its precise constitution.

The reading room at Dominica is a private concern, but the regulations are very liberally construed, and the institution is of much use, considering its very limited resources, to the small community of that Island.

We have already seen in the growth and decay of human institutions, such as churches, hospitals and schools, the necessity for some mode of rendering them permanently responsible to, and amenable to, the will of the country. The only mode of securing that end is by placing them under the control of the State, which is the guardian of the interests of the people.

The people have a very great interest in the maintenance of a Public Library as a means of education, and a necessary supplement to the training they receive at the public schools. The superiority of American farmers is attributable to the subscription libraries, which are found everywhere in the United States, and which are publicly and gratuitously open as Libraries of reference. In Eng-

land the formation of Town Libraries has been authorized by Act of Parliament, and many towns have taken advantage of those Acts. The limit of legislation has probably not yet been reached, for it is proposed that all such Libraries should be placed under a system of management and inspection similar to that of national schools. It is highly probable, that when a system of national education is adopted in England, and it cannot be long delayed, that the Libraries will come in for a share of attention, and steps be taken to ensure the maintenance of at least one such institution in every town of importance.

The reasons set forth herein, and the desire to make our Public Library as useful as possible to all classes of the community, who have in fact an equal interest and an equal right in it, have prompted me to lay these views before you; and I trust the time is now at hand when those principles of Library management, which, after a long and severe struggle, have asserted themselves, and obtained the recognition of every State of importance, will be duly applied in our Island.

I shall conclude this paper by stating briefly what steps should, in my opinion, be taken to place the Public Library, as far as possible, upon such a ground of usefulness as every such institution ought to occupy. I would therefore recommend that Hinde's bequest, together with such amount as can be raised by private subscription, be devoted to the construction of a proper building for the Library, and that the Government be petitioned to supplement these funds, which of themselves would be insufficient, by a grant for that purpose. The building ought to include accommodation for a museum, the foundation for which already exists in Dr. Leotaud's collection of Birds, Dr. Court's collection of Reptiles, Mr. Keate's collection of shells, and the fossils, etc. collected by the Geological Survey. Due allowance should be made for future donations.

The Leotaud and Crüger collections of Books should be deposited in the same building as the Public Library, and should be subject to the same regulations; but they should be placed in the Reference Department, and not be allowed to go out of the Library.

The Library should be freely open to all comers.

Ths books should be arranged and classified according to subjects upon the shelves, and press-marks should be affixed.

A proper manuscript catalogue should be kept, in which should be entered the titles of all books upon receipt at the Library. The press-marks of the books should be inserted in the catalogue, so that any book may be found immediately on reference to the catalogue.

All pamphlets and periodicals should be properly preserved and regularly bound. The Government should be petitioned to make an annual grant (of say £100) for the purpose of purchasing those Scientific Works in which the Library is now so deficient; and a further grant (of say £50) for the purpose of binding and keeping in order the publications of the Commissioners of Patents.

The salary of the Librarian should be placed upon the fixed establishment of the Island; and the Librarian should in future be appointed by the Governor, thus assimilating in another essential respect the practice of our Library to that of similar institutions elsewhere.

The constitution of the managing body should be slightly modified. The Board of Directors should not exceed a working number, say ten. Of these, four might be appointed by the Governor, and four elected by the Subscri-

bers, irrespective of the number of the latter. To these should be added two members, appointed by the Governor, to have special charge of the Museum and scientific portion of the Library, but whose powers at the Board should be the same as that of other members. I need hardly say that the Public Library, thus developed, would enter on a new career of usefulness, and afford the means of improvement to a large part of our community. I shall be happy to be of any assistance in placing the details of the Library management upon a proper footing, or in furnishing information on points relating to the construction of the building, the compilation of the catalogues, and the classification of the books.

In conclusion, I beg to present to you, and to recommend most respectfully to the notice of the Government and the Committee of the Trinidad Public Library, the suggestions herein made as to the reorganization and due establishment of the Library and Museum.

[P. S.—It will be matter for consideration whether the Library of legal books lately acquired by the Government might not, with very great convenience to readers, be added to the reference department of the Public Library, upon that institution being duly reformed, and suitable accommodation for readers being provided.—R. J. L. G., 30th May, 1871.]

