The nature of the problem

A rose: by any name?

Man's highly developed constructive curiosity and his capacity for communication are two of the attributes distinguishing him from all other animals. Man alone has sought to understand the whole living world and things beyond his own environment and to pass his knowledge on to others. Consequently, when he discovers or invents something new he also creates a new word, or words, in order to be able to communicate his discovery or invention to others. There are no rules to govern the manner in which such new words are formed other than those of their acceptance and acceptability. This is equally true of the common, or vulgar or vernacular names of plants. Such names present few problems until communication becomes multilingual and the number of plants named becomes excessive. For example, the diuretic dandelion is easily accommodated in European languages. As the lion's tooth, it becomes Lowenzahn, dent de lion, dente di leone. As piss-abed it becomes pissenlit, piscacane, and piscialetto. When further study reveals that there are more than a thousand different kinds of dandelion throughout Europe, the formulation of common names for these is both difficult and unacceptable.

Common plant names present language at its richest and most imaginative (welcome home husband however drunk you be, for the houseleek or *Sempervivum;* shepherd's weather-glass, for scarlet pimpernel or *Anagallis*; meet her i'th'entry kiss her i'th'buttery, or leap up and kiss me, for *Viola tricolor;* touch me not, for the balsam *Impatiens noli-tangere;* mind your own business, or mother of thousands, for *Soleirolia soleirolii;* blood drop emlets, for *Mimulus luteus*). Local variations in common names are numerous and this is perhaps a reflection of the importance of plants in general conversation, in the kitchen and in herbalism throughout the country in bygone days. An often-quoted example of the multiplicity of vernacular names is that of *Caltha palustris*, for which, in addition to marsh marigold, kingcup and May blobs, there are 90 other local British names (one being dandelion), as well as over 140 German and 60 French vernacular names.

Common plant names have many sources. Some came from antiquity by word of mouth as part of language itself, and the passage of time and changing circumstances have obscured their meanings. Fanciful ideas of a plant's association with animals, ailments and festivities, and observations of plant structures, perfumes, colours, habitats and seasonality have all contributed to their naming. So too have their names in other languages. English plant names have come from Arabic, Persian, Greek, Latin, ancient British, Anglo-Saxon, Norman, Low German, Swedish and Danish. Such names were introduced together with the spices, grains, fruit plants and others which merchants and warring nations introduced to new areas. Foreign names often remained little altered but some were transliterated in such a way as to lose any meaning which they may have had originally.

The element of fanciful association in vernacular plant names often drew upon comparisons with parts of the body and with bodily functions (priest's pintle for *Arum maculatum*, open arse for *Mespilus germanicus* and arse smart for *Polygonum hydropiper*). Some of these persist but no longer strike us as 'vulgar' because they are 'respectably' modified or the associations themselves are no longer familiar to us (*Arum maculatum* is still known as cuckoo pint (cuckoo pintle) and as wake robin). Such was the sensitivity to indelicate names that Britten and Holland, in their *Dictionary of English Plant Names* (1886), wrote 'We have also purposely excluded a few names which though graphic in their construction and meaning, interesting in their antiquity, and even yet in use in certain counties, are scarcely suited for publication in a work intended for general readers'. They nevertheless included the

examples above. The cleaning-up of such names was a feature of the Victorian period, during which our common plant names were formalized and reduced in number. Some of the resulting names are prissy (bloody cranesbill, for *Geranium sanguineum*, becomes blood-red cranesbill), some are uninspired (naked ladies or meadow saffron, for *Colchicum autumnale*, becomes autumn crocus) and most are not very informative.

This last point is not of any real importance, because names do not need to have a meaning or be interpretable. Primarily, names are mere ciphers which are easier to use than lengthy descriptions, and yet, when accepted, they can become quite as meaningful. Within limits, it is possible to use one name for a number of different things but, if the limits are exceeded, this may cause great confusion. There are many common plant names which refer to several plants but cause no problem so long as they are used only within their local areas or when they are used to convey only a general idea of the plant's identity. For example, *Wahlenbergia saxicola* in New Zealand, *Phacelia whitlavia* in southern California, USA, *Clitoria ternatea* in West Africa, *Campanula rotundifolia* in Scotland and *Endymion non-scriptus* (formerly *Scilla non-scripta* and now *Hyacinthoides non-scripta*) in England are all commonly called bluebells. In each area, local people will understand others who speak of bluebells but in all the areas except Scotland the song 'The Bluebells of Scotland', heard perhaps on the radio, will conjure up a wrong impression. At least ten different plants are given the common name of cuckoo flower in England, signifying only that they flower in spring at a time when the cuckoo is first heard.

