TABLE I.

Resistance in circuit.	1 S. U.			2 S. U.			3 S. U.			4 S. U.			5 S. U.			6 S. U.			1 S. U.		
	$\sin \phi$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$
1	59°5	1°698	1°70	45°9	1°032	1°03	35°47	7°125	7°12	28°7	5°475	5°47	23°9	4°431	4°43	20°35	3°709	3°71	61°87	1°871	1°87
8	56°2	1°494	1°87	39°5	8°243	1°03	29°7	5°704	7°13	23°55	4°358	5°45	19°42	3°526	4°41	16°57	2°975	3°72	56°32	1°500	1°87
6	48°25	1°120	1°87	31°72	6°181	1°03	23°15	4°280	7°13	18°0	3°249	5°41	14°85	2°651	4°42	12°4	2°199	3°67	48°3	1°122	1°87
4	36°67	7°446	1°86	22°17	4°061	1°01	15°85	2°839	7°10	12°22	2°166	5°41	10°0	1°763	4°41	8°25	1°450	3°62	36°87	7°450	1°86
2	20°27	3°693	1°85	11°70	2°071	1°03	8°02	1°409	7°04	6°05	1°060	5°41	5°0	0°875	4°37	4°17	0°729	3°64	20°27	3°693	1°85

It will be seen from this table that the value of $\frac{\tan \alpha}{\sin \phi}$ is as nearly a constant as can be expected from this kind of measurement.

Table II. gives the results obtained with the same coil and needle as before, but with the current unaltered in strength (one Bunsen's cell suitably reduced by the insertion of a small resistance). The order of experiments is shown by the arrows.

TABLE II.

$\sin \phi$	I.			II.			III.		
	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$
1	10°4	1°835	1°83	10°25	1°808	1°81	10°25	1°808	1°81
2	20°2	3°679	1°84	20°15	3°669	1°83	20°15	3°669	1°83
3	29°1	5°566	1°85	29°05	5°554	1°85	29°00	5°543	1°85
4	36°95	7°522	1°88	36°75	7°467	1°87	36°65	7°440	1°86
5	42°95	9°309	1°86	42°85	9°276	1°85	42°95	9°309	1°86
6	48°15	1°116	1°86	48°15	1°116	1°86	48°1	1°115	1°86
7	52°45	1°301	1°86	52°5	1°303	1°86	52°45	1°301	1°86
8	56°2	1°494	1°87	56°05	1°485	1°86	56°2	1°494	1°87
9	59°1	1°671	1°86	59°1	1°671	1°86	59°1	1°671	1°86
1	61°9	1°873	1°87	61°8	1°865	1°86	61°7	1°857	1°86

The smaller value of the constant at the top of each column is doubtless due to slight mechanical inaccuracies in this experimental instrument.

Table III. gives the results obtained with the copper band provided with stout leading wires and with the needle fixed to an axle. The resistance of the copper band, including the leads, was only '001 Siemens' units. Three Bunsen's cells connected parallel were used without additional resistance.

TABLE III.

$\sin \phi$	α	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$
1	66°9	2°344	2°34
8	61°6	1°849	2°31
6	54°4	1°397	2°33
5	49°4	1°167	2°33
4	42°9	9°293	2°32
2	25°1	4°684	2°34
1	13°2	2°345	2°34
1	66°8	2°333	2°33

In this table the greatest difference from the mean of the constant (2°33) is not more than .8 per cent.

The foregoing experiments having shown that the measurements with this instrument are, as to exactness, in no way inferior to those with the usual form of tangent galvanometer, I also employed it for the currents of dynamo-electric machines.

The first of these experiments was made with a Siemens' machine of smallest size. Besides the galvanometer an electric

lamp was in circuit. The strength of the current and the intensity of the light was measured, and at the same time the number of revolutions of the armature counted. The results are given in the next table.

TABLE IV.

Revolutions of armature.	Deflection α ($\sin \phi = .2$)	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	Intensity of light in standard candles.
860	38	7°813	3°906	3200
851	37	7°536	3°768	2750

The second experiment was made in the same way as the preceding, but with a Siemens' machine of medium size. The results are given in

TABLE V.

