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.

His first anatomical instruction was obtained at Bâle, and was continued during five years, after which Haller returned to his native country, where an active medical practice did not hinder him from ever and ever reading to increase the field of his already vast knowledge. He read at table, in journeying on foot or on horseback, during his visits and consultations, which made those shake their heads who could not understand his marvellous clearness of perception.

His botanical labours were then very extensive, and brought him his first encouragement from abroad. In December, 1733, the Royal Academy of Sciences of Upsala received him among the number of its members, and proposals were made to him to become a professor there. At Berne his success was not easy; in 1734 he obtained the modest position of librarian. This was the epoch when, while carrying on his work as a practitioner, he gave himself especially to poetic composition, but which came to an end in 1736.

It was at this time he received a call from the newly-founded University of Göttingen, to go there as Professor of Anatomy and Botany. This call was accepted, and although it was for him the occasion of a great grief, in the death of his wife soon after their arrival, he displayed in this new centre a remarkable activity and capacity. His desire and his plans for the foundation of an anatomical theatre were soon realised. Measures were taken that subjects should not be wanting for dissection; and at the same time conformably to his proposals, a botanical garden was created which soon became one of the most important in Germany. He was the soul of his faculty and of the entire university, and his reputation caused students to flock to Göttingen from all countries, whom he encouraged in every way, prescribing to them various works in connection with his own and for the prompt development of the physiological sciences. He founded at Göttingen the Royal Academy of Sciences, of which he was appointed president, a position he retained to the end of his life, notwithstanding his return to his own country.

It was at this time he published his commentaries on the work of Boerhaave, when he commenced his "Elementa Physiologiæ," his "Anatomical Plates," his "Flora of Switzerland," and other works. In 1749 the King of England appointed Haller his private physician, and confirmed the titles of nobility which had been conferred on him by the Emperor Francis I. The Royal Society of London, the Academy of Stockholm, those of Berlin and Bologna, enrolled him on their lists of members. Frederick the Great of Prussia attempted to get him to Berlin, but Haller would only leave Göttingen to return to Berne, and he decided to do so in 1753. His zeal for public affairs caused him to accept in his native country official functions in which his aptitudes of every kind found their application. Appointed Bailiff of the district of Aigle, near the eastern extremity of the Lake of Geneva, he explored and worked the sources of salt; at Berne he contributed to the creation of an orphanage and a large hospital, upon which he inscribed the beautiful device, "Christo in pauperibus." In 1754 he received from the French Institute the great distinction of being nominated one of its foreign associates; of the eight then existing, three were Swiss—Jean Bernoulli, Euler, and Haller. He regretted that his administrative occupations absorbed much of the time he would have wished to devote to science; and yet even during this period of his life his productiveness was enormous. Besides a large number of monographs and dissertations on subjects in the domains of botany, medicine, anatomy, and physiology, he published more extensive works, such as: Two parts of anatomical plates in folio, a quarto volume of surgical dissertations, four volumes "Disputationes practicæ selectæ," and six volumes of his "Elementa Physiologiæ Corporis humani." He occupied himself more especially with the anatomy of the eye, the formation of the bones, and the comparison of the brains of birds and fishes. He was chiefly original in his experiments on the movement of the blood, in his researches on the development of the chicken in the egg, and on that of the fœtus of quadrupeds, as well as in his teratological studies.

In his physiology he introduced the dominant idea, which was his principal discovery, of irritability considered as a force peculiar to muscular fibre, independent of sensibility properly so called, and differently distributed. In his hands this force became a new law, with which he connected nearly all the animal functions. He can only be blamed, perhaps, for having distinguished it too absolutely and in too decided a manner from the nervous force on which it always depends. As to generation, Haller maintained the doctrine of the pre-existence of germs, and he gave it the most solid support in his studies on the fœtal development. Not knowing the chemical action of the air on the blood he was unable to understand the exact idea of respiration.

All his writings show immense erudition, the fruit of his extensive reading, with the assistance of a prodigious memory. In four "Bibliothecæ," published under his auspices at Berne, Zurich, and Bâle, he spoke of 52,000 different scientific works or treatises all known by him and annotated by his hand to make known the text, the sources, and the authors.

A similar erudition rendered him eminently apt at bibliographical work. Thus we have from him in his "Methodus Studii Medici" of Boerhaave a classification of works, in which their degree of merit is distinguished by one, two, or three asterisks. But few living authors were content with the number of asterisks which he accorded to their works, and this attempt made him numerous enemies. He had collected for his use about 20,000 volumes, which were bought after his death by the Emperor Joseph II. and given to the University of Paris.

On many occasions attempts were made to bring Haller back to Göttingen. In 1770 King George III. personally made overtures for this purpose; but the republic of Berne valued too highly his presence to consent to a new departure. The Council, while assuring the king of its friendship and its desire to please him, was opposed to this departure, not being able to be deprived of a man so necessary to the public weal in a place for life created expressly for him, and in view of the general service of the state. The passionate love which he had for his country made him respond in the most efficacious and the most varied manner to the hopes which his fellow-citizens had placed in his activity, more especially in the great start which agriculture took in his time and under his influence.

However, in the midst of so many matters, for which Haller was always of easy access, his health was constantly delicate. With advancing age many infirmities presented themselves which would have arrested a man of less energy, and which led to very painful crises. Gout and insomnia tormented him more and more, and he did not conceal from himself that the use of opium, by means of which he combated them, had serious drawbacks. One of his friends advising to change the *régime*, he replied in Italian:—

"Sono venti tre ore e mezza."

Haller died December 12, 1777, in his seventieth year, observing till the last moment the ebbing of his life, and indicating at last by a sign the moment when his pulse stopped. But he saw the approach of death with the calmness of a confirmed Christian, having all his life preserved a sincere faith, without fearing more than Newton, Euler, or Linné, that that faith could be contradicted or compromised by the scientific researches which he had pursued with a zeal which has scarcely been surpassed.

E. G.