to prosecute his studies; and the great Dr Johnson actually accompanied him to Harwich and saw him off, with many protestations of affection.

At Utrecht Boswell was as unsettled and dissipated as before. He had a fair allowance from his father—£240 a year; but he was determined "not to be straitened nor to encourage the least narrowness of disposition as to saving money." To what extent this virtuous resolution was carried out is unknown; but after leaving the university, he determined, sorely against his father's inclination, to prolong his residence abroad. He travelled through various parts of the Continent, visited Voltaire and Rousseau, and was finally attracted to Corsica, where he speedily attached himself to and became the intimate friend of the patriot Paoli. He did not return to England till 1766, but he had not neglected his note-book, and in 1768 published his *Account of Corsica, Journal of a Tour to that Island, and Memoirs of Pascal Paoli*. The book had a very considerable success, not on account of the merits of its historical or descriptive passages, but from the liveliness and truth of the journal, and from the numerous anecdotes and sayings, which brought the Corsican patriot vividly before the English imagination. Johnson's estimate of the work was discriminating and just; and other good judges, though they could not avoid noticing and ridiculing Boswell's extravagances and follies, appreciated at its true value his unrivalled power of biographical narration. The book did much for Paoli, and secured for him sympathy and assistance in England when he was compelled to fly from his native island. The author was for a time intoxicated with his success; he pestered every one with Corsica, introduced himself to Pitt in Corsican dress, and not only appeared at the Shakespeare Jubilee arrayed in the costume of an armed Corsican chief, with "Viva la Libertà" inscribed on his hat, but wrote a full description of his appearance to the *London Magazine*. He certainly gained notoriety, if not fame.

His restless spirit next found occupation in the great Douglas peerage case. He took an intense interest in this affair, acted as an unattached counsel, and published on it a novel and a pamphlet. The often repeated story, that he resented the judgment given by his father in the case to such an extent that he headed the rioters who broke the old judge's windows, is not inconsistent with his character, but as the father's judgment virtually coincided with the son's opinion, it really has no foundation in fact.

In 1769, after numerous love affairs, which are told to his friend Temple with more freedom than decency, he married Miss Montgomerie. Not much is known of this lady, except that she was a relation of the earl of Eglinton, as Boswell took care to inform the people of Scotland in his *Letter* to them in 1785. Johnson's opinion of her qualities was very low; but she probably concurred with old Lord Auchinleck in thinking the great lexicographer "a brute." She seems also to have had rather a contempt for some aspects of Mr Boswell's character, whatever that might "comprehend in his own imagination, and in that of a wonderful number of mankind."

In 1773, though against his father's will, Boswell came to London. He was admitted a member of the Literary Club, and soon after set out with his great friend on the immortal tour to the Hebrides. It was not till many years afterwards that the famous *Journal* was given to the world,—not till after the death of Johnson. Some years after the death of his father in 1782 he had joined the English bar, but he never succeeded in gaining any practice. In 1785 the *Journal of a Tour to the Hebrides* was published, and preparations set on foot for an extended *Life of Johnson*. The collection of materials and careful revision occupied several years, and though Boswell sometimes was despondent, yet on the whole he looked with well-grounded confidence for success. He was absolutely certain that his "mode of biography, which gives not only a *history* of Johnson's *visible* progress through the world, and of his publications, but a view of his mind in his letters and conversations, is the most perfect that can be conceived, and will be more of a life than any work that has ever yet appeared." His expectations were not deceived. The book, which appeared in 1791, was received with the greatest eagerness and delight; and in 1793 a second edition was published. The author's triumph and self-satisfaction were complete; but meantime the evil habits he had contracted during a dissipated life were ruining his health, both of mind and body. He was in his later years an habitual drunkard, and the hypochondria, from which he had always suffered at intervals, terribly increased. He died after a short illness on the 19th May 1795 at the age of 55.