The problem of plant names and of plant naming is that common names need not be formed according to any rule and can change as language, or the user of language, dictates. If our awareness extended only to some thousands of 'kinds' of plants we could manage by giving them numbers but, as our awareness extends, more 'kinds' are recognized and for most purposes we find a need to organize our thoughts about them by giving them names and by forming them into named groups. Then we have to agree with others about the names and the groups, otherwise communication becomes hampered by ambiguity. A completely coded numerical system could be devised but would have little use to the non-specialist, without access to the details of encoding.

Formalized names provide a partial solution to the two opposed problems presented by vernacular names: multiple naming of a single plant and multiple application of a single name. The predominantly two-word structure of such formal names has been adopted in recent historic times in all biological nomenclature, especially in the branch which – thanks to Isidorus Hispalensis (560–636), Archbishop of Seville, whose *Etymologies* was a vast encyclopaedia of ancient learning (or truths) and was studied for 900 years – we now call botany (βοτανη, fodder or plants eaten by cattle). Of necessity, botanical names have been formulated from former common names, but this does not mean that in the translation of botanical names we may expect to find meaningful names in common language. Botanical names, however, do represent a stable system of nomenclature which is usable by people of all nationalities and has relevancy to a system of classification.

Since man became wise, he has domesticated both plants and animals and, for at least the past 300 years, has bred and selected an ever-growing number of 'breeds', 'lines' or 'races' of these. He has also given them names. In this, man has accelerated the processes which, we think, are the processes of natural evolution and has created a different level of artificially sustained, domesticated organisms. The names given by the breeders of the plants of the garden and the crops of agriculture and arboriculture present the same problems as those of vernacular and botanical names. Since the second edition was published (1989), genetic manipulation of the properties of plants has proceeded apace. Not only has the innate genetic material of plants been re-ordered, but alien genetic material, from other organisms, even from other kingdoms, has been introduced to give bizarre results. The products are unnatural and have not faced selection in nature. Indeed some may present

problems should they interbreed with natural populations in the future. There is still a divide between the international bodies concerned with botanical and cultivated plant names and the commercial interests that are protected by legislation for trademarking new genetic and transgenic products.

The size of the problem

'Man by his nature desires to know' (Aristotle)

Three centuries before Christ, Aristotle of Stagira (384–322 BC), disciple of Plato, wrote extensively and systematically of all that was then known of the physical and living world. In this monumental task, he laid the foundations of inductive reasoning. When he died, he left his writings and his teaching garden to one of his pupils, Theophrastus of Eresus (*c*. 370–287 BC), who also took over Aristotle's peripatetic school. Theophrastus' writings on mineralogy and plants totalled 22 treatises, of which nine books of *Historia plantarum* contain a collection of contemporary knowledge about plants and eight of *De causis plantarum* are a collection of his own critical observations, a departure from earlier philosophical approaches, and rightly entitle him to be regarded as the father of botany. These works were subsequently translated into Syrian, to Arabic, to Latin and back to Greek. He recognized the distinctions between monocotyledons and dicotyledons, superior and inferior ovaries in flowers, the necessity for pollination and the sexuality of plants but, although he used names for plants of beauty, use or oddity, he did not try to name everything.

To the ancients, as to the people of earlier civilizations of Persia and China, plants were distinguished on the basis of their culinary, medicinal and decorative uses – as well as their supposed supernatural properties. For this reason, plants were given a name as well as a description. Theophrastus wrote of some 500 'kinds' of plant which, considering that material had been brought back from Alexander the Great's campaigns throughout Persia, as far as India, would indicate a considerable lack of discrimination. In Britain, we now recognize more than that number of different 'kinds' of moss.

