the corolla, (*b*) its excision, (*c*) loss of colour, (*d*) closing, (*e*) not opening, (*f*) absence of insects, (*g*) reduction of temperature, (*h*) transportation. 5. Highly self-fertile forms may arise under cultivation. 6. Special adaptations occur for self-fertilisation. 7. Inconspicuous flowers are highly self-fertile. 8. Cleistogamous flowers are always self-fertilised. 9. Conservation of energy in reduction of pollen. 10. Relative fertility may equal or surpass that of crossed plants. 11. It does not decrease in successive generations. 12. It may increase. 13. Free from competition self-fertilised plants equal the intercrossed; (*a*) as seedlings, (*b*) planted in open ground. 14. They may gain no benefit from a cross from the same or a different stock. 15. They are as healthy as the intercrossed. 16. They may be much more productive than flowers dependent upon insects. 17. Naturalised abroad they gain great vigour; and (18) are the fittest to survive in the struggle for life.

PHYSIOLOGICAL ACTION OF NICOTIN.—About twenty years ago the Rev. Prof. Haughton called attention to the fact that there was an antagonism between the actions of nicotin and of strychnia. His experiments were on frogs. About ten years afterwards Dr. Wormley experimented in the same direction with cats; and some five years ago Dr. Reese performed a series of experiments with these drugs on dogs. Not satisfied with the results of any of these experimenters and recognising the great importance of the subject, Dr. Haynes has made a long series of experiments on dogs, cats, rabbits, and rats, and after some 143 experiments, has come to the following conclusions:—"The recorded cases of strychnia poisoning treated by tobacco are extremely unsatisfactory. If they prove anything it is merely that tobacco is a powerful emetic." "Haughton's experiments on this subject (really only two in number) were performed in such an unscientific manner as to be utterly valueless." "Strychnia and nicotin are in no degree antagonistic poisons." "Strychnia increases the convulsive action and does not diminish the motor paralysis of nicotin." "Nicotin (even in paralysing doses) increases the convulsive action of strychnia." "Both poisons cause death by paralysing the respiratory organs. They may affect respiration in different ways, but the result is the same." Animals may be killed by injecting together doses of the two drugs which, singly, are not fatal. (*Proceedings* of the American Philosophical Society, vol. xvi., No. 99.)

GLASSY SPONGES.—Drs. W. Marshall and A. B. Meyer have published a memoir, as one of a series of communications to the Zoological Museum at Dresden, "on some new or little-known sponges belonging to the Hexactinellidæ found in the Philippines." It seems but the other day since one could have numbered on the fingers of one hand all the known species of this family, so well known to many by that beautiful typical form, the Venus's flower-basket (*Euplectella*), and now the number of described species is very large. In 1872 one of the authors (Dr. Meyer) was staying at Cebú one of the Philippine group, where *Euplectella aspergillum* is a regular article of trade, quoted at so much a dozen, and where it is not surprising that he should discover a number of other lovely forms in this memoir described and figured. Among the more interesting forms are the following:—*Hyalocaulos simplex*, *Myliusia zittelii*, and two species of *Aulodictyon*, all of these found living attached to the basal portion of *Euplectella*. *Semperella schultzei* is figured of a natural size from a specimen twenty-one inches in length, and figures of the spicules of the various new species are also given.

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THE BRAIN OF A FOSSIL MAMMAL.—Prof. Cope has been able to take a cast of the cranial cavity of a specie of the Tapiroid genus Coryphodon, from the Wahsatch beds of New Mexico. This has revealed remarkable primitive characters: (1) the small size of the cerebellum; (2) the large size of the region of the corpora quadrigemina; (3) the cerebral hemispheres were small, and (4) the olfactory lobes were very large. The medulla oblongata is wider than the cerebral hemispheres. In profile the brain closely resembles that of a lizard. These characters are so extraordinary that Prof. Cope considers them sufficient to mark a primary division of mammalia, which he, following Owen, calls Protencephala. Prof. Cope describes and gives figures of a cast, the skull cavity, in the *Proceedings* of the American Philosophical Society, vol. xvi., No. 99.