Revolutions of armature.	Deflection α ($\sin \phi = .1$)	$\tan \alpha$	$\frac{\tan \alpha}{\sin \phi}$	Intensity of light in standard candles.
660	28	5°317	5°317	4100
696	33°5	6°619	6°619	6400
692	33	6°494	6°494	7700 ¹

The deflections in the experiments with the small machine were taken with the galvanometer ring at an inclination, the sine of which is equal to .2; with the larger machine the sine of the angle of inclination was equal to .1. The column headed $\frac{\tan \alpha}{\sin \phi}$ gives in both cases the tangent of the deflection which would be obtained with the vertical ring.

By these two tables I intend merely to show that even such powerful currents which give a light of thousands of candles produce readable deflections with a suitable inclination of the ring.

I may add that the method I have just described to reduce the action of a coil upon the magnetic needle by turning it round a horizontal axis will scarcely be limited to the tangent galvanometer, but that this method very likely can be used with other galvanometric apparatus for many purposes where shunts are not desirable.

EUGEN OBACH

GULF-WEED²

FROM the time of Columbus to the present day the gulf-weed growing in the "Sargasso Sea" has attracted the attention and excited the interest of all voyagers who have crossed the

¹ With other carbon points than used before.

² Om de under Korvetten *Josephines* expedition, sistlidn sommar (1869), insamlade Algerne. Af J. G. Agardh, Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, 1870, No. 4, Stockholm.

Enumeration of Algae collected by Mr. Moseley, Naturalist to H.M.S. *Challenger*, at St. Thomas, Bermudas, Coast of Brazil, Cape de Verde Islands, St. Paul's Rocks, Fernando de Noronha, Tristan d'Acunha, Inaccessible Island, Simon's Bay, Seal Island, Marion Island, Heard Island, and Kerguelen's Island. By Prof. G. Dickie, M.D., F.L.S., Linnean Society's Journal—Botany, vol. xiv.

Atlantic. Almost every one who meets with the plant on his first trip across the ocean brings home a small bottle filled with the weed, which is shown to admiring friends, and then put away and forgotten. But the plant is much too interesting to be thus thrown aside without examination. Let the bottle be carefully broken so that the gulf-weed may be removed without injury; then place it in salt water—in sea-water if it can be got—in a large vessel of clear glass, where it will have room to expand, and then will be seen its beauty and grace of form, no small addition to which are the pretty and minute species of Campanularia, Plumularia, and Sertularia which twine around its branches, while other parts of the plant are covered by Polyzoa with a delicate lace-work as hard as stone.

But it is not only on account of its beauty that gulf-weed is deserving of attention; there is a history attached to it which renders it one of the most interesting vegetable productions of the sea. I propose, therefore, to give a summary of all that is yet known respecting the habits and history of this plant.

Whether the Sargasso Sea was known to the ancients is doubtful. Two descriptions, by ancient writers, of a kind of "Mar de Sargasso," near the coast of Africa, have been transmitted to us.

Humboldt ("Aspects of Nature," pp. 46, 47, Bohn's edition) has shown that both these descriptions refer to localities too near the coast of Africa to be applicable to the Sargasso Sea. The first description is from a work which Humboldt says for a long time bore incorrectly the name of Aristotle; it is as follows:—"Phœnician mariners came in a four days' voyage from Gades to a place where the sea was found covered with rushes and sea-weed. The sea-weed is uncovered at ebb, and overflowed at flood tide." There are no rushes mixed with the sea-weed in the Sargasso Sea, neither is the weed covered or uncovered by the water according to the state of the tide. The second description, from the Periplus, which has been ascribed to Scylax, of Caryanda, is thus quoted by Humboldt: "The sea beyond Cerne¹ ceases to be navigable in consequence of its great shallowness, its muddiness, and its sea-grass. The sea-grass lies a span thick, and it is pointed at its upper extremity, so that it pricks." Now the Sargasso bank is in deep water, which is not muddy, and no sea-grass (which inhabits shallow water) ever grows on it. The Sargasso bank is much more than a span in thickness, and the upper extremity of the plant is not sharp enough to prick.

Columbus and his followers called the floating sea-weed "sargazo," a term which botanists have modified into SARGASSUM, as the generic name, adding, as the specific name, *bacciferum*, alluding to the great number of berry-like air-vesicles which assist to buoy up the plant when in the water. This alga is also sometimes called "*Fucus natans*," on account of its being found floating on the sea, and not attached to the shore or to rocks, while to sailors it is known by the name of "gulf-weed," and that part of the sea where it is met with in greatest abundance is called the Sargasso Sea.

