development of bacteria—a point that cannot be doubted—they may not kill the spores, thus permitting the germs of disease to escape. There are no experiments (of which I am aware) to answer this objection. But there is reason to believe that pathogenic germs do not resist for a very long time when in unfavourable media; even in sewers, that are not over-filled and stagnant, and that are well ventilated, infection does not easily linger. If inside the sewers disinfection is complete, and bacterial growth checked, and all disease germs rendered inactive, until carried for away from all populous centres, I think we can leave it to air, and to the other natural agents, to ultimately destroy the surviving germs, or completely alternate their pathogenic qualities.

Amongst the mineral acids, hydrochloric would, of course, be the cheapest. But I think sulphuric acid ought to be preferred, nitric acid being too costly and too corrosive. Sulphuric acid does not attack easily calcareous cements; and if the sewers have their walls well plastered, the action of a *slight excess* of sulphuric acid in the sewage would be very slight indeed. Cements, more resisting than plaster, could be prepared. Moreover, if some portions of teh sulphuric sewage get carried in the air, or are dried in the higher parts of the sewers, the germ-laden particles do not rid themselves of the acid by evaporation; on the contrary, the acid becomes more concentrated and active, and finally must disorganise and destroy the noxious germs. This is very important in preventing the effects of sewage air.

Since 1881 Prof. Beilstein of St. Petersburg (NATURE, vol. xxiii. p. 394), experimentally concluded that sulphuric acid is the best disinfectant, although he did not advise its use because of its corrosive action. Strange to say, Beilstein thought that, practically, aluminous sulphate was to be preferred to the free acid.

It is not only during the fear of cholera invasions, but at all times, that I would wish the sewage to be *slightly* acidified with sulphuric acid. Strict supervision should be maintained over all the sewers, to ascertain that the whole mass of flowing sewage is permanently acid. I am persuaded that this simple mode of disinfection would diminish considerably many infectious diseases.

During the cholera epidemic of 1884, in Naples, I did my best, in a series of letters I then published, to persuade the sanitary authorities of this mode of disinfection. But a strange confusion of ideas was then prevalent in Naples. Through the goodwill of Prof. Cantani, Member of the Sanitary Commission, some trials of the method I proposed were done, but not in a complete and systematic manner. Such experiments cannot be done easily in Naples, and the results cannot be conclusive until the system of sewers is in good working order. Indeed, in some parts of the soil of Naples it is difficult to know if there is more sewage inside or outside the sewers. It is no easy problem to disinfect and cleanse such an impure soil, and it is indeed to be wondered that the ravages of cholera were so limited in 1884.

My letters caused sulphuric acid to be used abundantly in the sewers and *pozzi neri* of Portici, Castellamare, Taranto, and, I believe, in other places; but this, like all other disinfections, was done under pressure of approaching cholera, and abandoned as soon as the danger passed, no observation being made to measure the influence of the sanitary method adopted on local infectious diseases. The defective system of sewers and of drainage in many Italian towns renders thorough disinfection scarcely possible, and prevents precision in testing any kind of disinfection.

In English towns sewers are generally well arranged, and often well ventilated; and vital statistics have taken sufficient development to permit the testing of sanitary reforms. When it is proved (and I think the proof can be easily given) that the present systems of sewage disinfection are not sufficient to prevent *entirely* bacterial development in the sewers, these systems cannot be considered good. I venture to hope that beneficial results would soon become evident if the sulphuric acid disinfection of sewage were thoroughly applied in English towns.

Portici, August 20 ITALO GIGLIOLI

Ozone at Sea

THE presence of this element in the atmosphere is alleged to be indicative of its healthiness, and it has been *investigated on land* frequently by observers with varying and uncertain results.

Records of its presence may be seen daily in the *Times*, furnished from the Observatory on Ben Nevis, but as yet little notice has been taken of its *prevalence at sea*, though it has been supposed to be more plentiful there than on land.

During a voyage around the United Kingdom on the s.s. *Ceylon* in August last, we entered into the investigation of its existence at sea, and used Moffatt's papers for the purpose, obtained from Negretti and Zambra. They were exposed in a perforated light wooden box, hung up in the open air on the deck of the ship in the shade, and noted and changed twice a day.

It was found most prevalent in *Cork Harbour* (4), less so in Bantry Bay (2) and Oban Harbour (2), and nearly absent in Kingstown Harbour (1) and Leith Roads (1).

In the open sea it was most shown in the *Irish Channel* (4) and off the Lands End (4); next in the North Seas (3) and in the English Channel (2), and least in the Irish seas (1) and western coasts of Scotland (1).