INSECTIVOROUS PLANTS[1]

SINCE the appearance of Mr. Darwin's work on "Insectivorous Plants" the want of direct proof that the plants profit by their carnivorous habits has been somewhat widely felt. Thus we find expressions to this effect by MM. Cassimir de Candolle, Cramer, Duchartre, Duval-Jouve, Faivre, Göppert, E. Morren, Munk, Naudin, W. Pfeffer, Schenk, &c., &c.

The assent which many naturalists have given to Mr. Darwin's explanation of the meaning of the structure and physiological properties of carnivorous plants rests on a sound basis, namely, the impossibility of believing that highly specialised organs are unimportant to their possessor, and the difficulty of giving any rational explanation except the one proposed in "Insectivorous Plants." Mr. Darwin himself felt the desirableness of direct evidence on this head, and the experiments intended to

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and exhaustive paper in the last volume of the *Memoirs* of the Royal Astronomical Society) to be 11·111 years. While if we ask the magnetic men the length of the cycle of their needle manifestations, they (as in Mr. Allan Broun's first paragraph on p. 183) declare it as confidently to be 10·5 years.

Wherefore I would request to be kindly informed if the maxima of the two cycles do approximately agree just now, where will they be, relatively to each other, after a dozen cycles hence? And the answer may or may not assist in clearing up certain apparent anomalies in the Edinburgh earth-thermometer observations.

PIAZZI SMYTH

15, Royal Terrace, Edinburgh, January 11

On the Insects of Chili and New Zealand

IN Mr. McLachlan's note "On Some Peculiar Points in the Insect Fauna of Chili" (NATURE, vol. xvii. p. 162), I see, with surprise, the remark that "the large islands of New Zealand furnish us with no indication whatever of forms parallel with those found in Chili," for it is well known that many Lepidoptera belonging to European genera do occur in New Zealand, although, perhaps, neither *Argynnis* or *Colias*. Amongst a small number of Lepidoptera from New Zealand which lately came into my hands, I notice species of the following European genera:—*Sesia*, *Cloantha*, *Nonagria*, *Heliothis*, *Hybernia*, *Larentia*, *Fidonia*, *Cidaria*, *Coremia*, *Camptogramma*, *Asthena*, *Acidalia*, *Scoparia*. Except in the case of *Sesia tipuliforme*, it is not probable man has had any hand in the introduction of them. None, except the *Sesia*, are identical with European species, although several approximate, and the causes which have led to the existence of *Agynnis* and *Colias*, in Chili, are probably the same as those which have planted the insects I have named in New Zealand.

In Mr. Darwin's "Origin of Species," Chapter XII., we find a suggested Explanation of the Presence of the Forms of the Northern Temperate Zone in South America and New Zealand in the occurrence of alternate glacial epochs at the North and South Poles, and although the observations especially refer to plants, they are applicable to the insects which would, doubtless, accompany them in their supposed migrations. Perhaps it is not an entirely satisfactory explanation, and with his usual candour, Mr. Darwin admits that it does not meet all difficulties. In describing the wanderings of the plants, Mr. Darwin uses terms (figurative of course) which endow them with extraordinary if not voluntary powers of locomotion, as, indeed, they would seem to require in reality, for effecting such wonderful migrations, and as regards insects Mr. McLachlan goes further, and suggests that some of them "mistook the points of the compass and went southward."

Now the pertinacity with which the Lepidoptera adhere to particular plants and stations, and prefer death to change of either, is a much more noticeable character than their ability to emigrate, and seems to me a serious bar to the acceptance of a theory involving great changes of food and a double journey across the equator; possibly some of the polyphagous species might survive it, but even these, according to Mr. McLachlan, appear to have got a little muddled in their reckoning. Most of the insects I have named are eminently select in their diet, and how are we even to conceive of the wingless female of Hybernia performing the vast journey?

I do not know that we have evidence that change of climate induces migration of the Lepidoptera. There is a large colony of *Bryophila perla*, which has been stationed on an old wall here for the last twenty years, and although there are miles of similar lichen-covered walls in the neighbourhood, I have never seen a specimen fifty yards from head-quarters, and even under the threat of a new glacial epoch, I do not think it would consent to move on.