Boswell's character is curious and somewhat contradictory. He was vain of his birth, and of his own talents, sensual and self-indulgent, inquisitive and undignified; and all these faults he parades with a perfectly childish naïveté;—not certainly without consciousness that they were faults, for he is constantly repenting of his sins and framing the best of resolutions, swearing "like an ancient Pythagorean to observe silence, to be grave and reserved though cheerful and communicative." "One great fault of mine," he says, "is talking at random. I will guard against it." But he was, as he has himself admitted, "utterly wanting in solidity and force of mind." His egotism and vanity were excessive, and he exposes these qualities with the greatest frankness to his friend Temple. "I, James Boswell, Esq.," he writes on one occasion,—"you know what vanity that name includes." And again with reference to one of his rivals in Johnsonian literature, he writes; "Hawkins is, no doubt, very malevolent; observe how he talks of me as quite unknown." The peculiar weakness of his intellect and exuberance of his spirits hurried him into absurdities and follies, and made him the butt of the society in which he moved. Yet he was far from having no redeeming qualities. He was genial and friendly, of cultured literary taste, and of no mean powers of mind. It was not a mere frivolous, foolish, prating sot who could appreciate the great qualities of Johnson, and devote himself to a friendship from which he derived no profit and little praise. And assuredly it was not by his unrivalled powers as a fool that Boswell has produced the best biography the world has yet seen. He was not only, as Macaulay admits, a man of quick observation and retentive memory, but he had also grasped with complete consciousness the true idea of biography, which he had learned from his great teacher. Johnson valued biography, because it gives us what comes home to ourselves; he thought that no one could write a real life unless he had lived in social intercourse with the man of whom he wrote, and laid it down as the duty of a biographer to give a full account of the person whose life he is writing, and to discriminate him from all other persons, by any peculiarities of character or sentiment he may happen to have. All these hints were taken hold of and assimilated by Boswell, and the result was a biography which has no equal in our own or in any other literature, which, so far from losing its popularity, is as much esteemed now as when first given to the world, and on which it seems superfluous even to bestow laudation. Johnson was undoubtedly a great man, but he would never have been to us more than a mere name had it not been for Boswell's life. Through that life he is known to us as no other English writer is; his faults and weaknesses, his grand powers of mind and rugged moral strength,—his whole personality is revived for us. We know him as he actually lived and moved among his fellow-men. The very lights and shades thrown on his character by the narrative give it additional force, for they convince us of its intense truth and reality. Nor is it only as a life of Johnson that Boswell's book has value for us; it is the most important contribution yet made to a knowledge of actual living and thinking in the 18th century. "It is not speaking with exaggeration," says Carlyle, "but with strict measured sobriety, to say that this book of Boswell's will give us more real insight into the history of England, during those days, than twenty other books, falsely entitled 'Histories,' which take to themselves that special aim."

A short memoir of Boswell was written by Malone and will be found in Nichol's *Literary Anecdotes*. It is also reprinted, with some extracts from Boswell's letters to Malone, in the edition of the *Life* published by Bohn, 1859. The *Letters to W. J. Temple and Andrew Erskine* were printed in 1857; in the introduction will be found a pretty complete notice of Boswell's minor writings. *Boswelliana* have been published in the second volume of the Philobiblon Society Miscellanies, 1855–6, and by Dr Charles Rogers, 1874. Editions of Boswell's great work are very numerous; perhaps the amended form of Croker's first edition, by Wright (Bohn, 10 vols., 1859), is the most helpful. The famous essays on Boswell by Macaulay and Carlyle may be taken as mutually corrective and supplementary.

BOTANY

THE science of Botany includes everything relating to the Vegetable Kingdom, whether in a living or in a fossil state. Its object is not, as some have supposed, merely to name and arrange the vegetable productions of the globe. It embraces a consideration of the external forms of plants—of their anatomical structure, however minute—of the functions which they perform—of their arrangement and classification—of their distribution over the globe at the present and at former epochs—and of the uses to which they are subservient. It examines the plant in its earliest state of development, when it appears as a simple cell, and follows it through all its stages of progress until it attains maturity. It takes a comprehensive view of all the plants which cover the earth, from the minutest lichen or moss, only visible by the aid of the microscope, to the most gigantic productions of the tropics. It marks the relations which subsist between all members of the vegetable world, and traces the mode in which the most despised weeds contribute to the growth of the mighty denizens of the forest.