Ozone was found to be indicated in greater intensity during the prevalence of *westerly winds* in the English and Irish Channels, and Atlantic seas and Dutch seas, and less with *easterly* winds prevailing in the Irish seas, Firth of Forth, and west coasts of Scotland.

The *velocity* of the winds seemed also to create a higher manifestation, as was seen during the gale from the south-west in Cork Harbour and the fresh north-westerly breezes on the south coasts of Ireland and east coasts of England. None, however, of the observations approached those registered in the *Times* from Ben Nevis (8–9), which amounted to double those noticed in the seas around our coasts during the same period (August), supposing that the same papers and scale (Moffatt's) were used for both sets of observations.

Ozone was also found to exist in the *cabin of the ship* both day and night, but at a half intensity to that on the deck, due probably to the great difference in the movement of the air in the two places.

The degrees of manifestation of ozone at sea here shown by no means come up *to expectation* that it prevailed in all its potentiality on the ocean, but of course a whole year's observation would be required to enlighten the subject and furnish a comparison with that on the land.

Again, it may be possible that *altitude* may have something to do with its prevalence, more or less, as it appeared more on the top of Ben Nevis than on the level of the seas of the same coasts near it and at the same period of the year (August).

Should this idea be of any significance it might be as well to search for manifestations of ozone at the base as well as on the top of mountains, and if similar results followed to these here pointed out it would establish the *reputation of high* level sites for great salubrity of atmosphere. W. J. BLACK

August, 1885

THE INTERNATIONAL BOTANICAL AND HORTICULTURAL CONGRESS, ANTWERP, 1885

THE International Botanical and Horticultural Congress met at Antwerp on Sunday, August 2, in the hall of the Artistic, Literary and Scientific Club, the opening meeting being honoured by the presence of a good many ladies. The gathering was a representative one, and included many well-known European botanists and horticulturists. The Burgomaster of Antwerp opened the proceedings with a few appropriate remarks, and Prof. Ed. Morren, of Liége, having been made President of the Congress, took the chair, and a discussion was held on the flora of the Congo. After a short discussion the meeting adjourned to the Exhibition building, where the International Horticultural Show was being held, and which was formally opened at one o'clock. Many of the plants exhibited were of great interest, and the whole of the collections were nicely and artistically arranged. At five o'clock the Congress visited the Plantin Museum, the old printing office of the Plantin Moretus family. The Museum is full of interest, and as the printing office from which the works of Lobel, Dodonaeus, and Clusius issued, doubly interesting to all botanists. Through the kindness of the Burgomaster of Antwerp a sheet had been struck off for the members of the Congress, so that each was presented with a souvenir of the three great herbalists.

In the evening there was a concert in the garden of the Exhibition in honour of the members of the Congress.

During Monday, Tuesday, and Wednesday the two sections of the Congress—the Botanical and Horticultural—met in the Botanic Garden in the upper and lower halls of the Botanical Institute. The different subjects contained in the programme were duly discussed, and a resolution of Congress on the different points raised terminated each discussion. The method adopted at these meetings was one which might well be followed in other assemblies, and is one which reflects great credit on the President of the Organisation Committee, M. Charles de Bosschere. All the subjects to be discussed were treated of in longer or shorter papers, all of which were printed in the four fasciculi of the *Preliminary Reports* issued to the adherents of the Congress. In this way all the members had the subjects before them in a tangible form, and discussion was easy. Might not the British Association take a hint from this? Without giving up the method at present followed, let the British Association add to their work a discussion on one or two subjects of importance, papers by special men to be printed beforehand, so as to be in the possession of those who can discuss the subject at the meeting.

The subjects of discussion—twenty-two in number—were mostly of considerable botanical interest, others being purely horticultural, the question of the Congo being general. Perhaps the most important subjects were the discussions on botanical laboratories, on the amount of instruction in cryptogams to be given in different parts of the botanical course of study and the recent progress of botany in different countries. It is important to notice that the general opinion of the Congress was in favour of two kinds of botanical laboratories, those of instruction and those of research, and there can be no doubt that in every society research should be encouraged in every way and be the highest object of their organisation.