In saying there are no indications of similar forms on the northern portions of the Andes, I am not sure whether Mr. McLachlan refers to Lepidoptera or Trichoptera, so I will mention that I have received several species of *Colias* captured on the eastern Cordillera of New Granada. The genus probably ranges through the whole chain of the Andes.

Douglas, Isle of Man, January 2 EDWIN BIRCHALL

Macrosilia cluentius

IN NATURE (vol. viii. p. 223) I have spoken of a *Sphinx* which, with its proboscis of 0·25 metre length, would be capable of obtaining nearly all the nectar of *Anagræcum sesquipedale*. Lately my brother, Fritz Müller (Itajahy, Prov. St. Catharina, Brazil), sent me the wings of another specimen of the same species, and Dr. Staudinger, of Dresden, stated by comparison of these wings with the Sphingidæ of his collection that the name of the species is *Macrosilia cluentius*, Cramer.

Lippstadt, January 9 HERMANN MÜLLER

Meteor

I TAKE the liberty of forwarding the following particulars relative to a meteor which I saw on Sunday last at 4h. 24m. P.M., that is to say, about twenty minutes after sunset. As, however, the day had been very fine, there was not only full daylight in the west, but only a trace of twilight in the north-west direction, in which I saw the meteor. I may add that the sky was slightly overcast by watery clouds in that direction:—

Point from which seen, Salthill, near Kingstown; direction in which seen, north-west; elevation above horizon, 10° to 15°; length of luminous "tail," 5° to 6°; inclination from vertical, about (towards south) 10°; time, 4h. 24m. P.M.; colour of tail and of globe of explosion, light blue.

Judging from the elevation and from the fact of its being visible notwithstanding the strong twilight and the interposed clouds, I conclude that this meteor must have been remarkably brilliant and that it exploded over or beyond the West Coast of Ireland. It is for these reasons that I take the liberty of calling attention to it, as others may have seen it under more favourable conditions.

P. W. REILLY

Royal College of Science for Ireland,
Stephen's Green, Dublin, January 15

Philadelphia Diplomas

IN NATURE, vol. xvii. p. 183, there appears a note by Dr. C. M. Ingleby on the "Philadelphia Diplomas." Permit me to say that the only institutions in Philadelphia legally authorised to grant medical diplomas are the University of Pennsylvania, a school which has long ago celebrated its centenary, and the Jefferson Medical College. The so-called University of Philadelphia is a hybrid concern, the medical department of which is under the management of the Eclectic Medical School.

January 10 RICHD. C. BRANDEIS

Great Waterfalls

I SHALL be much obliged if you, or any of your readers, can inform me in what book I can find accounts of any of the following great waterfalls:—The Tequendama Fall, near Sta. Fé de Bogota, South America; the Cauvery Falls, near Seringapatam, India; the Alatau Falls, Alatau Mountains, Central Asia; the Guava, or Guayra Falls, on the Alto Parana, South Brazil; Falls of the Rio Grande, near Guadalajara, Mexico. These great falls, five of the most remarkable in the world, are shortly noticed in books of geography, but I have hitherto been unable to obtain any detailed particulars or description of them.

Eltham, January 7 ARTHUR G. GUILLEMARD

BIOLOGICAL NOTES

SELF-FERTILISATION OF PLANTS.—This subject, around which the genius of Mr. Charles Darwin has thrown a halo, seems likely to give rise to further controversy. The Rev. G. Henslow, in a communication laid before the first meeting this session of the Linnean Society, gave an exposition of the views he had arrived at; these in many respects being at variance with those promulgated by Mr. Darwin. The author acknowledged how indebted he stood towards the latter, whose vast storehouse of facts and close reasoning necessitated constant reference to his writings; but the author's own deductions therefrom, and additional researches, nevertheless, confirmed him in hesitating to accept some of Mr. Darwin's conclusions. According to Mr. Henslow, the chief facts and bearings of the self-fertilisation of plants may thus be summarised: 1. The majority of flowering plants are self-fertile. 2. Very few are known to be physiologically self-sterile. 3. Many are morphologically self-sterile. 4. Self-sterile plants become self-fertile by (*a*) withering of

decide the question only failed through an accident. The present research by Dr. F. Darwin is practically a repetition of the same experiments.