History.

The plants which adorn the globe more or less in all countries must necessarily have attracted the attention of mankind from the earliest times. The science that treats of them dates back to the days of Solomon, for that wise monarch "spake of trees," from the cedar of Lebanon to the hyssop on the wall. The Chaldeans, Egyptians, and Greeks were the early cultivators of science, and Botany was not neglected, although the study of it was mixed up with crude speculations as to vegetable life, and as to the change of plants into animals. Æsculapius and his priests, the Asclepiades, who studied the art of medicine, had their attention directed to plants in a pharmaceutical point of view. About 300 years before Christ Theophrastus wrote a *History of Plants*, and described about 500 species used for the treatment of diseases. Dioscorides, a Greek writer, who appears to have flourished about the time of Nero, issued a work on Materia Medica. The elder Pliny described about a thousand plants, many of them famous for their medicinal virtues. Asiatic and Arabian writers also took up this subject. Little, however, was done in the science of botany, properly so called, until the 16th century of the Christian era, when the revival of learning dispelled the darkness which had long hung over Europe. Brunfels, a physician of Bern, has been looked upon as the restorer of the science in Europe. He published a *History of Plants*, illustrated by figures, about the beginning of the 16th century.

One of the earliest attempts at a methodical arrangement of plants was made in Florence by Andreas Cæsalpinus, a native of Arezzo, some time professor of botany at Padua, and afterwards physician to Pope Clement VIII. He is called by Linnæus *primus verus systematicus*. In his work *De Plantis*, published at Florence in 1583, he distributed the 1520 plants then known into fifteen classes—the distinguishing characters being taken from the fruit.

John Ray, a native of Essex, did much to advance the science of botany. He was born in 1628, and died in 1705. He promulgated a system which may be considered as the dawn of the "natural system" of the present day (Ray, *Methodus Plantarum*, 1682). He separated flowering from flowerless plants, and divided the former into Dicotyledons and Monocotyledons. His orders were founded on a correct idea of the affinities of plants, and he far outstripped his contemporaries in his enlightened views of arrangement.

About the year 1670 Dr Robert Morison[1] of Aberdeen published a systematic arrangement of plants. He divided them into eighteen classes, distinguishing plants according as they were woody or herbaceous, and taking into account the nature of the flowers and fruit. In 1690 Rivinus[2] promulgated a classification founded chiefly on the forms of the flowers. Tournefort[3] about the same time took up the subject of vegetable taxonomy. He was a contemporary of Ray, and was professor of botany at Paris in 1683. He was long at the head of the French school of botany, and published a systematic arrangement in 1694–1700. He described about 8000 species of plants, and distributed them into twenty-two classes, chiefly according to the form of the corolla, distinguishing herbs and under-shrubs on the one hand from trees and shrubs on the other. The system of Tournefort was for a long time adopted on the Continent, but was ultimately displaced by that of Linnæus.

Carl von Linné, or, as he is commonly called, Linnæus,[4] was born on the 23d of May 1707, at the village of Rooshoolt (Råshult), in Smaland, a province of Sweden, where his father, Nicholas Linnæus, was clergyman. He entered as a pupil at the University of Lund, and about the years 1727–28 was received into the house of Stobæus, a physician in that city, where he had abundant opportunities of prosecuting natural history. He afterwards proceeded to Upsal, and had to struggle with great difficulties during his studies there. He aided Celsius in his *Hierobotanicon*, or account of the plants of Scripture, and he became assistant to Rudbeck, professor of botany. He afterwards travelled in Lapland, took his degree in Holland, visited

[1] Morison, *Præludia Botanica*, 1672; *Plantarum Historia Universalis*, 1680.

[2] Rivinus (Augustus Quirinus) paterno nomine Bachmann, *Introductio generalis in Rem Herbariam*, Lipsiæ, 1690.

[3] Tournefort, *Elémens de Botanique*, 1694; *Institutiones Rei Herbariæ*, 1700.