STATEMENT of the Receipts and Expenditure of the TRINIDAD PUBLIC LIBRARY, so far as the same can be ascertained from the published Reports of the Committee of Management:

YEAR.	REVENUE.				EXPENDITURE.					
	Subsidy. $	Subscriptions. $ c.	Miscellaneous $ c.	Total. $ c.	Rent. $	Salary. $	Wages. $ c.	Books. $ c.	Miscellaneous $ c.	Total. $ c.
1856	1920	419 30	34 20	2373 50	545	600	..	893 60	159 97	2198 57
1857	1920	441 48	33 25	2394 73	420	600	..	1221 42	369 38	2610 80
1858	*	*	*	*	*	*	*	*	*	*
1859	1920	484 46	17 68	2422 14	420	600	111 00	1081 92	125 95	2338 87
1860	1920	537 10	16 26	2493 36	420	620	122 33	1131 43	50 92	2344 68
1861	1920	608 00	75 62	2603 62	420	720	187 86	1066 25	141 84	2535 95
1862	1440	643 60	8 59	2092 19	420	720	252 68	779 59	113 40	2285 67
1863	*	*	*	*	*	*	*	*	*	*
1864	1440	761 20	18 95	2220 15	420	720	257 00	529 56	46 73	1973 29
1865	1440	654 60	19 23	2113 18	420	720	253 48	657 50	60 95	2155 13
1866	1440	657 60	7 46	2105 06	420	720	240 00	609 39	91 92	2081 31
1867	1440	646 40	68 98	2155 38	420	720	255 33	478 59	78 60	1952 52
1868	1440	562 00	9 52	2011 52	420	720	280 00	589 90	186 59	2196 49

NOTE.—I have been unable to discover any statement of the Receipts and Expenditure for the years previous to 1856, nor for the years 1858 and 1863.
The expenditure under the head of Miscellaneous includes Catalogues (printing, &c.)

ELECTION OF OFFICERS.

The Ballot for Officers for the Year 1869-70 having been taken, the following were declared duly elected ;—

Henry William Caird, M.A., President.
Robert John Lechmere Guppy, F.L.S., F.G.S. } Vice
Horace Deighton, M.A., F.R.A.S. } Presid'ts.
Henry F. J. Guppy, F.A.S.L., Secretary & Treasurer.

Tuesday, 9th November, 1869.

Henry F. J. Guppy, F.A.S.L., in the Chair.

The following communication was read :—

On coming Weather and Weather Predictions:

By the Hon. George Webbe, F.R.A.S., Corresponding Member.

"*Nam et tempestates, ac temporum varietates, cœlique mutationes,*
"*a Diis immortalibus generi humano tribuuntur.*"

CICERO DE NAT. DEORUM—I.

THERE is scarcely any subject in which the generality of mankind take so much interest as in that which is popularly termed "The Weather:" and few are regarded with such superstitious veneration as they who assume to possess the faculty of "forecasting" the weather that will occur at a future period. It is somewhat curious to notice what a variety of meanings is involved in the phrase "the weather," according to the different positions and desires of the parties interested. "What *glorious weather*," says the thirsty planter, whose thoughts are justly devoted to the improvement of his growing crop :—" it *rained* heavily all night." "Charming prospect, Lady Bab, for our pic-nic "to-morrow," says the indefatigable Mrs. Bouncer—" if this delightful sunshine and *balmy weather* will but continue." "Well, I wonder how much longer this tarna-"tion *weather* is going to last," says the anxious skipper, whose vessel has been beating about in the chops of the channel for a week past, under the power of a heavy north-easter. And so, like the varied hues of the chamelion, what is called "The Weather" is regarded under very inconsistent and almost repugnant conditions; according to the point of view that may be taken by the observer.

But they who make this branch of Natural Science a leading subject of their studies, apply a very extensive meaning to the term "The Weather." Meteorologists, in the most comprehensive acceptation of the term, direct their attention to all the phenomena presented by the changes in the state of the atmosphere:—to the direction and force of the wind—to the temperature of the passing hour—to the moisture or dryness of the air—to the effects due to electricity—and generally to the observation of all such phenomena as, it is hoped, may in due time lead to a systematic knowledge of the causes that produce what we term "the weather." Meteorological observations, we know, have been established for several years past in various parts of the world, and competent observers have been employed to note and record the various circumstances that may occur in relation to meteorology. And yet but little progress has been made in deducing anything like settled principles by which we may infer the future condition of the "weather." Nor need we be surprised at this. Let us consider, for instance, how many laborious years were passed in midnight observations; and what a host of innumerable calculations had to be performed by men of the highest intellects the world had as yet known, before the planetary system was firmly established as a scientific fact.

