books: it requires, of necessity, a thorough theoretical and practical training. The control of disinfection is in the majority of cases left in the hands of police officials who have no knowledge of the subject whatever, and thus numerous mistakes are made, and much unnecessary damage to property ensues. . . For cholera-disinfection, in my opinion, special courses of instruction should be provided for disinfectors in both the theoretical and practical application of the subject."

We cordially commend the perusal of this valuable report to our own public authorities, who might, thereby, possibly be stimulated to take some serious and effective steps in staying the ravages of, to us, a far more deadly enemy, *i.e.* diphtheria. The Hamburg cholera disaster has not been without its lesson to Germany; surely we need wait no longer for our authorities to be similarly roused to successfully combat diphtheria.

G. C. FRANKLAND.

A JAMAICA DRIFT-FRUIT.

THE dispersal of plants by oceanic currents is a subject full of interest, and no apology is needed in bringing it forward if thereby we stimulate those who have opportunities for observing the effects of this agency in various parts of the world. The valuable contribution made to the literature of the subject by Mr. W. B. Hemsley, F.R.S., in the "Botany of the *Challenger*," and since added to by himself, Mr. Guppy, and others, cannot fail to enlarge our knowledge in regard to the origin of plant-life on oceanic islands as well as on the littoral of much larger areas. Our first acquaintance with the fruit of the remarkable *Lodoicea* of the Seychelles, for instance, was as a waif floating on the surface of the sea, and hence one of its familiar names *Coco-de-mer*. In the West Indies the ripe fruits of a palm unknown in the Greater Antilles are continually brought by the Gulf Stream from the south, and washed ashore at Jamaica and other places. These are locally called "Sea apples" or "Sea cocoa-nuts." They are the fruits of the Bussu palm (*Manicaria saccifera*), found in Trinidad and the adjacent mainland of South America. The white kernel is sometimes fresh enough to be eaten after long immersion in salt water. This fruit was gathered by Sloane as long ago as 1687, and he remarked that it was frequently cast on the north-west islands of Scotland by the currents and the sea. The seeds of the Cocoon (*Entada scandens*), large brown beans about two inches in diameter, are so frequently cast ashore in various parts of the world, that they are commonly called "Sea-beans." Several plants have been raised at Kew from seeds picked up at the Azores. It is also mentioned by Robert Brown that a plant of *Cæsalpinia Bonduc* was raised from a seed found stranded on the west coast of Ireland. Linnæus also seems to have been acquainted with instances of germination having taken place in seeds thrown ashore on the coast of Norway. These are well-known and familiar examples of drift-fruits. The record might be considerably enlarged without more than touching on the fringe of the subject. It is hoped that botanists in suitable localities will give attention to this comparatively unworked field of investigation, and record the results of their observations.

In NATURE (vol. xxxix. p. 322), I gave an account, with woodcuts, of a drift-fruit that was collected on the shores of Jamaica. This had a very singular history. It had, in the first instance, been gathered nearly three hundred years ago, and presented by Jacob Plateau to Clusius. It was figured and described by many of the older botanists, but up to the time of writing in 1889 the plant bearing it had not been identified. The object I had in view in drawing attention to it in the columns of NATURE, was to enlist the interest of those likely to throw light upon its origin, and lead eventually to its identification.

FORMER HISTORY.

It is somewhat remarkable that a drift-fruit so plentifully brought by the Gulf Stream, and cast ashore in the West Indies and elsewhere, should have been so long a mystery.

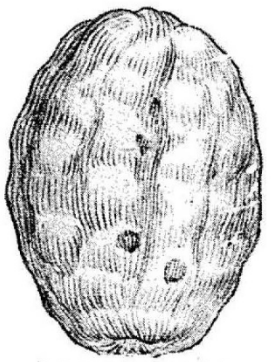
The first notice, so far as I can gather, is given with a woodcut, by Clusius, in his "Exoticorum libri decem," lib. ii. cap. 19. This work bears the date of 1605. The following is Clusius' description, which is reproduced as it appears in the original, together with his representation of the fruit:—

Exotici fructus à Jacobo Plateau & aliis accepti.

Cap. xix.

Aliquot exoticos fructus mittebat ad me Jacobus Plateau, quum intelligeret me Exoticorum Historiam scribere, ut quantum posset meos conatus etiam in hac materia juvaret, sed quos, præter binos, jam antè videram & descripseram.