[4] Linnæus, *Systema Naturæ*, 1735; *Genera Plantarum*, 1737; *Philosophia Botanica*, 1751; *Species Plantarum*, 1753.

England, and commenced practice in Stockholm, where he lectured on botany and mineralogy. He finally became professor of botany at Upsal, and was one of the most popular lecturers of the day. He died on the 8th of January 1778, in the 71st year of his age. His herbarium is now in the possession of the Linnean Society.

One of his biographers, in summing up his merits, says,—"Educated in the severe school of adversity, accustomed from his earliest youth to put a high value on verbal accuracy and logical precision, endowed with a powerful understanding, and capable of undergoing immense fatigue, both of body and mind, Linnæus produced a most important revolution in botanical science. He improved the distinctions of genera and species, introduced a better nomenclature on the binomial method, and invented a new and comprehensive system founded on the stamens and pistils. His verbal accuracy and the remarkable terseness of his technical language reduced the crude matter that was stored up in the folios of his predecessors into a form which was accessible to all men. He separated with singular skill the important from the unimportant in their descriptions. He arranged their endless synonyms with a patience and a lucid order that were quite inimitable. By requiring all species to be capable of a rigorous definition, not exceeding twelve words, he purified botany from the endless varieties of the gardeners and herbalists; and by applying the same strict principles to genera, and reducing every character to its differential terms, he got rid of the cumbrous descriptions of the old writers. It is said of Linnæus, that, although no man of science ever exercised a greater sway, or had more enthusiastic admirers, yet his merit was not so much that of a discoverer as of a judicious and strenuous reformer. The knowledge which he displayed, and the value and simplicity of the improvements which he proposed, secured the universal adoption of his suggestions, and crowned him with a success altogether unparalleled in the annals of science."

The system of Linnæus is founded on the sexes of plants, and hence it is often denominated the sexual system. It is called an artificial method, because it takes into account only a few marked characters in plants, and does not propose to unite them by natural affinities. It is an index to a department of the book of nature, and as such is useful to the student. It does not aspire to any higher character, and although it cannot be looked upon as a scientific and natural arrangement, still it has a certain facility of application which commends it to the tyro. In using it, however, let it ever be remembered, that it will not of itself give the student any view of the true relations of plants as regards structure and properties, and that by leading to the discovery of the name of a plant, it is only a steppingstone to the natural system. Linnæus himself claimed nothing higher for it. He says—"Methodi Naturalis fragmenta studiose inquirenda sunt. Primum et ultimum hoc in botanicis desideratum est. Natura non facit saltus. Plantæ omnes utrinque affinitatem monstrant, uti territorium in mappa geographica." Accordingly, besides his artificial index, he also promulgated fragments of a natural method of arrangement.

The Linnean system was strongly supported by Sir James Edward Smith, who adopted it in his *English Flora*, and who also became possessor of the Linnean collection. The system was for a long time the only one taught in the schools of Britain, even after it had been discarded by those in France and in other Continental countries.

The foundation of Botanic Gardens during the 16th and 17th centuries did much in the way of advancing botany. They were at first appropriated chiefly to the cultivation of medicinal plants. This was especially the case at universities, where medical schools existed. The first Botanic Garden was established at Padua in 1545, and was followed by that of Pisa. The garden at Leyden dates from 1577, that at Leipsic from 1579. Gardens also early existed at Florence and Bologna. The Montpellier Garden was founded in 1592, that of Giessen in 1605, of Strasburg in 1620, of Altorf in 1625, and of Jena in 1629. The Jardin des Plantes at Paris was established in 1626, and the Upsal Garden in 1627. The Botanic Garden at Oxford was founded in 1632. The garden at Edinburgh was founded by Sir Andrew Balfour and Sir Robert Sibbald in 1670, and, under the name of the Physic Garden, was placed under the superintendence of James Sutherland, afterwards professor of botany in the university. The park and garden at Kew date from about 1730. The garden of the Royal Dublin Society at Glasnevin was opened about 1796; that of Trinity College, Dublin, in 1807; and that of Glasgow in 1818. The Madrid Garden dates from 1763, and that of Coimbra from 1773. Gesner states that at the end of the 18th century there were 1600 Botanic Gardens in Europe.