On the evening of August 3 the Burgomaster of Antwerp held a reception at the Hôtel de Ville, which was very largely attended by the members. On the evening of August 4 Dr. Henri Van Heurck, the Director of the Botanic Garden, gave a most interesting series of microscopical demonstrations in the meeting-room of the Botanical Section. The application of the electric light to microscopic work was shown, and nothing could exceed the perfection of the arrangement employed by Dr. Van Heurck. *Surirella gemma*, *Amphipleura pellucida*, and Noberts's 19th band were shown in a manner which left nothing to be desired; and in the case of Amphipleura, not only were the striæ shown as distinctly as one is accustomed to see them in *Navicula rhomboides*, but, by illumination through the object-glass, the striæ were distinctly resolved into beads; by oil-immersion lenses, of which, as of other object-glasses by all the best makers, Dr. Van Heurck possesses a remarkable series. The electric light employed is obtained by a bichromate battery (Trouvé's) and Dr. Helot's photophore. As the photophore works equally well with an accumulator, and where there is no difficulty in getting the accumulators charged, no better illumination can be got, and this I would strongly recommend to all microscopists. Altogether Dr. Van Heurck's demonstration will be remembered as one of the most interesting things connected with the Congress. On the evening of Wednesday there was a grand banquet, when the members spent a very pleasant evening together.

On Thursday morning the Congress left by train for Brussels. On arrival, the members went to the Natural History Museum, and were shown through the building by the Director, who kindly admitted the members of the Congress at an early hour. Next, the party proceeded to the Botanic Garden, where they were received by Prof. Crepin and others. The herbarium, museum, garden, and hot-houses were all inspected, and then the Members of the Congress were entertained in the orangery of the garden to a luncheon given by the Members of the Royal Botanic Society of Belgium. After luncheon the party proceeded by tramway to Laeken, to visit the Winter Garden, which had been opened to them by his Majesty the King of the Belgiums. Mr. Knight, the Inspector of the Royal Gardens, accompanied the party, and pointed out the objects of interest. Friday was to be devoted to an excursion to Ghent, and Saturday to a botanic excursion in the neighbourhood of Herrenthals, Dolen, and Gheel, where the Members of the Congress were to disperse. I left the party at Brussels, spending Friday at Liége with Prof. Morren, who showed me the splendid new laboratory in the pretty little garden under his charge. I afterwards visited Prof. Suringar at Leyden, and saw some of the treasures he has just brought back with him from the Dutch West Indian Islands, where he has been able to make extensive botanic collections of living and dried specimens. W. R. McNAB

August 31

THE FAUNA OF THE SEA-SHORE[1]

THE marine fauna of the globe may conveniently, in the pursuit of certain lines of scientific study, be divided into three groups according to the regions inhabited by it. There is the littoral fauna comprising the animals inhabiting the sea-shore and the shallow waters in its immediate neighbourhood, the deep-sea fauna, and the pelagic fauna, the latter occupying the surface waters of the ocean. Each of these regions presents certain marked peculiarities of conditions of existence, and exhibits, in accordance with these, certain special characteristics in the composition and history of the origin of its fauna. The deep-sea is devoid of sunlight and therefore of plant life. It is dark, cold, and monotonous, being devoid of day and night and periodical or irregular changes of any kind. Its habitation probably dates from no very great antiquity. The ocean surface can support only a peculiar fauna of animals adapted for floating or constant swimming, and affords no shelters nor resting-places.

As Prof. Lovèn writes[2]: "The littoral region comprises the favoured zones of the sea, where light and shade, a genial temperature, currents changeable in power and direction, a rich vegetation spread over extensive areas, abundance of food, of prey to allure, of enemies to withstand or evade, represent an infinitude of agents competent to call into play the tendencies to vary which are embodied in each species and always ready, by modifying its parts, to respond to the influences of external conditions." It is in this littoral zone where the water is more than elsewhere favourable for respiration because of its aëration by the surf and where constant variation of conditions is produced by the alternation of the tides that the ancestors of all the main groups of the animal kingdom came into existence, and all the primary branches of the animal family tree first commenced to grow. It is here, probably, that the first attached and branching plants were developed, thus establishing a supply of food, and rendering possible the colonisation of the region by animals.

The animals inhabiting the littoral region are adapted in most various ways to withstand and endure the special physical conditions which they there encounter—the action of the surf, the retreat of the tides, the numerous enemies. Either they burrow deep in the sand, or cling tight to, or even bore into, the rocks, or develop hard shells or skeletons, or protect themselves by other modifications. Probably all hard shells and skeletons of marine invertebrata have thus originated in the littoral

[1] A Friday evening lecture at the Royal Institution, delivered January 23, 1885, by Prof. H. N. Moseley, F.R.S.

[2] "On Pourtalesia, a genus of Echinoidia." by Sven Lovèn. (Stockholm, 1883, p. 86.)