Four centuries later, about AD 64, Dioscorides Pedanius of Anazarbus, a soldier who wrote in Greek and became a Roman doctor, recorded 600 'kinds' of plants and, in about AD 77, the elder Pliny (Gaius Plinius Secundus (23–79), a victim of Vesuvius' eruption), in his huge compilation of the information contained in the writings of 473 authors, described about a thousand 'kinds'. During the 'Dark Ages', despite the remarkable achievements of such people as Albertus Magnus (1193–1280), who collected plants during extensive journeys in Europe, and the publication of the German *Herbarius* in 1485 by another collector of European plants, Dr Johann von Cube, little progress was made in the study of plants. It was the renewal of critical observation by Renaissance botanists such as Rembert Dodoens (1517–1585), Matthias de l'Obel (1538–1616), Charles de l'Ecluse (1526–1609) and others which resulted in the recognition of some 4,000 'kinds' of plants by the sixteenth century. At this point in history, the renewal of critical study and the beginning of plant collection throughout the known world produced a requirement for a rational system of grouping plants. Up to the sixteenth century, three factors had hindered such classification. The first of these was that the main interested parties were the nobility and apothecaries who conferred on plants great monetary value, either because of their rarity or because of the real or imaginary virtues attributed to them, and regarded them as items to be guarded jealously. Second was the lack of any standardized system of naming plants and, third and perhaps most important, any expression of the idea that living things could have evolved from earlier extinct ancestors and could therefore form groupings of related 'kinds', or lineages, was a direct contradiction of the religious dogma of Divine Creation.

Perhaps the greatest disservice to progress was that caused by the doctrine of signatures, which claimed that God had given to each 'kind' of plant some feature which could indicate the uses to which man could put the plant. Thus, plants with

kidney-shaped leaves could be used for treating kidney complaints and were grouped together on this basis. The Swiss doctor, Theophrastus Phillipus Aureolus Bombastus von Hohenheim (1493–1541) had invented properties for many plants under this doctrine. He also considered that man possessed intuitive knowledge of which plants could serve him, and how. He is better known under the Latin name which he assumed, Paracelsus, and the doctrinal book *Dispensatory* is usually attributed to him. The doctrine was also supported by Giambattista Della Porta (1537–1615), who made an interesting extension to it, that the distribution of different 'kinds' of plants had a direct bearing upon the distribution of different kinds of ailment which man suffered in different areas. On this basis, the preference of willows for wet habitats is ordained by God because men who live in wet areas are prone to suffer from rheumatism and, since the bark of *Salix* species gives relief from rheumatic pains (it contains salicylic acid, the analgesic principal of aspirin), the willows are there to serve the needs of man.

In spite of disadvantageous attitudes, renewed critical interest in plants during the sixteenth century led to more discriminating views as to the nature of 'kinds', to searches for new plants from different areas and concern over the problems of naming plants. John Parkinson (1567–1650), a London apothecary, wrote a horticultural landmark with the punning title *Paradisi in sole paradisus terestris* in 1629. This was an encyclopaedia of gardening and of plants then in cultivation and contains a lament by Parkinson that, in their many catalogues, nurserymen 'without consideration of kind or form, or other special note give(th) names so diversely one from the other, that . . . very few can tell what they mean'. This attitude towards common names is still with us but not in so violent a guise as that shown by an unknown author who, in *Science Gossip* of 1868, wrote that vulgar names of plants presented 'a complete language of meaningless nonsense, almost impossible to retain and certainly worse than useless when remembered – a vast vocabulary of names, many of which signify that which is false, and most of which mean nothing at all'.

Names continued to be formed as phrase-names constructed with a starting noun (which was later to become the generic name) followed by a description. So, we find that the creeping buttercup was known by many names, of which Caspar Bauhin (1560–1624) and Christian Mentzel (1622–1701) listed the following:

Caspar Bauhin, *Pinax Theatri Botanici*, 1623
Ranunculus pratensis repens hirsutus var. C. Bauhin
repens fl. luteo simpl. J. Bauhin
repens fol. ex albo variis
repens magnus hirsutus fl. pleno
repens flore pleno
pratensis repens Parkinson
pratensis reptante cauliculo l'Obel
polyanthemos 1 Dodoens
hortensis 1 Dodoens
vinealis Tabernamontana
pratensis etiamque hortensis Gerard

Christianus Mentzelius, *Index Nominum Plantarum Multilinguis* (*Universalis*), 1682
Ranunculus pratensis et arvensis C. Bauhin
rectus acris var. C. Bauhin
rectus fl. simpl. luteo J. Bauhin
rectus fol. pallidioribus hirsutis J. Bauhin
albus fl. simpl. et denso J. Bauhin
pratensis erectus dulcis C. Bauhin
Ranoncole dolce Italian
Grenoillette dorée o doux Gallic
Sewite Woode Crawe foet English
Suss Hanenfuss