The Sargasso Sea is situated in the North Atlantic, between 22° and 36° N. latitude, in the comparatively quiet space which is bounded on the south by the great Equatorial current, on the west and north by the Gulf Stream, and on the east by the Guinea current, which flows southwards. Humboldt² states that there are two principal banks, the larger of which lies a little to the west of Fayal, one of the Azores; the smaller near to the Bahamas. The situation, however, of the weed-banks varies in different seasons, according to the prevalent winds. Maury states³ that "an area equal in extent to the Mississippi Valley, is so thickly matted over with gulf-weed, that the speed of vessels passing through it is often much retarded. When the companions of Columbus saw it, they thought it marked the limits of navigation, and became alarmed. To the eye, at a little distance, it seems substantial enough to walk upon. Patches of the weed are generally to be seen floating along the outer edge of the Gulf Stream. The sea-weed always 'tails' to a steady or constant wind, so that it serves the mariner as a sort of marine anemometer, telling him whether the wind, as he finds it, has been blowing for some time, or whether it has just shifted, and which way. Columbus first found this weedy sea on his voyage of discovery; there it has remained to this day, moving up and down, and changing its position, like the calms of Cancer, according to the seasons, the storms, and the winds. Exact

observation as to its limits and their range, extending back for fifty years, assure us that its mean position has not been altered since that time." Dr. Harvey says⁴ that he had made the voyage across the Atlantic four times, and only once found gulf-weed in any quantity. It then occurred in ridges of great length from ten to twenty yards in breadth. These ridges are separated by water, which flows between them like rivers or lakes.⁵

One fact respecting the gulf-weed, hitherto unnoticed by botanists, has not escaped the keen eye of the sailor, namely, that the plants rise a few inches above the water, the upper branches not being immersed; hence it is readily observed from a distance. It is this power of supporting the upper branches out of the water in an erect position—a very unusual power in sea-weeds—that enables the gulf-weed to "tail" to the wind, as before mentioned.

Another peculiarity attending the floating weed is that no other marine plant has ever been found growing on it or with it; small zoophytes and polyzoa are, however, often attached to it. Although its vegetation is limited to one species, the Sargasso Sea is a great resort of animal life, and it lies within the northern limits of the wanderings of the Sperm whale. The Right whale sometimes crosses its northern boundary, where the water is cooler.

A third peculiarity affecting the floating gulf-weed is that it has neither root nor fruit; never in the Atlantic, or in other localities where it is met with, has it ever been found in fruit.⁶ On this point I shall have more to say hereafter.

The genus Sargassum is the most highly organised of the Melanospermæ, or olive-coloured sea-weeds. It possesses root, stem, branches, leaves, air-vesicles, and distinct organs of fructification. The species are very numerous. Agardh, in his "Species, Genera et Ordines Algarum," part I, published in 1848, describes 126 species, which number has since been greatly increased. These species are classified into three sections and twelve tribes. Gulf-weed belongs to the highest section, namely, *Eu-sargassum*, or Sargassum proper, and to the twelfth tribe Cymosæ.

The genus Sargassum inhabits the tropical and sub-tropical seas of both hemispheres, extending on each side of the equator to about the 45° parallel of latitude, gradually increasing in number of species towards the line. With the exception of *S. bacciferum* (gulf-weed) and *S. vulgare*, which is also sometimes called "*Fucus natans*,"⁷ the species are very local. Thus some grow on the coasts of Australia only, and the species of North Australia differ from those of the south. A remarkable group of Sargasso inhabits the coasts of Japan, where the plants grow in the warm waters of "the Black Current," the Pacific analogue of the Gulf-Stream of the Atlantic; other species are found in the China Seas, many in the Indian Ocean, and these are generally distinct from those of the Red Sea. The section *Cymosæ*, to which Gulf-weed belongs, inhabit chiefly the Atlantic and Indian Oceans and the Australian coasts.

With these extremely local habits, and permanently distinct species, it seems difficult to reconcile the errant habits and the fixed forms of *S. vulgare*, and the plant which has given its name to the Sargasso Sea; both species are found in most of the warmer seas in both hemispheres.⁸ Slight deviations sometimes occur in these plants, but they are clearly traceable to local causes. Thus, in the Sargasso Sea, the plants have often shorter leaves, the branches are contracted, and the bristles of the air-vessels broken off; whereas, specimens from Sydney, New South Wales, have longer leaves, the air-vessels have very long bristles, which frequently form narrow leaves, and the habit of the plants is more lax and straggling.