It may safely be asserted that nine persons at least out of every ten that we are acquainted with, deduce their expectations of coming weather from certain conditions of the moon; and although their expectations are almost al-

ways disappointed, still they continue to pin their faith on that luminary. Some years ago "The Farmer's Almanac," a book extensively circulated in England, contained a sort of table or calendar, the authorship of which was incorrectly attributed to Sir William Herschel, by which the state of the weather during a whole lunation might be foretold by observing the hour of the day or night at which the change of the moon might take place. The belief, however, in this spurious calendar has probably in these days nearly faded away. Others again go further, and lay great stress on the effects to be expected from the influence of the moon when she is in perigee, or at her nearest proximity to the earth, especially if at that time she is also in conjunction with, or in opposition to, the sun. No doubt an aerial spring-tide, or heaping up as it were of the atmosphere directly under the moon, will take place by the force of her attraction when she is in her nearest position to the earth; but when we consider that air is more than eight hundred times lighter than water, we may rest satisfied that no important atmospheric disturbance, having any special effect on the general atmosphere, will take place on such occasions. The public mind in this part of the world has recently been very incautiously alarmed by certain predictions of direful results to be apprehended about the 6th of October, in consequence of the moon being in perigee, and also in conjunction with the sun on that day. It may be sufficient to say that such apprehensions are utterly groundless. We do not affirm that there will *not* be a gale, nor a flood, nor some other such calamity on the 6th of October, nor on the 6th of November, nor on any other of the three hundred and sixty-five days in the year; such a prediction would be as absurd as that which we have condemned. We simply assert that we have no sufficient knowledge to enable us to predict either one way or the other. Once in every lunar month the moon is in conjunction, as Astronomers term it, with the sun, and once in opposition. Once also in every month she is in perigee, or at that point in her orbit which is nearest to the earth; and it may happen perhaps twice or thrice in the year that the time of the moon's conjunction or opposition, and the time of her being in perigee may coincide within two or three hours; yet we never hear of any great aerial disturbances at those periods. On the 26th of February last, for instance, the time of full moon and the time of the moon being in perigee, concurred within less than an hour's interval between them. If ever any atmospheric convulsions should result from the influence of the heavenly bodies, such should have occurred at that time; but, so far as we are aware, no gale, or flood, or other atmospheric disturbance, nor even a change in the state of the tides, which might perhaps have been looked for to a small extent, did actually happen at that period.

But while we condemn a blind devotion to the imaginary influence of the moon as the cause producing meteorological phenomena, we are willing to admit that there *is* an influence exercised by her on the state of the air, which we believe is not so generally recognised as might have been expected. Let any one set himself to observe the state of the sky on the evening of a full moon. The evening perhaps may be cloudy; but when the full moon rises, or soon after, he will generally perceive, not only that the clouds clear away as if by magic, but also that the night becomes calm and serene. Now, what is the cause of this sudden transformation? We will endeavour to explain it.

It must be remembered that the immensely heated surface of the moon when full *must* radiate or reflect upon the

earth a portion of its heat, in the same manner that it reflects the sun's light, although in a much inferior and more feeble degree. The clouds, which are nothing more than the vapour of water in a semi-condensed state, receive this reflected heat. The heat thus transmitted to the clouds will cause them to pass from the state of *cloudy* vapour to that of transparent and *invisible* vapour, which, indeed, is the general condition of the great mass of aqueous vapour which the sun is perpetually raising from the oceans and seas. This transparent vapour is of course imperceptible to our senses. It remains on high commingled with the air until when acted upon by a colder stratum of the atmosphere, it again resumes the condition of cloud, and finally descends in the state of rain to bless and fertilise the earth.

Now, here we have a specified effect assigned to a specified and sufficient cause. There is no conjecture in the matter. We do not say, however, that this tendency to clear the sky of clouds by the reflected heat of the full moon will invariably take effect. The clouds may be so dense, and so nearly approaching to the condition of rain, as to be insusceptible of the very weak influence of the reflected lunar heat. But although the effect that we have described cannot be reckoned upon with positive certainty, yet if any one will take the trouble to put down in his pocket-book an impartial and fair record of the state of the sky as to clouds on the night preceding each full moon, on the night of the full noon, and on the night after—from an hour before the moon rises, and thence hourly, as late as his convenience will allow—he will find after a twelvemonths' observations a large preponderance of instances where the clouds were dissipated on the full moon's appearance in the manner we have mentioned.

