

in them had been specially aroused by seeing a house-fly, which had previously narrowly escaped capture, swoop down on his mortal enemy and touch him on the back with his claws (as though twitting him on his failure), the spider apparently taking no notice whatever. On seeing, therefore, one of these spiders stalking a small moth on my wall in Cape Coast Castle, I devoted my attention to the operation.

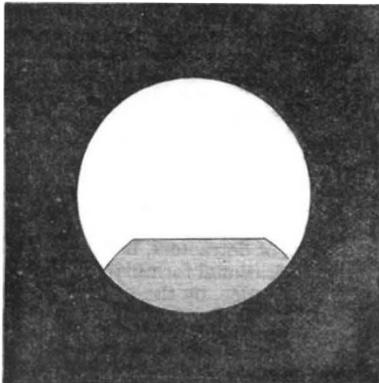
After moving off several times the moth at length settled on the ceiling, and I thought the chase was over. The spider, however, followed on to the ceiling, and approaching within striking distance (about two inches) anchored his web; then moving round in a circle from the moth until he was about equi-distant from his anchor and his prey, he made his spring. He had evidently calculated how much loose web he would require to reach his prey, for when he fell (as was inevitable from the force of gravity) he was suspended in mid-air by the loose web. The spider regained the ceiling by his own web, having narrowly missed a good meal.

C. B. LYSTER.

19 Waterloo Crescent, Dover, August 12.

The Lunar Eclipse of August 3.

IT would be interesting to know if the following phenomenon was observed at other places. At 9.30 p.m., local time, at Hamburg, a small cumulus cloud was observed a little distance below the moon, and the darkened part of the lunar surface was taken to be part of the cloud, from its upper edge being flattened. Ten minutes later the cloud had passed away, but the



Sketch of Lunar Eclipse of Wednesday, August 3, 1887 (as observed at Hamburg).

flattened appearance on the moon remained, and it was evident that the earth's shadow was distorted, as seen in the annexed sketch. Several persons noted the peculiarity, which was visible until about 10.30 p.m. in a very clear sky.

H. H.

August 8.

BOTANY OF SAN DOMINGO.

THE vegetation of this, the largest of the West India Islands next to Cuba, has long been almost totally unknown to botanists. The absence of all but the scantiest data about its flora has made any general conclusions as to the main facts of the geographical distribution of plants in the West Indies very uncertain. It has usually been supposed that any attempt to explore any part of the island botanically would present almost insuperable difficulties. The following extracts from a letter from San Domingo received at Kew from Baron Eggers, who has laboured so assiduously in the investigation of West Indian botany, will be read therefore with much interest.

W. T. THISELTON DYER.

Puerto Plata, Sto. Domingo, July 11, 1887.

I HAVE now been about three months in this island. I arrived in Samana on April 14, and the following day in this place. After having spent a couple of weeks in exploring the

lower mountains here (2600 feet), I proceeded to Santiago, where again I spent some time in exploring the Vega Real and the Monte Christi range. From Santiago I went further into the interior to Jarabocon and the Valle de Constanga (3860 feet), from where I made an expedition up to the highest peaks I could find (Pico del Valle, 8680 feet), and which I succeeded in climbing, though with considerable hardship and fatigue. From this Sierra I returned to Santiago, and from thence to Puerto Plata, where I have latterly been exploring the region to the east towards the rivers Yasica and Jamao.

This, in short, is an outline of my travels here. I have been so far very fortunate, as I have succeeded in penetrating to regions where no European seems ever to have been before: my collections are very rich—about 1200 species—and my health has not suffered from the rather hard life here.

This island is, to a considerable extent, in a state of uncivilization: the roads are frightful, and hardly deserve that name; in fact, there is not one single good road in the whole island. You could hardly believe that the principal road from Santiago to Puerto Plata, on which the greater part of the traffic of the island goes, in the rainy season is impassable often for weeks. With regard to the vegetation, it does not strike me as being very luxuriant. It is much less so than I expected, and is certainly less luxuriant than that of Dominica.