A new era dawned on botanical classification when Antoine Laurent de Jussieu appeared. He was born at Lyons in 1748, and was educated at Paris under the care of his uncle, Bernard de Jussieu. At an early age he became botanical demonstrator in the Jardin des Plantes, and was thus led to devote his time to the science of botany. Being called upon to arrange the plants in the garden, he necessarily had to consider the best method of doing so, and adopted a system founded in a certain degree on that of Ray, in which he embraced all the discoveries in organography, adopted the simplicity of the Linnean definitions, and displayed the natural affinities of plants. His *Genera Plantarum*, begun in 1778, and finally published in 1789, indicated an important advance in the principle of classification. Jussieu subsequently became professor of rural botany; he died in 1836 at the age of 88.

The system of Jussieu made its way slowly in Great Britain, and it was not until Robert Brown brought it under notice that it was adopted.[1] It is now the basis of all natural classifications. One of the early supporters of this natural method was Augustin Pyrame De Candolle, who was born in 1778, and who, after attending the lectures of Vaucher at Geneva, devoted himself to botanical pursuits. He subsequently prosecuted his studies at Paris, and lectured on botany at the College of France. He commenced his publications in 1802, and in 1804 he promulgated his *Elementary Principles of Botany*. In 1807 he became professor of botany at Montpellier, and in 1816 he was appointed to the chair of natural history at Geneva, with the charge of the Botanic Garden. In that city he carried on his future botanical labours, and began his *Prodromus Systematis Naturalis Regni Vegetabilis*, which was intended to embrace an arrangement and description of all known plants. He was enabled to complete eight volumes of the work before his death, and it has since been carried on by his son Alphonse De Candolle, with the aid of other eminent botanists. It now embraces descriptions of the genera and species of Dicotyledonous plants. The system followed by De Candolle is a modification of that of Jussieu, and it is adopted more or less at the present day. De Candolle's own herbarium was extremely rich. He had visited and carefully examined many of the most extensive collections, especially those of Paris; and many entire collections, as well as separate families, on which he was specially engaged, were from time to time submitted to his examination by their possessors. He had thus

[1] Brown, *Prodromus Floræ Novæ Hollandiæ*, 1810.

opportunities of comparison greatly beyond what in ordinary circumstances fall to the lot of an individual. His library, too, was stored with almost every important publication that could be required for his undertaking. With such ample materials, aided by his untiring zeal and the persevering energy of his character, he steadily pursued his allotted task, and only ceased to labour at it when he ceased to live. For some years his health declined, and it is to be feared that the severe and incessant attention which he paid to the elaboration of the great family of Compositæ had made a deep inroad upon it. As a relaxation from his labours he undertook in the last years of his life a long journey, and attended the scientific meeting held at Turin; but he did not derive from this the anticipated improvement in his health, which gradually failed until his death on the 9th September 1841. Since De Candolle's time various modifications of his system have been introduced by Endlicher, Lindley, Hooker, and Bentham.

In arranging plants according to a natural method, we require to have a thorough knowledge of structural and morphological botany, and hence we find that the advances made in these departments have materially aided the efforts of systematic botanists.

Robert Brown, a Scottish botanist, was the first in this country to support and advocate the natural system of classification. The publication of his *Prodromus Floræ Novæ Hollandiæ*, according to the natural method, led the way to the adoption of that method in the universities and schools of Britain. Sir William (then Dr) Hooker, in his prelections in the University of Glasgow, and in his numerous writings, ably supported Brown. John Lindley also came into the field, and in 1830 published the first edition of his *Introduction to the Natural System*. Dr Robert Kaye Greville and Dr Walker Arnott were able coadjutors, more especially in the department of Cryptogamic Botany. From the year 1832 up to 1859 great advances were made in systematic botany, both in Britain and on the continent of Europe. Endlicher's *Enchiridion* and *Genera Plantarum*, De Candolle's *Prodromus*, and Lindley's *Vegetable Kingdom* became the guides in systematic botany, according to the natural system.