Most of the prognostications that the "weatherwise" lay down for our edification are nothing more than traditional assertions handed down from generation to generation without the slightest proof of reality deduced from the test of experience, or by fair investigation. "The sheep turn their tails," says the ignorant shepherd, "to the southwest, *therefore*, there will be a gale of wind from that quarter." The poor shepherd had heard his seniors make this assertion, and therefore implicitly believed it. Poetry, too, has lent her aid in handing down various groundless prognostications in reference to the weather. "The rain-" bow in the morning is the shepherd's warning." "The " evening red and the morning gray,"—and many others are uttered with a claim to authority, but in total ignorance of the sequence of cause and effect, or of the modes of action which influence the operation of natural phenomena.

In the meteorological observations before mentioned, observations are carefully takên and faithfully recorded, in some of them every hour, day and night. But the observers do not attempt to make conjectural predictions therefrom. They send their accumulated facts to men of science, who patiently digest and compare them, in the hope of deducing in time some principles by which meteorology may be brought into the form of a philosophical system, which it can hardly be said to have as yet assumed. Something, it is true, has been already effected. We may mention, for instance, that in extra-tropical countries, beyond the reach of the Trade winds, the winds in their changes have been found to have a preponderating tendency to veer in the same direction round the compass with the sun's apparent diurnal course in the heaven's—that is, from east round by south, west, and north, in the northern hemisphere, and reversely in the southern. This

fact had been surmised, and perhaps had been occasionally observed in an imperfect manner from very early times; but it has of late taken its place among ascertained truths as a meteorological law of universal applicability, connected with that great fact which underlies so many other phenomena—the daily rotation of the earth.

There is also an important atmospherical disturbance which is beginning to be recognised as a regular periodical phenomenon, under the name of "the November atmospheric wave." This is one great billow or enormous wave of air which sweeps in November across the North Atlantic and the European Continent from north-west to south-east, preceded and followed by sudden and violent subordinate fluctuations. To this condition of the atmosphere in Europe are attributed the gale of October 25, 1859, in which the "Royal Charter" was lost—the great Crimean hurricane of November 14, 1855—and many other November gales of fearful violence. But it is somewhat remarkable, that although the march of these mountain waves of air is almost invariably from north-west to south-east, yet the *direction* of the *wind*, when those gales are raging, is nearly as invariably from the south-west quarter, or at right angles to the course of the atmospheric flow. This has been attempted to be explained more or less satisfactorily by meteorologists. We may, however, see something analogous in some degree to this circumstance, by noticing how the surf breaks continuously on any of the exposed coasts of these Islands, in whatever direction the wind may happen to be blowing.

To return to "predictions of coming weather:" We are happily in possession of two instruments, the barometer and the thermometer, which, if rightly observed, will never disappoint or deceive us. These were the oracles that the late Admiral Fitzroy had recourse to, and the answers he received were never false, and rarely ambiguous. By long-continued observations he had systematised the indications presented by those instruments, which, coupled with other indications such as those of the force and direction of the wind, afforded sufficient data for "precasting" the state of the weather a short time in advance. But all such indications are to be considered as valid only for a very brief interval of time. The weather-prophet, who ventures his predictions on a great scale, is altogether to be disregarded. The sooth-sayers, in a country with a climate like that of England, may hazard their prognostications with a very probable chance of partial fulfilment. If any one were to *throw dice* to determine what days in the winter months in England he might pronounce beforehand would be rainy or stormy, he would probably be right in at least half the number of his guesses. For it is more than an even chance in that climate, that any day that might be named from November to February, inclusive, will be either a wet or a stormy day. All such predictions are nothing more than lucky guesses, and no person in his senses would arrange or alter his plans for a month, or even a week in advance, on the faith of any special prediction of a wet or a dry, a calm or a stormy season. The barometer alone is the weather-prophet, on whom we may implicitly rely for at least a few hours; and here we may be permitted to offer a word or two of suggestion to those who may possess that valuable instrument. When we see the surface of the mercury in our barometer assume a hollow or cup-like shape, we know it is about to descend, and when we perceive the falling of the barometer to be very slow and gradual—say one-tenth of an inch in twenty-four hours, to be followed perhaps by another

small descent on the following day—we may generally infer that the atmosphere over our heads is supercharged with the vapour of water. As water, when converted into invisible vapour, is very much lighter than air, and interpenetrates and mixes with it, it is easy to perceive that the air thus mingled with watery vapour will be lighter than the undiluted air in its normal state, and hence less pressure will act on the mercury in our barometer. Under these circumstances we might reasonably expect a fall of rain shortly.