The Cacti, which are a good criterion with respect to dryness of climate, are seen very frequently in the Vega by Santiago; higher up, the mountains in the interior are covered with pine forests to an immense extent. There the soil is gravelly and rather sterile. I found the pine growing from 600 feet up to the very highest peaks. The Sierra and Monte Christi, a coast range, consists of Tertiary limestone, and has no pines at all. But here you find also Cacti, Acacias, and Agaves not unfrequently. Palms are comparatively scarce—only about six or seven species are known (*Oreodoxa*, *Sabal*, *Thrinax*, *Euterpe*, and one called "Yarey" here, which I believe is a species of *Thrinax*), comparatively few *Orchideæ*, and no *Cycadeæ* at all. I believe in the south, near San Domingo, there is a *Zamia*; and, on the whole, the eastern part of the island is more moist, especially near Samana Bay and along the river.

Of remarkable plants I have found here a *Clavija*, which seems to be known only from Trinidad among the West India Islands, *Phyllocoryne jamaicensis*, a *Stanhopea* or *Lalia*, and several tree ferns. In the high mountains, of course, I found a greater number of interesting species: several *Tupa*, two *Ericaceæ*, two *Fuchsias*, of which one has a most beautiful large pendulous flower, *Ranunculaceæ*, Ferns, *Loranthus*, and others which of course were all unknown there. The *Juglans cinerea* grows here at a height of about 1800 feet; I obtained a number of seeds.

Among *Coniferae* I should especially mention a splendid *Taxodium*, the wood of which is dark red and very odorous. It is called *Sabium* here.

The *Cacti* are, no doubt, very rich and interesting, but as they require to be preserved in alcohol, and the means of transport are so very difficult, I have not made any collections of them this time. The beautiful *Rudolphia rosea* grows from the coast up to 4000 feet.

On the stems of the pines a number of curious Bromeliads are growing, none, however, very conspicuous; at about 1000 feet a bulbous *Oxalis* with white flowers is found, commonly among the pines in the sandy soil. A number of herbaceous *Synantheræ* were found among grasses in the upper regions above 7000 feet.

The *Podocarpus* of Jamaica I did not see here at all. A number of beautiful *Echites* are found in the lowlands, as well as some striking *Orchids* (*Bletia*, *Leliopsis*); also two remarkable *Coccolobas*, the immense-leaved *C. macrophylla*, and another species with somewhat lesser

leaves. The first-named has, as you know, large dark purple flower spikes of 2 feet long; the other, on the other hand, only short spikes with small white flowers. On these Coccolabas are found several nice Epidendrums.

The savannahs are frequent and extensive here, and afford a number of smaller plants of various descriptions.

In several parts of the island there are tracts of mahogany, which are cut for export.

The climate is generally cooler than in the smaller islands. I found the nights quite fresh. In the higher mountains, of course, it was quite cold at night. On the Pico del Valle I passed one night. We had a large fire blazing all night; in the morning, at 6 o'clock, the thermometer only showed 11° C.

Rivers and brooks are innumerable, but on account of the freshets and the violent current after rain, hardly any aquatic plants are seen, at least in this part of the island. I missed the beautiful *Pontedera* of Porto Rico.

I send you to-day, by mail, seeds of the only palm which I have been able to obtain, a species of *Euterpe*, which is common here above 1200 feet, and the fruit of which is much eaten by half-wild hogs. It is called "Manacla" here, and grows to a height of about 30 to 40 feet.

Towards the end of the year I propose continuing my explorations of the West Indies, having in view a further investigation of this island, especially of the east and south, and furthermore of the Bahamas (especially Andros) and the two islands of Tobago and Grenada, both of which, I believe, are very little explored. The northern part of Dominica is also still *terra incognita*, unless something has been done there since my visit in 1879 and 1880. This island is particularly interesting to me. I believe it is one of the most luxuriant of the West India Islands.

CONSTITUTIONAL FORMULÆ AND THE PROGRESS OF ORGANIC CHEMISTRY.