The widely-spread belief that insectivorous plants thrive equally well when deprived of animal food rests on very insufficient grounds. Many observers have based their opinion on the general appearance of the plants, and in no case has observation been sufficiently extended in point of time or details of comparison. The plan of the present research was therefore (1) To cultivate a large number of plants. (2) To continue observation for a considerable space of time, during which artificial starving and feeding of two sets of plants was to be kept up. (3) To compare the starved and fed plants in a variety of ways and especially as to the production of seed.

With this object about 200 plants of *Drosera rotundifolia* were transplanted (June 12, 1877), and cultivated in soup-plates filled with moss during the rest of the summer.

Each plate was divided into halves by a low wooden partition, one side being destined to be fed with meat, while the plants in the opposite half were to be starved. The plates were placed altogether under a gauze case, so that the "starved" plants might be prevented from obtaining food by the capture of insects. The method of feeding consisted in supplying each leaf (on the fed sides of the six plates) with one or two small bits of roast meat, each weighing about one-fiftieth of a grain. This operation was repeated every few days from the beginning of July to the first days of September, when the final comparison of the two sets of plants was made. But long before this it was quite clear that the "fed" plants were profiting by their meat diet. Thus, on July 17 it was evident that the leaves on the "fed" side were of a distinctly brighter green, showing that the increased supply of nitrogen had allowed a more active formation of chlorophyll-grains to take place. It may be inferred, partly from microscopical examination of the starch in the leaves, but more certainly from the final comparison of dry weights, that the increase of chlorophyll was accompanied by an increased formation of cellulose. From this time forward the "fed" sides of the plates were clearly distinguishable by their thriving appearance and their numerous tall and stout flower-stems.

The advantage gained by the fed plants was estimated in many ways. Thus, on August 7 the ratio between the number of "starved" and "fed" flower stalks was 100 : 149·1. And by comparing the number of stems actually in flower it was clear that the starved plants were losing the power of throwing up new flower stems at an earlier date than their rivals. In the middle of August the leaves were counted in three plates, and were found to be 187 on the starved, and 256 on the fed side—or in the ratio of 100 : 136·9.

At the beginning of September the seeds being ripe, all the flower-stems were gathered, and the plants of three plates were picked out of the moss and carefully washed. As it seemed probable that one advantage of the fed over the starved plants would be the power of laying by a larger store of reserve-material, three plates were allowed to remain undisturbed after the flower-stems had been gathered. The relative number of plants which will appear in the spring on the "fed" and "starved" sides will be a means of estimating the relative quantities of reserve-material.

The following list gives the result of counting, measuring, and weighing the various parts of the two sets of plants. It will be seen the number of plants (judging from the three plates examined) were fairly equal on the starved and fed sides of the partitions so that a direct comparison of their produce is allowable :—

Ratio between the number of starved and fed plants	100 : 101·2[1]
Ratio between weights of the plants *exclusive* of flower-stems	100 : 121·5
Total number of flower stems	100 : 164·9
Sum of the heights of the flower stems ...	100 : 159·9[1]
Total weight of flower stems	100 : 231·9
Total number of capsules	100 : 194·4
Average number of seeds per capsule ...	100 : 122·7
Average weight per seed	100 : 157·3
Total calculated *number* of seeds produced	100 : 241·5
Total calculated *weight* of seeds produced	100 : 379·7

[1] In all cases "starved" = 100.

The most important feature in the general result is that the advantage gained by the fed plants is far more conspicuously shown in all that relates to the seeds and flower-stems than in any other part. Thus the ratio between the weights of the plants, exclusive of flower-stems were as 100 to 121·5 ; while the weights of the flower-stems, including seeds and capsules, were as 100 to 231·9. The highest ratio is seen to be between the total weights of seed produced, namely 100 : 379·7 ; and this is intelligible, because a store of nitrogen is laid by in the albuminous seeds.