Jaskien sodky Polish
Chrysanth. simplex Fuchs
Ranunculus pratensis repens hirsutus var. c C. Bauhin
repens fl. luteo simpl. J. Bauhin
repens fol. ex albo variis Antonius Vallot
repens magnus hirsut. fl. pleno J. B. Tabernamontana
repens fl. pleno J. Bauhin
arvensis echinatus Paulus Ammannus
prat. rad. verticilli modo rotunda C. Bauhin
tuberosus major J. Bauhin
Crus Galli Otto Brunfelsius
Coronopus parvus Batrachion Apuleius Dodonaeus (Dodoens)
Ranunculus prat. parvus fol. trifido C. Bauhin
arvensis annuus fl. minimo luteo Morison
fasciatus Henricus Volgnadius
Ol. Borrich Caspar Bartholino

These were, of course, common or vernacular names with wide currency, and strong candidates for inclusion in lists which were intended to clarify the complicated state of plant naming. Local, vulgar names escaped such listing until much later times, when they were being less used and lexicographers began to collect them, saving most from vanishing for ever.

Great advances were made during the seventeenth century. Robert Morison (1620–1683) published a convenient or artificial system of grouping 'kinds' into groups of increasing size, as a hierarchy. One of his groups we now call the family *Umbelliferae* or, to give it its modern name, *Apiaceae*, and this was the first natural group to be recognized. By natural group we imply that the members of the group share a sufficient number of common features to suggest that they have all evolved from a common ancestral stock. Joseph Pitton de Tournefort (1656–1708) had made a very methodical survey of plants and had assorted 10,000 'kinds' into 69 groups (or genera). The 'kinds' must now be regarded as the basic units of classification called species. Although critical observation of structural and anatomical features led to classification advancing beyond the vague herbal and signature systems, no such advance was made in plant naming until a Swede, of little academic ability when young, we are told, established landmarks in both classification and nomenclature of plants. He was Carl Linnaeus (1707–1778), who classified 7,700 species into 109 genera and gave to each species a binomial name (a name consisting of a generic name-word plus a descriptive epithet, both of Latin form).

It was inevitable that, as man grouped the ever-increasing number of known plants (and he was then principally aware of those from Europe, the Mediterranean and a few from other areas), the constancy of associated morphological features in some groups should suggest that the whole was derived, by evolution, from a common ancestor. Morison's family *Umbelliferae* was a case in point. Also, because the basic unit of any system of classification is the species, and some species were found to be far less constant than others, it was just as inevitable that the nature of the species itself would become a matter of controversy, not least in terms of religious dogma. A point often passed over with insufficient comment is that Linnaeus' endeavours towards a natural system of classification were accompanied by his changing attitude towards Divine Creation. From the 365 aphorisms by which he expressed his views in *Fundamenta botanica* (1736), and expanded in *Critica botanica*, (1737), his early view was that all species were produced by the hand of the Almighty Creator and that 'variations in the outside shell' were the work of 'Nature in a sporty mood'. In such genera as *Thalictrum* and *Clematis*, he later concluded that some species were not original creations and, in *Rosa*, he was drawn to conclude that either some species had blended or that one species had given rise to several others. Later, he invoked hybridization as the process by which species could be

created, and attributed to the Almighty the creation of the primeval genera, each with a single species. From his observation of land accretion during trips to Öland and Gotland, in 1741, he accepted a continuous creation of the earth and that Nature was in continuous change (*Oratio de Telluris habitabilis incremento*, 1744). He later accepted that fossil-bed remains could only be explained by a process of continuous creation. In *Genera plantarum* (6th edn, 1764) he attributed to God the creation of the natural orders (our families). Nature produced from these the genera and species, and permanent varieties were produced by hybridization between them. The abnormal varieties of the species so formed were the product of chance.

Linnaeus was well aware of the results which plant hybridizers were obtaining in Holland and it is not surprising that his own knowledge of naturally occurring variants led him towards a covertly expressed belief in evolution. However, that expression, and his listing of varieties under their typical species in *Species plantarum*, where he indicated each with a Greek letter, was still contrary to the dogma of Divine Creation and it would be another century before a substantive declaration of evolutionary theory was to be made, by Charles Darwin (1809–1882).