S. vulgare produces fruit in all the localities where it is found; but, with regard to *S. bacciferum*, it has already been

¹ "Manual of British Algae." Introduction, p. xxi., xxii., second edition.

² Besides the Sargasso-bank, in the Atlantic, Maury mentions several other accumulations of sea-weed known to mariners as "Sargassos." The immense banks of weeds in the South Pacific, through which ships pass in going to the Australian colonies, consist principally of a pelagic form of Macrocyctus; of the composition of the other weed-banks little is known.

³ "Om de under Korvetten *Josephines* expedition, sistidenssamar (1869) insamlade Algerne." Af J. G. Agardh, Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, 1870, No. 4, Stockholm.

⁴ It is much to be regretted that this term "*Fucus natans*" should not have been limited by authors to *S. bacciferum*.

⁵ *S. bacciferum* is found in the Atlantic, between 22° and 58°, being sometimes carried on the Gulf Stream as far as the Orkney Islands. It is also found on the coasts of Spain and Portugal, and in the Mediterranean Sea, its presence in these localities also being due to the Gulf Stream. It is likewise met with in the Indian Ocean, the Pacific, on the coasts of Australia, and New Zealand.

⁶ "The Phœnician station for merchant vessels (Gaulæa); or, according to Gosselin, the small estuary of Fedallah, on the north-west coast of Mauritania." Humboldt, *ib.*

⁷ See "Views of Nature," Bohn's translation, p. 48.

⁸ "Physical Geography of the Sea," p. 28, tenth edition.

observed that the specimens found floating in all the seas are always barren. The question then arises, how is the floating weed propagated? To this question Dr. Harvey¹ replies:—"It seems to me that the old frond, which is exceedingly brittle, is broken by accident, and the branches, continuing to live, push out young shoots from all sides. Many minute pieces that I have examined were as vigorous as those of a large size; but they were certainly not seedlings, and appeared to me to be broken branches, all having a piece of the old frond from which the young shoots spring. As the plant increases in size it takes something of a globular form, from the branches issuing in all directions, as from a centre."² The specimens brought to this country are merely the uppermost branches, the whole plant often attaining a diameter of three or four feet. The upper branches are of a light olive colour, the lower more or less brown; the lowest parts of all wither and decay, and finally drop away.

With regard to the origin of the plant there has been much controversy among algologists. On this point Harvey observes:—"Nothing has yet been discovered; for, though species of *Sargassum* abound along the shores of tropical countries, none exactly corresponds with *S. bacciferum*. That the ancestors of the present banks have migrated from some fixed station is probable, but further than probability we can say nothing." Prof. Agardh, however, thought he had found the parent stock in a plant which grows on the banks of Newfoundland; and in his "Species, Genera, et Ordines Algarum," vol. i., published in 1848—a year before the second edition of Harvey's "Manual" appeared—thus writes of it:—"Natans semper sterilis, nec in pratis Atlanticis fructifera, Fructiferam et affixam e mari Americanum alluente habeo." In his before-mentioned notes on the algæ collected by the *Josephine* expedition, after referring to the passage just quoted, he says:—"I have received from the banks in the neighbourhood of Newfoundland specimens with root and fruit, which, although somewhat different in form, I nevertheless did not scruple to consider as belonging to the same species" (*S. bacciferum*); and he adds that "from no facts yet come to my knowledge have I had reason to change the opinion I had expressed in 1840 at the meeting of naturalists at Copenhagen, that the floating form originates from the Banks of Newfoundland, and perhaps grows on similar localities on the east coast of America, when it is provided with root and fruit." Since the publication of these observations, additional information relative to the fruit of *S. bacciferum* has been obtained. Specimens "covered with fructification" have been found by Mr. Moseley,³ the naturalist of the *Challenger* expedition, in Harrington Sound, Bermudas, which islands lie in the very heart of the Sargasso Sea.

The fact, therefore, that *S. bacciferum* bears fruit when attached to the land in the Sargasso Sea and the Gulf Stream, may be considered as established.

With regard to the comparative antiquity of the Bermudas and Newfoundland plants, it must be observed that they both occur within the influence of the Gulf Stream. It is not likely that the *Sargassum* could make its way from the northern locality against the current of the stream; hence it seems most probable that it vegetated first at Bermudas, and thence emigrated, with the stream, northwards.