Binos igitur illos, quos dixi mihi antè non fuisse conspectos, cum binis aliis aliunde acceptis, in tabella exprimi curabam quam hîc subjicio. Primus illorum quos Plateau mutuo dabat, binas uncias cum semisse longus erat, quatuor in ambitu crassus, cine-



Drift-fruit (after Clusius).

racei coloris, quem aliquo operimento tectum fuisse arbitrabar: in quinque partes dividi posse, venæ per longitudinem ductæ indicabant; alioqui eminentibus aliquot tuberculis instar vesicularum obsitus erat, quæ aperta, inanes & inæquales lacunas ostendebant spadicei coloris & splendentes, quasi semen aliquod continuissent: valde durus autem erat is fructus, & adstringente facultate præditus.

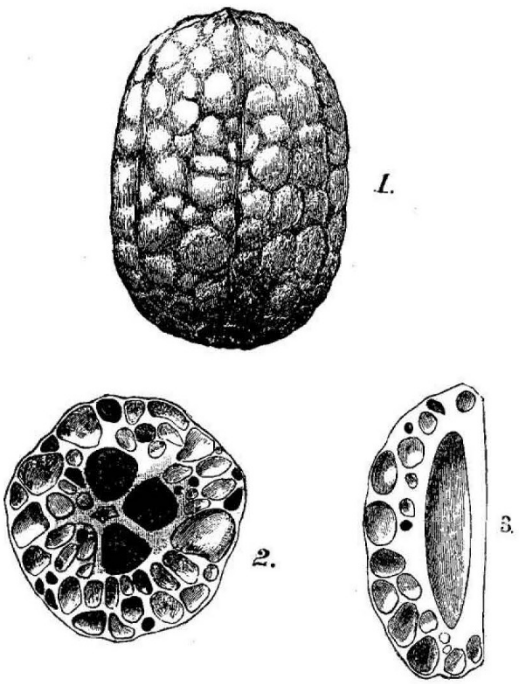
About sixty years afterwards, Johannes Jonston, in "Historia Naturalibus de Arboribus et Fructibus" (1662), p. 102, refers to the same fruit. In 1680 both the description and figure given by Clusius were reproduced by J. Bauhin in "Historia Plantarum," tom. i. lib. 3, cap. cxi. fig. 1. It is next mentioned in Sloane's "Catalogus Plantarum" (1696), p. 214, in the following words: "Fructum nunc saepissime collegi in Insulæ Jamaicæ littus ejectum cum aliis maris recrementis." The fruit itself was recognised in 1889 by Mr. E. G. Baker, as existing in the Sloane Collection in the British Museum (Natural History) where it is labelled "No. 1656." Further, in 1764, a small and somewhat unsatisfactory figure was given in "Petiveri Opera," t. lxxi., fig. 5, with the information: "It is a hard oval fruit with seed-holes round its surface. Cat. 605. Found on the shores of Jamaica." In all the cases enumerated above, it is represented in its water-worn condition as given in Fig. 1 below. It is a hard bony fruit, about an inch and a half to two inches long, marked externally with mammillated protuberances corresponding (as shown in Figs. 2 and 3) with numerous cavities or resin-cysts existing in its walls. In the transverse section, Fig. 2, it may be seen that the fruit is normally five-celled, but two are suppressed. The seeds are solitary, and contain abundant albumen. There is no doubt it was once a drupaceous fruit, but the fleshy outer layer or sarcocarp has decayed or worn away by the action of water. What is now left is, in many respects, so unlike the fruit in the fresh state, that its origin must always have been somewhat difficult to trace.

In passing, it may be noticed that it possesses ideal qualities as a drift-fruit. The numerous closed cavities contained in the walls render it very buoyant, and easily influenced by the action of the wind, while its hard texture and the presence of resin preserve it from becoming water-logged or decayed. There is no record that the seeds have germinated after long immersion in salt water, or that the plant has established itself in a new locality outside its present area. These are interesting points for further observation.

RECENT HISTORY.