IF the mere increase in the number of known facts were an accurate measure of the growth of a science, the question as to the progress of organic chemistry would be easily answered. Let the reader open a text-book on chemistry of fifty or sixty years ago, and he will find, sheltering itself under the wing of the inorganic chemistry of that day, the half-fledged science of organic chemistry. Then let him turn to Beilstein's gigantic *Handbuch der organischen Chemie*, with its more than two thousand large closely-printed pages—a mere classified catalogue of the known facts, written moreover in the highly-condensed elliptical style appropriate to catalogues. Here is increase.

But life is not measured by days, nor chemistry by new compounds; and the reader might resent the invitation to appraise the progress of organic chemistry by this rough quantitative method. A qualitative analysis is necessary here.

But how? The really important facts, even with the aid of the most judicious selection, could hardly be packed within the compass of a single article; nor would they be interesting, or, in such compression, even intelligible, to the non-chemist. There are of course the usual *pièces de résistance* in the shape of the coal-tar colours, and the various naturally-occurring compounds that have been artificially prepared; but probably the general reader has heard enough of these already, and might feel inclined to ask whether organic chemistry has nothing further to say for itself.

There is, however, a peculiarity of organic chemistry which distinguishes it from the remainder of the science. The aim of all chemistry is to ascertain the constitution of matter, and the said peculiarity of organic chemistry is,

that it expresses its views on this important subject in greater detail, more precisely (or, as some will have it, more dogmatically), than inorganic chemistry. Its articles of belief on this head are embodied in its constitutional formulæ.

Here we touch on matter which every chemist will at once recognize as debatable. But, for good or for evil, these constitutional formulæ are, apart of course from the dry facts, the main scientific outcome of organic chemistry: they form the particular contribution which organic chemistry has been able to make towards solving the central problem of all chemistry—the constitution of matter. At present they crown the edifice of organic chemistry. Are they the keystone of an arch, or a mere meaningless architectural embellishment? This is the most general question which organic chemistry can put to itself at the present moment, and an attempt to answer it is the most fitting mode of reviewing the past work of the science. Let us therefore turn our attention to these constitutional formulæ, and ask ourselves what they are: what their meaning is, their scope, their justification.

According to some unfriendly critics, constitutional formulæ have done incalculable harm to chemistry by causing chemists to desert accurate experiment and observation for idle speculation—to substitute for the arduous work of the laboratory the easy task of stringing together atomic symbols, according to certain rules, on paper. There may in some cases have been some small measure of truth in this accusation—in other words, there may have been some occasional abuse of constitutional formulæ; but the injustice of the accusation as a whole is sufficiently proved by the fact that the most successful experimenters of the day in the domain of organic chemistry are enthusiastic supporters of constitutional formulæ, and confess to having been guided by these formulæ at almost every step of their researches. This actively-hostile attitude towards constitutional formulæ is fortunately becoming daily rarer.

Another class, not of detractors, but of rather lukewarm friends, of the constitutional formula, regard it as a convenient mnemonic device, by the aid of which the composition of otherwise hopelessly complex compounds may be successfully impressed on the memory. It is perfectly true that constitutional formulæ do perform this important function; but an impartial review of the case will, we imagine, lead to their being rated somewhat more highly than this.

A third class may be described as the indiscriminating admirers—the injudicious friends—of the constitutional formula. To them the constitutional formula is a final expression of the position of the atoms in the molecule—a picture of the molecule itself. This is a phase of belief which many pass through in making their first acquaintance with organic chemistry, and its existence is due to the circumstance either that the teacher is so much engrossed in impressing the complex array of facts and theories upon the mind of the student that he has not time to introduce philosophic limitations and doubts, or that he considers such an addition only calculated to render an already somewhat tough intellectual fare totally indigestible by a beginner. However this may be, it is certain that the faith of the beginner is quite as frequently appealed to as his reason.

We shall best be in a position to discern the meaning and to estimate the value of these constitutional formulæ, if we consider to what necessity they owe their origin, and how far they fulfil the purpose for which they were devised.

The atomic theory, as propounded by Dalton, satisfied for a time the requirements of chemists. For every properly-analyzed compound a more or less simple atomic proportion could be calculated, and this atomic proportion was expressed in the empirical formula of the compound. These empirical formulæ were combined into