Darwin's essay on *The Origin of Species by Means of Natural Selection* (1859) was published somewhat reluctantly and in the face of fierce opposition. It was concerned with the major evolutionary changes by which species evolve and was based upon Darwin's own observations on fossils and living creatures. The concept of natural selection, or the survival of any life form being dependent upon its ability to compete successfully for a place in nature, became, and still is, accepted as the major force directing an inevitable process of organic change. Our conception of the mechanisms and the causative factors for the large evolutionary steps, such as the demise of the dinosaurs and of many plant groups now known only as fossils, and the emergence and diversification of the flowering plants during the last 100 million years, is, at best, hazy.

The great age of plant hunting, from the second half of the eighteenth century through most of the nineteenth century, produced a flood of species not previously known. Strange and exotic plants were once prized above gold and caused theft, bribery and murder. Trading in 'paper tulips' by the van Bourse family gave rise to the continental stock exchange – the Bourse. With the invention of the Wardian case by Dr Nathaniel Bagshaw Ward, in 1827, it became possible to transport plants from the farthest corners of the world by sea and without enormous losses. The case was a small glasshouse, which reduced water losses and made it unnecessary to use large quantities of fresh water on the plants during long sea voyages, as well as giving protection from salt spray. In the confusion which resulted from the naming of this flood of plants, and the use of many languages to describe them, it became apparent that there was a need for international agreement on both these matters. Today, we have rules formulated to govern the names of about 300,000 species of plants, which are now generally accepted, and have disposed of a great number of names that have been found invalid.

Our present state of knowledge about the mechanisms of inheritance and change in plants and animals is almost entirely limited to an understanding of the causes of variation within a species. That understanding is based upon the observed behaviour of inherited characters as first recorded in *Pisum* by Gregor Johann Mendel, in 1866. With the technical development of the microscope, Marcello Malpighi (1671), Nehemiah Grew (1641–1712) and others explored the cellular structure of plants and elucidated the mechanism of fertilization. However, the nature of inheritance and variability remained clouded by myth and monsters until Mendel's work was rediscovered at the beginning of the twentieth century. By 1900, Hugo Marie de Vries (1848–1935), Carl Erich Correns (1864– 1933), Erich Tschermak von Seysenegg (1871–1962) and William Bateson (1861–1926) had confirmed that inheritance had a definite, particulate character which is regulated by 'genes'. Walter Stanborough Sutton (1877–1916) was the first person to clarify the manner in which the characters are transmitted from parents to offspring when he described the behaviour of 'chromosomes' during division of the cell nucleus. Chromosomes are thread-like bodies

which can be stained in dividing cells so that the sequence of events of their own division can be followed. Along their length, it can be shown, the sites of genetic control, or genes, are situated in an ordered linear sequence. Differences between individuals can now be explained in terms of the different forms, or allelomorphs, in which single genes can exist as a consequence of their mutation. At the level of the gene, we must now consider the mutants and alleles as variants in molecular structure represented by the sequences of bases in the deoxyribonucleic acid. Classification can not yet accommodate the new, genetically modified forms that may only be distinguished in terms of some property resultant upon the insertion of a fragment of DNA.

The concept of a taxonomic species, or grouping of individuals each of which has a close resemblance to the others in every aspect of its morphology, and to which a name can be applied, is not always the most accurate interpretation of the true circumstances in nature. It defines and delimits an entity, but we are constantly discovering that the species is far from being an immutable entity. However, botanists find that plant species may have components which have well-defined, individual ecotypic properties (an ability to live on a distinctive soil type, or an adaptation to flower and fruit in harmony with some agricultural practice) or reproductive barriers caused by differences in chromosome number, etc. The plant breeder produces a steady stream of new varieties of cultivated species by hybridization and selection from the progeny. Genetically modified plants with very specific 'economic' properties are produced by techniques which evade nature's safeguards of incompatibility and hybrid sterility and may or may not have to be repeatedly re-synthesized.

If we consider some of the implications of, and attitudes towards, delimiting plant species and their components, and naming them, it will become easier to understand the need for internationally accepted rules intended to prevent the unnecessary and unacceptable proliferation of names.

Towards a solution to the problem

It is basic to the collector's art to arrange items into groups. Postage stamps can be arranged by country of origin and then on face value, year of issue, design, colour variation or defects. The arranging process always resolves into a hierarchic set of groups. In the plant kingdom we have a descending hierarchy of groups through Divisions, divided into Classes, divided into Orders, divided into Families, divided into Genera, divided into Species. Subsidiary groupings are possible at each level of this hierarchy and are employed to rationalize the uniformity of relationships within the particular group. Thus, a genus may be divided into a mini-hierarchy of subgenera, divided into sections, divided into series in order to assort the components into groupings of close relatives. All such components would, nevertheless, be members of the one genus.