But if we perceive a rapid descent of the mercury in our barometer—say two-tenths of an inch (or even less than that) in an hour, and that it continues to go down—then let us lose no time in looking after our defences against the approaching foe. Be not beguiled by the apparent fineness and serenity of the weather at the moment, for so sure as such indications as we have just referred to shall be disclosed by the barometer, so certain is it that a heavy gale is near at hand. Let us *first* secure our doors and windows that front the *east*, the *north* and the *west*;—for as a hurricane *cannot commence* from the *south*, we may attend to the southern fronts of our buildings afterwards.

In offering to the Society this little Essay on "coming "weather and on weather predictions," we have endeavoured to show, that neither from experience, nor by any legitimate principles of science, have we any grounds to justify us in presuming to predict any particular condition of weather beyond the continuance of at most a few hours. We have also adverted to the erroneous notion that the configurations of the sun and moon have any influence whatever on atmospheric disturbances. The dreams of astrology have passed away. We must bring our belief into conformity with that of the Indian

> "whose untutored mind,
> "Sees God in clouds, and hears Him in the wind."

In such a humble and devotional spirit we should not be long in acknowledging that "He who holds the winds in the hollow of His hand," has reserved to Himself the knowledge of how and when He shall send them forth;—and although those terrific ministers of His will may occasionally inflict what we consider to be fearful destruction, let us reconcile ourselves to the conviction that such events are part of His providential administration of the world, in which we may be sure His wisdom and mercy will educe from

> "All partial evil, universal good."

Rules *and* Regulations *and* List *of* Members *of the* Scientific Association *of* Trinidad—1869-70.

The object of this Association is the cultivation of Scientific Knowledge in the West Indies.

RULES;

1. This Association shall be called the "Scientific Association of Trinidad."

2. The objects of the Association shall be carried out by the reading of Papers and the discussion of Scientific subjects, by maintaining a correspondence with scientific men in other countries, by assisting in the development and application of Science in the West Indies, and generally by the collection and publication of useful information.

3. The Association shall consist of Members, Corresponding Members, and Honorary Members.

4. The Association shall, in October of each year, elect from among the Members a President, two Vice-Presidents, and a Secretary and Treasurer, who shall constitute the Council of the Association. Such Council shall have, subject to the Rules, the general management of the affairs of the Association.

5. The person who shall have filled the office of President in any year shall not be eligible for election as President for the next following year.

6. When any candidate shall be proposed for admission to the Association as a Member, he shall be balloted for at the next meeting thereafter, one black ball in five excluding.

7. The Association may elect as Corresponding Members such persons in the West Indies and elsewhere as from their services to Science are likely to contribute towards the advancement of the objects of the Association.

8. The Association may elect as Honorary Members such persons not permanently resident in Trinidad as may be desirable.

9. The Association shall meet on the second Tuesday in each month, or on such other day as may be fixed by the Council.

10. No motion relative to the Rules of the Association shall be brought forward except at a Special General Meeting of the Association; and no such motion shall be carried, except by a majority of at least two-thirds of the Members present at such Special General Meeting.

11. One-third at least of the Members of the Association actually in the Island shall be required to constitute a Special General Meeting: and in order to constitute such

Special General Meeting, it shall be requisite to give notice thereof at an ordinary Meeting.

12. Provided however that the ordinary meeting in October of each year shall have all the powers of a Special General Meeting without respect to the number of Members present.

13. The Subscription of each Member shall be One Pound and Tenpence per annum, payable half-yearly on the first day of January and the first day of July. Every new Member on election shall pay the subscription for the current half-year.

14. No Member whose subscription shall be in arrear for three calendar months, unless at the time absent from the Island, shall be entitled to any of the privileges of membership.

15. The Secretary shall, at the monthly meetings in April and October of each year, lay before the Association lists of those Members whose subscriptions are in arrear.

16. No non-Member may be present at the Meetings of the Association; but Members may introduce Strangers to such meetings. Provided that no person shall be considered a Stranger after he shall have been resident in the Island longer than three calendar months.

17. Every Member shall be entitled to one copy of each Paper printed since his election.

18. No Member shall be entitled to receive free any paper published during any period for which he shall not have paid subscription.

19. The Author of every Paper printed for the Association shall be entitled to have six copies of such Paper.

20. Members desiring to obtain copies of the Proceed-

ings of the Association, other than those to which they are entitled as specified in the preceding Rules, may have the same, as far as copies are available, on payment of the following rates:

When the Part of the half-yearly Journal shall not exceed 32 pages (for each part) .. .. 1s. 0d.
When the same shall exceed 32 pages (for each part) .. 1s. 6d.