The chapter in the recent history of the fruit opened in 1884. It was then collected, by the writer, with other drift-fruits on the sandy-spit of land known as the Palisadoes enclosing Kingston Harbour, Jamaica. On this land the Botanical Department had

established a cocal or cocoa-nut plantation with about 25,000 trees. Many of these are now in full bearing, and bring a regular revenue to the Government. The locality is exposed to the full force of the waves from the Caribbean Sea, and large quantities of wreckage, sea-weeds, and drift-fruit are thrown high up on the beach. The drift-fruits collected in 1884 were forwarded to Kew, and most of them were easily determined. The fruit under notice was, however, quite new, and it was placed in a cabinet with others until sufficient material had accumulated to lead to its identification. In November 1887, a further specimen was sent to Kew, by Mrs. Hubbard. This, singularly enough, had been picked up on the shore of Bigborough Bay, in the south of England. It is quite possible in this instance it may have been derived from a wreck, or thrown overboard from a passing ship, but, as Mrs. Hubbard aptly remarks, "such a fruit is not among the usual articles of import, and further, our south-west coasts are very likely to receive Gulf-stream waifs and strays." It was still, however, undetermined. The presence of the resin-cysts was always regarded as a character of some value. From the large collections in the Museums of Economic Botany at Kew a clue was at last obtained by the assistant, Mr. J. M. Hillier, in



Representation of a Jamaica drift-fruit (natural size). 1, external aspect; 2, cross-section; 3, longitudinal section.

the fruits of *Humiria gabonensis*, belonging to the natural order *Humiriaceæ*. These were somewhat smaller and more globular than the Jamaica drift-fruit, and, being covered with a brown fibrous epicarp, looked very different. The bony endocarp was, however, similar in character and plentifully furnished with resin-cysts. The natural order *Humiriaceæ* is a small one, and consists of plants entirely confined to tropical America, with the single exception of the species already mentioned. The theory was that the drift-fruit had been derived from tropical America, and not from Africa. The American genera of *Humiriaceæ* are *Vantanea*, *Humiria*, and *Sacoglottis*. The balance of probability at the time was in favour of *Humiria*, and possibly of *H. balsamifera*. The fruit of the latter was, however, unknown. After the publication of the note in NATURE special attention was given to the subject, with the result, as shown later, that the mystery connected with it was completely solved.

In 1887, Colonel Feilden, a member of the West India Exploration Committee stationed at Barbados, found a specimen on the beach of that island, while two years later Dr. H. A. Alford Nicholls, of Dominica, fished up a similar specimen off the island of Mustique, between St. Vincent and Grenada.

The most important result was, however, obtained from the island of Trinidad. In March 1889, Mr. J. H. Hart, Superintendent of the Botanic Garden at Trinidad, wrote as follows: "I am extremely pleased that you called my attention to the Jamaica drift-fruit. I remember the specimens well, and cut several of them in Jamaica at the time we were packing the set you sent to Kew for the *Botany* of the *Challenger* Expedition. As soon as I read your article in NATURE, I commenced a search among the material in the herbarium here, and found a drawing of *Sacoglottis*, by Crüger,[1] with dissections of the flower and fruit. These made it evident that the plant which produces the unknown fruit is a native of Trinidad. Feeling further interested in the matter, I communicated with Mr. Syl. Devenish, the friend and companion of Crüger on many of his excursions, and I learnt further particulars as follows. When travelling in the forest at Irois, in the south-eastern part of the island, they found on the beach specimens of the fruit in question. Following up the stream they came to the tree producing it, from which, I presume, the drawings were taken. In addition, Mr. Devenish gave me a fruit, which I now send, to show there can be no mistake in the matter. This was collected by himself on the spot, so that there can be no doubt of the identity of the species we are both discussing. Mr. Devenish states that the tree is very rare. He saw but two in all his travels through the island. It is known locally as *Cojon de Burro*. It is probable that a greater portion of the drift-fruits found in Jamaica and elsewhere are produced on the mainland of South America, and are brought down by the flood waters of the Orinoco and the Amazon." On receipt of Crüger's drawings, Prof. Oliver at once expressed the opinion that they afforded a satisfactory solution of the problem. He stated: "The fruit of *Sacoglottis amazonica* is unknown, but Crüger's drawings correspond well with the floral analysis of the plant given by Dr. Urban." The latter monographed the *Humiriaceæ* in Martius' "Flora Brasiliensis."

It may be mentioned, in passing, that Dr. Urban had already ventured an opinion that the fruit might belong to *Sacoglottis*, but there were no fruits available for comparison in the herbaria at Kew, Berlin, or Paris.

The *Humiriaceæ* consist of trees or shrubs mostly with balsamic juice. The Balsam of Unieri, possessing the properties of Peruvian and Copaiva, is the produce of *Humiria floribunda*. A preparation of the juice of this and *H. balsamifera* has the odour of Storax, and is made into ointment and used internally. Although very different in habit, the *Humiriaceæ* are not far removed from the Flax order, *Lineæ*.