Other facts in connection with the two islands favour this view. Sir Wyville Thomson says⁴:—"Bermudas is practically an 'atoll,' or annular coral reef. . . . What the basis on which the Bermudas reef rests may be, we have no means of telling; in fact, its having the form of an atoll precludes the possibility of our doing so. There seems to be little doubt, from Darwin's beautiful generalisation, which has been fully indorsed by Dana and other competent observers, that the atoll form is due to the entire disappearance by subsidence of the island round which the reef was originally formed. The abruptness and isolation of this peak, which runs up to a solitary cone about equal to that of Mont Blanc, is certainly unusual;

¹ "Manual of British Marine Algæ," second edition.

² The floating gulf-weed is not the only plant which can maintain life in vigour, and propagate itself without producing fruit. *Gigartina Tiedtii*, and *Griffithsia secundiflora*, have vegetated many years on rocks in the vicinity of Plymouth, without producing fruit. They are both natives of the Mediterranean, where they yield fruit freely.

³ "Manual," l. c.

⁴ See extract from Mr. Moseley's letters communicated by Dr. Hooker, Linnean Society's Journal, vol. xiv. It is much to be regretted that Mr. Moseley has sent home no specimens of the Bermudas plant.

⁵ "Letters from the *Challenger*," in *Good Words* for February, 1876, pp. 98-100.

probably the most reasonable hypothesis may be that the kernel is a volcanic mountain comparable in character with Pico in the Azores or the Peak of Teneriffe." It has been also stated¹ that "in the process of excavations carried out in order to accommodate the great floating dock, a bed of peat, with stumps of cedar trees in a vertical position, was found at a depth of forty-five feet below low-water mark, covered by beds of rock. Most conclusive proof is thus afforded that the Bermudas have changed their level, and sunk since they have been covered with a similar vegetation to their present one." These statements afford considerable evidence of the antiquity of the Bermudas. Now as to the comparative age of the Newfoundland Banks. Lieut. Payer² has observed respecting them:—"It is an established fact that ice-burys and ice-fields laden with the debris and rubbish of Arctic lands, deposit these burdens round the outer edge of the Frozen Ocean, and to this process, partially at least, the origin of the Newfoundland banks is to be ascribed." It would seem from these observations that these banks have been formed since the glacial period, hence that they are more recent than the Bermudas. On the above grounds, therefore, it is but reasonable to conclude that the Bermudas plant has superior claims to that of the Newfoundland banks to be considered as the parent-stock of the Atlantic plant.

That the parent-stock originated in the Atlantic, and then found its way into the Indian and Pacific Oceans is, at least, doubtful, especially as a form of the plant called var. *Capillifolium*,³ bearing fruit abundantly, has been found at Mauritius by Col. Pike. Thus, then, in two oceans out of the three, *S. bacciferum* has been obtained in fruit, but with sufficient differences in the forms to constitute varieties; whether the Bermudas plant differs from the others I have not been able to ascertain.

Prof. Mertens (see his work on the algæ collected by the Prussian expedition to Eastern Asia) supposed that *Sarg. dentifolium*, of the Red Sea, was the parent-stock of the floating *Sargassum*, on the ground that the same species of polyzoa were found on both plants. Not a very strong argument, especially as a remarkable difference exists in the structure of the two plants. *S. dentifolium* has a serrated midrib, while that of *S. bacciferum* is plain. This difference was observed by Prof. Agardh, who, in addition, expressed his belief⁴ that *S. dentifolium*, an inhabitant of a tropical sea, could not make, or survive, the voyage round the Cape of Good Hope. It must then have had other means of making the voyage, as the plant has actually been found at Key West, Florida, by Dr. E. Palmer. Dr. Farlow,⁵ who mentions this fact, observes: "It is not stated whether it was floating or attached. Dr. Palmer's specimens are more luxurious than those of the Red Sea, but the serrated midrib seems sufficiently characteristic to warrant us in supposing that the species is the same." Here then we have another instance of a tropical plant being found in both hemispheres. How did it get there?