Another point is that the difference between the starved and fed plants is more clearly shown in the comparison of weights than of numbers or heights. It is clear that increase of weight is a better proof of increased assimilation than any other character.

It may fairly be said that the above experiments prove beyond a doubt that insectivorous plants are largely benefited by a supply of animal food, and it can no longer be doubted that a similar benefit is gained in a state of nature by the capture of insects.

[1] Therefore the average height of the fed stems is slightly less (100 : 99·9) than that of the fed. But since equal numbers of *plants* are taken, the total yield of flower stems is the fair criterion.

ALBERT VON HALLER

ON December 12 last the republic and city of Berne celebrated the centenary of the death of one who is universally recognised as their greatest citizen. The important part played in science by Albert von Haller last century is a sufficient excuse for us, profiting by the occasion of the recent celebration, to enable our readers to appreciate the marvellous aptitude of this eminent man for every kind of work, theoretical and practical ; he was at once a statesman, theologian, and poet, as well as a physiologist, anatomist, and botanist.

Albert Haller was born at Berne in October, 1708, of a family originally of St. Gall, one of whose members fell by the side of Zwingli in 1531. Very weak in body, like Isaac Newton, in his infancy, he exhibited, like him, an extraordinary precocity, and his avidity for books was something indescribable. Having finished his classical studies brilliantly and rapidly, he went to Tübingen at the age of fifteen years to study medicine, then soon after to Leyden to follow the clinic of the illustrious Boerhaave, on whose works he at a later time published a commentary which greatly contributed to his renown. Albinus taught him anatomy and J. Gessner botany. At eighteen and a half years he obtained the degree of doctor, and afterwards attended, in London, the teaching of Dr. Winslow. After a sojourn at Paris he returned to Switzerland and studied mathematics with Jean Bernoulli, and that with such ardour that his friends were constrained to look after him.

In 1728 he made, with Gessner, his first great Alpine excursion, which, many times repeated, made him, in an eminent degree, master of the Swiss flora. His most celebrated poem, entitled "Die Alpen," was another result of his mountain journeys, which contributed to diffuse among those far away the magic charm of that magnificent scenery.[2]

[2] Prince Radzivil, Commander of the Polish Confederates, having at a later period become acquainted with the poem, could not think of anything better to signify to the author his satisfaction, than to send him a commission of Major-General.

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With this object about 200 plants of *Drosera rotundifolia* were transplanted (June 12, 1877), and cultivated in soup-plates filled with moss during the rest of the summer.

Each plate was divided into halves by a low wooden partition, one side being destined to be fed with meat, while the plants in the opposite half were to be starved. The plates were placed altogether under a gauze case, so that the "starved" plants might be prevented from obtaining food by the capture of insects. The method of feeding consisted in supplying each leaf on the fed sides of the six plates) with one or two small bits of roast meat, each weighing about one-fiftieth of a grain. This operation was repeated every few days from the beginning of July to the first days of September, when the final comparison of the two sets of plants was made. But long before this it was quite clear that the "fed" plants were profiting by their meat diet. Thus, on July 17 it was evident that the leaves on the "fed" side were of a distinctly brighter green, showing that the increased supply of nitrogen had allowed a more active formation of chlorophyll-grains to take place. It may be inferred, partly from microscopical examination of the starch in the leaves, but more certainly from the final comparison of dry weights, that the increase of chlorophyll was accompanied by an increased formation of cellulose. From this time forward the "fed" sides of the plates were clearly distinguishable by their thriving appearance and their numerous tall and stout flower-stems.

The advantage gained by the fed plants was estimated in many ways. Thus, on August 7 the ratio between the number of "starved" and "fed" flower stalks was 100 : 149·1. And by comparing the number of stems actually in flower it was clear that the starved plants were losing the power of throwing up new flower stems at an earlier date than their rivals. In the middle of August the leaves were counted in three plates, and were found to be 187 on the starved, and 256 on the fed side—or in the ratio of 100 : 136·9.