21. Copies of the Journal of Proceedings of the Association may be sold to the public at the following rates:—

When the Part of the half-yearly Journal shall not exceed 32 pages (for each part) .. .. 1s. 6d.
When the same shall exceed 32 pages (for each part) ... 2s. 6d.

A Commission at the rate of twenty-five per cent. shall be allowed to the Agent, if any, appointed for the sale of such Journal; and the monies derived from the sale of Papers shall be applied to the purposes of the Association.

22. Corresponding Members not being required to pay any subscription may receive the parts of the "Proceedings" at the prices charged to Members.

23. These Rules shall not be applicable to Honorary or Corresponding Members unless where expressly so stated.

Council (elected 13th October, 1869.)

Henry William Caird, M.A., *President.*
Horace Deighton, M.A., F.R.A.S., } *Vice-*
Robert John Lechmere Guppy, F.L.S., F.G.S. &c. } *Presid'ts*
Henry Francis Jeune Guppy, F.A.S.L., *Secretary & Treasurer.*

List of Members.

1863 Henry William Caird, M.A.
1863 Horace Deighton, M.A., F.R.A.S.
1867 Louis de Verteuil.
1864 The Hon. Louis Antoine Aimé de Verteuil, M.D.
1863 Henry Francis Jeune Guppy, F.A.S.L.
1864 Robert Guppy, M.A.
1863 Robert John Lechmere Guppy, F.L.S., F.G.S , &c.
1869 Edward Johnston Hammond, M.R.C.S.L.
1866 Octavius Harley.
1868 The Hon. John Imray, M.D. (Dominica.)
1864 William Caspar Kelaart, M.R.C.S.L., Corr. Member Z. S., &c.
1868 Robert Knaggs, M.R.C.S.L.
1868 André Blasini Knox, M.A.
1866 John Persse Lambert, B.A.
1866 The Hon. Louis Alexander LeRoy.
1863 The Hon. Henry Stuart Mitchell, M.D., Ph. D.
1867 Lewis Henry Moorsom, M.I.C.E.
1864 Henry Prestoe.
1867 William Henry Stone, M.A., M.B., F.R.C.P., &c.
1867 John Herbert Trollope.

Honorary Member.

HisExcellency the Honorable Sir Arthur Hamilton Gordon, K.C.M.G.

Corresponding Members.

The Hon. Richard Hill, Spanish-town, Jamaica.

George Parkes Wall, F.G.S., Victoria-Park, Sheffield, England.

Hugh Croskerry, M.D., Chapeltown, Jamaica.
The Hon. Francis Goding, M.D., The Hermitage, Barbados.
Nathaniel Wilson, Botanic Gardens, Bath, Jamaica.
Albert C. L. G. Günther, M. A., M.D., Ph. D., F.R.S., &c., British Museum, London, W.C.
Robert Swift, St. Thomas.
Henry J. Krebs, St. Thomas.
Jules François Court, M.D., 4, Rue du Centre, Beaujon, Paris.
The Hon. George Webbe, F.R.A.S., Nevis.
Thomas Bland, F.G.S., 34½, Pine-street, New-York.

Members are requested to communicate changes of Residence, &c., to the Secretary.

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ERRATA.

Ordinary misprints are not included in this List.

P. 27—line 11 from bottom, for *terversanus* read *terverianus*.
" 67—last line, for *Eclimoderm* read *Echinoderms*.
" 96—line 8 from bottom, for *make* read *mark*.
" 154—2nd column, for " Tertiaries of Cumana, Barbados," &c., read " Tertiaries of Cumana, Barbuda," &c.
" 167— A cross should be placed in the last (Sanfernando) column opposite *Nodosaria raphanistrum*, that being the only still-existing species hitherto discovered in the Sanfernando beds.
" 185—line 22, for *unmersed* read *immersed*.
" 191—line 22, for *oval* read *ova*.
" 366—line 5, for " Asiphis" read *Asaphis*.
" " —lines 20-21, for " obture" read *obtuse*.
" 383—line 1, for " raising" read *rising*.
" 398—line 18, for " coasting" read *casting*.
" 409—line 21, for " indifference" read *inadvertence*.
" 424—line 2, for " Act" read *Acts*.

The title was inadvertently omitted from Mr. Henry Prestoe's " Catalogue of Plants in the Royal Botanical Gardens."—p. 252.

For a list of the errata in Mr. Prestoe's Catalogue of Plants, see page 353.

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