According to the present conformation of the land in tropical and sub-tropical seas, there is no water-passage open in those latitudes between the Atlantic and Pacific, or between the Atlantic and Indian Oceans. In the north and also in the south, round "the Horn," the extreme cold would be fatal to all the species of *Sargassum*; and although certain species of this genus grow at the Cape of Good Hope, *S. bacciferum* has never yet been brought home from thence.⁶ The presence of the plant in the warmer parts of the three great oceans where means of communication are now impossible, except between the Indian and Pacific Oceans, owing to the conformation of the land and climatal obstructions, remains still to be accounted for. This can only be done by referring to a time when Mexico was submerged, and the isthmus not yet in existence, and there was thus communication between the tropical Atlantic and Pacific; when open passages also existed between the Indian Ocean and the warmer parts of the Atlantic, and between the Indian and Pacific Oceans. Tropical and sub-tropical algæ would thus be free to pass from sea to sea. That these plants did so is the opinion of botanists and other scientific persons. In support of this opinion may be mentioned the occurrence of a considerable

¹ *Athenæum* for December 1, 1877. Review of voyage of the *Challenger*.

² "New Lands Within the Arctic Circle," vol. i. pp. 41, 42.

³ I am indebted to Prof. Agardh for a fragment of a specimen of *S. bacciferum* from the banks of Newfoundland, and to Dr. Oliver, of Kew, for a fruitful specimen of Col. Pike's plant.

⁴ Agardh, l. c.

⁵ "List of Marine Algæ of the United States, with Notes of New and imperfectly-known Species." By G. W. Farlow. From *Proceedings of the American Academy of Arts and Sciences*, presented March 9, 1875.

⁶ Agardh, l. c.

number of sea-fishes inhabiting both sides of the Isthmus, which Dr. Günther has shown to be absolutely identical. To these may be added several species of mollusca. With reference to the mollusca Mr. Wallace¹ observes, "The long-continued separation of North and South America by one or more arms of the sea . . . is further rendered necessary by the molluscan fauna of the Pacific shores of tropical America, which is much more closely allied to that of the Caribbean sea, and even of West Africa, than to that of the Pacific Islands. The families of many of the genera are the same, and a certain proportion of very closely allied or identical species, shows that the union of the two oceans continued late into tertiary times. If fishes and mollusca could thus pass from ocean to ocean, there is no doubt that algae could also pass. Besides *Sarg. bacciferum*, *S. vulgare*, and *S. dentifolium*, the following species, among others, are common to both hemispheres, namely, *Chnoospora fastigiata*, *Hydroclathrus cancellatus*, *Digenia simplex*, *Acanthophora Thierrii*, and others too numerous to mention. It is further thought that such plants are among the oldest forms of algae, and that algae are among the oldest productions of the vegetable world. Geologists are of opinion that the tropical passage between the Atlantic and Pacific was open during the tertiary and cretaceous epochs. How long a time has elapsed since this period is another question that remains to be answered. This can only be done approximately. "From the Devonian period, or earlier," says Prof. Huxley,² "to the present day, the four great oceans, Atlantic, Pacific, Indian, and Antarctic, may have occupied their present positions, and only the coasts and channels of communication have undergone an incessant alteration." Mr. Croll, who, in his most interesting work "Climate and Time," brings astronomical science to bear upon the elucidation of geological problems, states that "the great ocean basins are probably of immense antiquity; that the great depressions of the Atlantic, Pacific, and Indian Oceans may be as old as the Laurentian period for any thing which geology shows to the contrary." He also remarks—"all our main continents and islands not only existed during the glacial period as they do now; the very contour of the surface was much the same as at the present day."³ The migration of *S. bacciferum* from one ocean to the other must then have taken place previously to the commencement of the glacial period—the most recent glacial period, I mean—for Mr. Croll thinks that there were other glacial periods with intermediate warm periods during the tertiary epoch. He gives astronomical reasons⁴ for saying that the commencement of the most recent glacial epoch cannot date back more than 240,000 years. As, then, there has been no material alteration of the surface of the land since that period, and our plant now inhabits and can live in the warmer parts only of the three great oceans, the barriers to their intercommunication being now closed as before-mentioned, it follows that this alga must be at least of greater antiquity than the glacial period, 240,000 years ago. How many thousands or hundreds of thousands additional years may be added to its age, it is impossible to say. Perhaps on some slab of rock from the depths of the earth the astonished and admiring botanist may yet recognise a fossil plant of the wandering *Sargassum*.⁵

If the presence of a great number of species in a limited area is suggestive that the parent-stock may have originated in that locality, then it is probable that the primary habitat of the genus *Sargassum* may have been in the Indian and adjacent oceans, since it is on the southern coasts of Asia, the islands in the Indian Ocean, and round the coasts of Australia and New Zealand (Mr. Wallace's "Oriental and Australian Regions," also his "Ethiopian Regions," Nos. 1 and 4), that the greater number of species of *Sargassum* are found. No less than forty species are known to inhabit the seas around Australia and New Zealand.