At the beginning of September the seeds being ripe, all the flower-stems were gathered, and the plants of three plates were picked out of the moss and carefully washed. As it seemed probable that one advantage of the fed over the starved plants would be the power of laying by a larger store of reserve-material, three plates were allowed to remain undisturbed after the flower-stems had been gathered. The relative number of plants which will appear in the spring on the "fed" and "starved" sides will be a means of estimating the relative quantities of reserve-material.

The following list gives the result of counting, measuring, and weighing the various parts of the two sets of plants. It will be seen the number of plants (judging from the three plates examined) were fairly equal on the starved and fed sides of the partitions so that a direct comparison of their produce is allowable :—

Ratio between the number of starved and fed plants	100 : 101·2[1]
Ratio between weights of the plants *exclusive* of flower-stems	100 : 121·5
Total number of flower stems	100 : 164·9
Sum of the heights of the flower stems ...	100 : 159·9[1]
Total weight of flower stems	100 : 231·9
Total number of capsules	100 : 194·4
Average number of seeds per capsule ...	100 : 122·7
Average weight per seed	100 : 157·3
Total calculated *number* of seeds produced	100 : 241·5
Total calculated *weight* of seeds produced	100 : 379·7

[1] In all cases "starved" = 100.

The most important feature in the general result is that the advantage gained by the fed plants is far more conspicuously shown in all that relates to the seeds and flower-stems than in any other part. Thus the ratio between the weights of the plants, exclusive of flower-stems were as 100 to 121·5 ; while the weights of the flower-stems, including seeds and capsules, were as 100 to 231·9. The highest ratio is seen to be between the total weights of seed produced, namely 100 : 379·7 ; and this is intelligible, because a store of nitrogen is laid by in the albuminous seeds.

Another point is that the difference between the starved and fed plants is more clearly shown in the comparison of weights than of numbers or heights. It is clear that increase of weight is a better proof of increased assimilation than any other character.

It may fairly be said that the above experiments prove beyond a doubt that insectivorous plants are largely benefited by a supply of animal food, and it can no longer be doubted that a similar benefit is gained in a state of nature by the capture of insects.

ALBERT VON HALLER

ON December 12 last the republic and city of Berne celebrated the centenary of the death of one who is universally recognised as their greatest citizen. The important part played in science by Albert von Haller last century is a sufficient excuse for us, profiting by the occasion of the recent celebration, to enable our readers to appreciate the marvellous aptitude of this eminent man for every kind of work, theoretical and practical ; he was at once a statesman, theologian, and poet, as well as a physiologist, anatomist, and botanist.

Albert Haller was born at Berne in October, 1708, of a family originally of St. Gall, one of whose members fell by the side of Zwingli in 1531. Very weak in body, like Isaac Newton, in his infancy, he exhibited, like him, an extraordinary precocity, and his avidity for books was something indescribable. Having finished his classical studies brilliantly and rapidly, he went to Tübingen at the age of fifteen years to study medicine, then soon after to Leyden to follow the clinic of the illustrious Boerhaave, on whose works he at a later time published a commentary which greatly contributed to his renown. Albinus taught him anatomy and J. Gessner botany. At eighteen and a half years he obtained the degree of doctor, and afterwards attended, in London, the teaching of Dr. Winslow. After a sojourn at Paris he returned to Switzerland and studied mathematics with Jean Bernoulli, and that with such ardour that his friends were constrained to look after him.

In 1728 he made, with Gessner, his first great Alpine excursion, which, many times repeated, made him, in an eminent degree, master of the Swiss flora. His most celebrated poem, entitled "Die Alpen," was another result of his mountain journeys, which contributed to diffuse among those far away the magic charm of that magnificent scenery.[2]

[1] Therefore the average height of the fed stems is slightly less (100 : 99·9) than that of the fed. But since equal numbers of *plants* are taken, the total yield of flower stems is the fair criterion.

[2] Prince Radzivil, Commander of the Polish Confederates, having at a later period become acquainted with the poem, could not think of anything better to signify to the author his satisfaction, than to send him a commission of Major-General.