The following remarks embrace the views of Mr Bentham on the change from the Linnean to the natural system of classification:—"The change from the technical to the scientific study of plants was now complete. The Linnean platform, established on the relation of genera and species, had now been so long and so universally adopted as the basis or starting point, that the credit due to its founder was almost forgotten, and it was superseded by the Jussiean method, although it was chiefly by the consistent following out the principles laid down by Linnæus himself that the change had been effected. Plants were now grouped upon a philosophical study of their affinities, whether morphological, structural, or physiological."

In all classification it is necessary to define what is meant by species. The usual definition of the term has been that a species (as regards the present epoch of the earth's history) is an assemblage of individuals having characters in common, and coming from an original stock or protoplast, and their seeds producing similar individuals. It was also supposed that variation in species was restrained within certain limits, and that varieties had a tendency to revert to the parent form. The view, however, adopted by many now-a-days is, that the tendency to variation is continuous, and that, after a lapse of long periods of time, and under the influence of varying external conditions, the descendants from a common stock may exhibit the differences which characterize distinct species. These are the views which are advanced by Darwin, and which imply a complete revolution in our idea of species. This theory is thus stated by Bentham:—

1. That although the whole of the numerous offspring of an individual plant resemble their parent in all main points, there are slight *individual* differences.
2. That among the few who survive for further propagation, the great majority, under ordinary circumstances, are those which most resemble their parent, and thus the *Species* is continued without material variation.
3. That there are, however, occasions when certain individuals, with slightly diverging characters, may survive and reproduce races, in which these divergencies are continued even with increased intensity, thus producing *Varieties*.
4. That in the course of an indefinite number of generations circumstances may induce such an increase in this divergency, that some of these new races will no longer readily propagate with each other, and the varieties become *New Species*, more and more marked as the unaltered or less altered races, descendants of the common parent, have become extinct.
5. That these species have in their turn become the parents of groups of species, that is *Genera*, *Orders*, &c., of a higher and higher grade, according to the remoteness of the common parent, and more or less marked, according to the extinction or preservation of unaltered primary, or less altered intermediate, forms.

As there is thus no difference but in degree between a variety and a species, between a species and a genus, between a genus and order, all disputes as to the precise grade to which a group really belongs are vain. It is left in a great measure to the judgment of the systematist, with reference as much to the use to be made of his method as to the actual state of things, how far he should go in dividing and subdividing, and to which of the grades of division and subdivision he shall give the names of Orders, Sub-orders, Tribes, Genera, Subgenera, Sections, Species, Sub-species, Varieties, &c., with the consequent nomenclature.

Such a systematic arrangement is founded on a hypothesis which, so far as the present flora of the globe is concerned, cannot be demonstrated. Conjecture is hazarded as to the present epoch of the earth's history, by extending back to unlimited ages. If the theory is consistent with what we see around us, and is founded on plausible grounds, then we must think that we have ascertained the plan followed by the great Creator, Designer, and Upholder of all things, that we have been able to ascertain and follow His workings, and the mode in which He has created the diverse plants which have covered our globe in time and space. This new phase of systematic botany, however, requires more definite data to lead to its adoption as an explanation of the plan of creation.

The Physiology of plants did not keep pace with the advance in Classification. Grew and Malpighi were the earliest discoverers in this department of botany. Hales also contributed to it by his observations on the motion of fluids in plants. The subject of fertilization was one which early excited attention.

The idea of the existence of separate sexes in plants was entertained in early times, long before separate male and female organs had been demonstrated. The production of Dates in Egypt, by bringing two kinds of flowers into contact, proves that in very remote periods some notions were entertained on the subject. Female Date Palms only were cultivated, and wild ones were brought from the desert in order to fertilize them. Herodotus informs us that the Babylonians knew of old that there were male and female Date-trees, and that the female required the concurrence of the male to become fertile. This fact was also known to the Egyptians, the Phœnicians, and other nations of Asia and Africa. The Babylonians suspended male clusters from wild Dates over the females; but they seem to have supposed that the fertility thus produced depended on the presence of small flies among