Sacoglottis amazonica is a moderately large tree, thirty to forty feet high, with a stout stem of an ash-grey colour. The leaves are alternate, slightly crenulated along the margin, and with two small glands at the base. The flowers are arranged in lateral panicles, petals yellowish-green, the anthers are ten in number, five long, five short, joined at the base. There is an annular disk closely girding the base of the ovary; the latter is five-celled, with a solitary ovule in each cell. The fruit was unknown until recently. It is described for the first time below.

Crüger's drawings, so thoughtfully sent by Mr. Hart, consisted of two sheets of dissections, with descriptive notes, all apparently done on the spot. They are minutely drawn, and give characters that are omitted even in the elaborate drawings in the "Flora Brasiliensis." They remind one of the careful field notes and sketches made by Sir Joseph Hooker in the Himalaya, by the late Dr. Thwaites in Ceylon, by Sir John Kirk in tropical Africa, and Mr. C. B. Clarke in India. The more recent botanical explorers are in no way behind their predecessors in regard to the skill and energy shown in selecting and drying their plants; but it may be mentioned, without disparagement of their invaluable services to science, that they do not, as a rule, devote the same attention as the older botanists to field notes and dissections, and thus a large amount of very interesting and accurate information is lost. Such information can never be obtained from the specimens themselves, however well they are mounted, in our National herbaria. It is certain that but for Crüger's drawings in this instance we should not, even now, have had the means of determining the origin of the Jamaica drift-fruit.

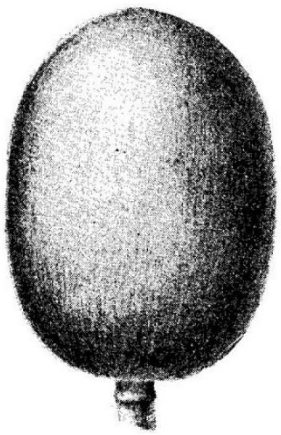
Since 1889 it has been sought to obtain fresh fruits of *Sacoglottis amazonica* from Trinidad or South America. These, so far, have not been received. There can, however, be no doubt of the identity of the plant. In order to obtain final evidence on the subject, my colleague, Dr. Stapf, the Assistant for India

[1] Dr. Herman Crüger, formerly Colonial Botanist and Superintendent of the Botanic Gardens, Trinidad.

in the Kew Herbarium, has been good enough to undertake a critical examination of Crüger's drawings, and compare them carefully with the description and plates of the species in the "Flora Brasiliensis." The result of the investigation is contained in the following note :—

"Crüger's drawings of *Sacoglottis*, Mart. 'Cojon de Burro,' October 13, 1861, agree perfectly with *Sacoglottis amazonica*, Mart. ('Flora Brasiliensis,' vol. xii. pt. 2, p. 449, tab. xcv.) The analyses are very carefully done. The sketch of the base of the leaf, for instance, shows the characteristic two glands which had been overlooked by Martius as well as Urban. As the fruit has not been previously described, it appears desirable to give a description of it drawn up from Crüger's drawings, as well as from the several specimens in the Kew Museum.

"Fructus subdrupaceus, ellipsoideus, 1½-1¾ poll. longus, 1-1¼ poll. latus, exocarpio vix 1 lin. crasso, endocarpio osseo, extus subbullato, cavernis resina impletis abundante, 5-loculari vel saepius ob ovula loculosque 1-4 aborta 4-1-loculari ineunte



Fruit of *Sacoglottis amazonica*, Mart. (after Crüger).

germinatione valvis 5-trigonis ab axi 5-alata semina inter alas in loculis late apertis exhibente sedentibus dehiscente. Semina cylindrica, pollicaria, testa tenui nigro-brunnea, albumine carnoso, embryone centrali, cotyledonibus lineari-oblongis planis, radicula brevi supera.

"The breaking up of the fruit, as described above, takes place also in water-worn specimens, as shown in the fruit collected by Dr. Nicholls. *Sacoglottis amazonica* was previously known only from Teffe or Egas, on the right bank of the middle Amazon, and from the banks of the Tagipurù, a channel in the delta of the Amazon, where it was collected by Martius. It is recorded from St. Vincent, on the authority of Guilding. Specimens from the latter are in the Kew Herbarium, but whether from wild or cultivated plants is not stated. It is also not certain whether they did not come, as many of Guilding's specimens, from Trinidad."—O. STAPF.

SUMMARY.