There are fair grounds for the opinion that many of the tropical algae of the three great oceans are probably among the oldest forms of this class of plants—*S. bacciferum* and its congener *S. vulgare*, also *S. dentifolium*, and other algae before mentioned may, therefore, be "survivals," still existing in health and vigour, of the marine vegetation of a very remote period, as ancient, at least, as the miocene⁶ epoch, when the appearance

and configuration of the country was, in all probability, different from what it is at the present day.

One cannot but look with wonder and admiration mixed with somewhat of veneration, on the wandering *Sargassum*, still in vigorous existence, which has survived so many changes of climate affecting different parts of the earth's surface; so much variation in the boundaries of the sea-shores; before which the rise and fall of empires, and the very existence of man, form almost inappreciable items in its life-history.

In order to show the great numerical increase in the species of *Sargassum* in the warmer seas, I shall conclude this article with a tabular view of their geographical distribution. In the division of regions I have followed Mr. Wallace. It is to be observed that as some species range through more than one region, they are consequently entered in each region, and thus the aggregate of species appears to be greater than it really is.

	1. Palæ-arctic.	2. Ethio-pian.	3. Orient-al.	4. Austra-lian.	5. Neo-tropical.	6. Nearc-tic.
	North Europe. Mediterranean. Siberia. Manchuria or Japan. East Africa. West Africa. South Africa. Madagascar. Hindustan. Ceylon. Indo-China. Malayan. Austro-Malayan. Australia. Polynesia. New Zealand. Chill. Brazil. Mexico. Antilles or West Indies. California. Rocky Mountains. East United States. Canada.					
Number of regions.	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4					
Number of species.	6 - 13 11 2 7 9 22 4 16 20 1 35 13 8 2 6 1 10 - - 1 -					

MARY P. MERRIFIELD

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

THE Master of Trinity College, Cambridge, has forwarded to the Vice-Chancellor certain statutes made by the College affecting the University, and in doing so intimates that the Colleges consider that the provisions of the Universities of Oxford and Cambridge Act, 1877, do not bind them to postpone their final adoption until one month after they have been communicated to the Council of the Senate. The statutes have reference to, among others, the Trinity Professorship of Physiology. They provide that any person hereafter elected to the Professorship shall be entitled to a Fellowship at Trinity unless he is Master or Fellow of some other College. The Trinity Professor of Physiology is to receive an annual stipend of 500*l.*, in addition to the emoluments of a Fellowship. The new statutes also provide that there shall be paid by the College to the University an annual sum calculated upon the amount of the distributable income of the College, which is particularly defined. Such annual sums to commence from the time the statutes come into operation, and shall be in the first instance equal to 5 per cent. of the distributable income, to be increased to 7½ per cent. when the statutes have been ten years in operation, and to 10 per cent. when they have been fifteen years in operation. The provisions of these statutes with respect to the Trinity Professorship of Physiology shall take effect from and after the appointment of the first Trinity Professor of Physiology, under the provisions of a statute or statutes to be made with the consent of the College for the establishment of the said professorship.

THE French Government proposes to do an act of justice in raising the stipends of professors in science and medicine to the same amount as in the case of law and letters, 15,000 francs. Dr. Simplicio, who writes on the subject in the *Union Médicale*, points out how unequally professors of pure science, as botany and chemistry, are rewarded as compared with, say, clinical professors, who can add enormously to their income by private

vol. xviii. p. 192). If this be the fact, a great addition must be made to the antiquity of these plants.

¹ "Geographical Distribution of Animals," vol. ii., p. 58.

² Address to the Geological Society, reported in the *Journal of the Geological Society*, May, 1870.

³ "Climate and Time," p. 9.

⁴ *Ibid.*, p. 355.

⁵ Among the fossil algae known to botanists are some specimens of *Sargassum*.

⁶ Mr. J. S. Gardner, F.G.S., has recently expressed his opinion that the American continents became united during the eocene period (see *NATURE*,