The story of this interesting drift-fruit is now told. The record of its occurrence has been traced from the year 1605, when it was first figured and described by Clusius, down to 1764, when it was redrawn by Petiver. For about one hundred and fifty years it was successively described by Clusius, Jonston, J. Bauhin, Hans Sloane, and Petiver. From 1764 until 1884, a period of one hundred and twenty years, it appears to have been entirely overlooked. It was, however, once more brought into notice in the latter year, and drifted specimens were obtained within a short period from Jamaica, the South of England, Barbados, the Grenadines (between St. Vincent and Grenada), and Trinidad. The specimen from the latter island was accompanied by careful drawings made by Crüger in 1861, giving particulars not only of the fruit itself, but also of the leaves and flowers. These when carefully compared with the description and plate in the "Flora Brasiliensis," and with specimens in the Kew Herbarium, left no doubt that the plant yielding the Jamaica drift-fruit is *Sacoglottis amazonica*, Mart. This grows very sparingly in the south-eastern portion of Trinidad, where it was collected by Crüger, but is more abundant in the delta of the Amazon, where it was collected by Martius and others. It is evident that from one or both of these localities the fruits are carried by the waters of the Gulf Stream into the Caribbean Sea, and either thrown ashore on the West Indian Islands, or carried still further, as in the case of many other similar fruits, across the North Atlantic, and cast on the shores of Western Europe. D. MORRIS.

THE PERCEPTION OF LIGHT.[1]

AT a former anniversary I brought before the members of the Institute the subject of the luminiferous ether. It is one of great and growing interest. I mentioned on that occasion how discoveries of very recent date have led us to attribute continually increasing importance, and a widening range of function, to that medium—substance can I call it ?—the existence of which was originally assumed as a hypothesis in order to account for the phenomena of light. It is in connection with this last aspect that it relates to what I propose to bring before you to-day.

The wonderful sense of sight, which, to use an expression of Sir John Herschel's, confers upon us to some extent the character of ubiquity, requires two things : in the first place, some means by which those distant bodies which we see are able to affect our own neighbourhood ; in the second place, some provision in our own bodies for receiving that influence, and transmitting some sensation to the conscious being.

In my former address I considered the first of these two subjects ; to-day I mean to confine myself to the second. This second, even by itself, is, however, far too wide for a single address ; selection of some kind is imperatively demanded. Moreover, there are some parts which are accurately known, and may even be made the object of mathematical calculation, while there are others which not merely lie beyond our existing knowledge, but beyond any that we can hope to attain to, at least in this life. Wonderful as is the construction of the eye in all its parts, so far as relates to the formation of images on the retina it acts simply like an optical instrument, like a telescope or microscope, or, more correctly, like the objective of such an instrument, and we may apply our mathematics to tracing the course of the rays through it. On the other hand, even if we knew accurately—which we do not—the nature of the effect which the external agent produces on the ultimate structure of our bodies, there would still remain, shrouded in impenetrable mystery, the nature of the process by which some change in the bodily organism causes a sensation to the conscious being.

Between these two extremes lies a region which has been to some extent explored, and in which a gradual and perhaps at last a very substantial increase to our existing scientific knowledge may be looked upon as probable. The investigation of this region possesses the keen interest which belongs to the discovery of new truths, and the addition thereby made to the stock of human knowledge. It is to this borderland lying between the well known and the unknown, and to certain parts of the structure of the eye having relation to it, that I would for a short time direct your attention to-day.

As I have already intimated, I propose to pass by entirely the functions of the eye acting as a simple optical instrument in forming images on the retina. The explanation of that may be found in all the ordinary text-books, and I will not weary you by repeating what is there to be found, and which is generally familiarly known.

The phenomena of vision show that distinctness of vision is dependent somehow or other in the first instance on the formation of distinct images of external objects on the retina. In that formation, as I have said, the transparent portion of the eye, the cornea, the aqueous humour, the crystalline lens and vitreous humour, plays the part of a lens in an optical instrument. I have said the "formation of the images on the retina" ; but the retina is not a mere surface, it has a certain amount of thickness, although it is, on the whole, very thin. We may further inquire on what part of the retina, considered at different depths from the place where it first commences, on which of the various layers into which histologists have divided it, is it that we have reason to think that light first acts on the organism of our bodies in such a manner as ultimately to give us the sensation of vision?

I have said that the retina, as a whole, though very thin, is not a mere surface. If we go from the centre of the eye-ball

[1] Presidential Address delivered at the Victoria Institute by Sir G. G. Stokes, F.R.S.