Early systems of classification were much less sophisticated and were based upon few aspects of plant structure, such as those which suggested signatures, and mainly upon ancient herbal and medicinal concepts. Later systems would reflect advances in man's comprehension of plant structure and function, and employ the morphology and anatomy of reproductive structures as defining features. Groupings such as Natural Orders and Genera had no precise limits or absolute parity, one with another; and genera are still very diverse in size, distribution and the extent to which they have been subdivided.

Otto Brunfels (1488–1534) was probably the first person to introduce accurate, objective recording and illustration of plant structure in his *Herbarium* of 1530, and Valerius Cordus (1515– 1544) could have revolutionized botany but for his premature death. His four books of German plants contained detailed accounts of the structure of 446 plants, based upon his own systematic studies on them. Many of the plants were new to science. A fifth book on Italian plants was in compilation when he died. Conrad Gesner (1516–1565) published Cordus' work on German plants in 1561 and the fifth book in 1563.

A primitive suggestion of an evolutionary sequence was contained in Matthias de l'Obel's *Plantarum seu stirpium historia* (1576), in which narrow-leaved plants, followed by broader-leaved, bulbous and rhizomatous plants, followed by herbaceous dicotyledons, followed by shrubs and trees, was regarded as a series of increasing 'perfection'. Andrea Caesalpino (1519–1603) retained the distinction between woody and herbaceous plants but employed more detail of flower, fruit and seed structure in compiling his classes of plants (*De plantis*, 1583). His influence extended to the classifications of Caspar (Gaspard) Bauhin (1550–1624), and his brother Jean Bauhin (1541–1613), who departed from the use of medicinal information and compiled detailed descriptions of some 5,000 plants, to which he gave many two-word names, or binomials. P. R. de Belleval (1558–1632) adopted a binomial system which named each plant with a Latin noun followed by a Greek adjectival epithet. Joachim Jung (1587–1657) feared being accused of heresy, which prevented him from publishing his work. The manuscripts which survived him contain many of the terms which we still use in describing leaf and flower structure and arrangement, and also contain plant names consisting of a noun qualified by an adjective. Robert Morison (1620–1683) used binomials, and John Ray (1627–1705), who introduced the distinction between monocotyledons and dicotyledons, but retained the distinction between flowering herbaceous plants and woody plants, also used binomial names.

Joseph Pitton de Tournefort (1656–1708) placed great emphasis on the floral corolla and upon defining the genus, rather than the species. His 69 generic descriptions are

detailed but his species descriptions are dependent upon binomials and illustrations. Herman Boerhaave (1668–1738) combined the systems of Ray and Tournefort, and others, to incorporate morphological, ecological, leaf, floral and fruiting characters, but none of these early advances received popular support. As Michel Adanson (1727–1806) was to realize, some sixty systems of classification had been proposed by the middle of the eighteenth century and none had been free from narrow conceptual restraints. His plea that attention should be focused on 'natural' classification through processes of inductive reasoning, because of the wide range of characteristics then being employed, did not enjoy wide publication and his work was not well regarded when it did become more widely known. His main claim to fame, or notoriety, stems from his use of names which have no meanings.

Before considering the major contributions made by Carl Linnaeus, it should be noted that the names of many plant families and genera were well established at the beginning of the eighteenth century and several people had used simplified, binomial names for species. Indeed, August Quirinus Rivinus (1652–1723) had proposed that no plant should have a name of more than two words.

Carl Linnaeus (1707–1778) was the son of a clergyman, Nils, who had adopted the Latinized family name when he became a student of theology. Carl also went to theological college for a year but then left and became an assistant gardener in Professor Olof Rudbeck's botanic garden at Uppsala. His ability as a collector and arranger soon became evident and, after undertaking tours through Lapland, he began to publish works which are now the starting points for naming plants and animals. In literature he is referred to as Carl or Karl or Carolus Linnaeus, Carl Linné (an abbreviation) and, later in life, as Carl von Linné. His life became one of devotion to the classification and naming of all living things and of teaching others about them. His numerous students played a very important part in the discovery of new plants from many parts of the world. Linnaeus' main contribution to botany was his method of naming plants, in which he combined Bauhin's and Belleval's use of binomials with Tournefort's and Boerhaave's concepts of the genus. His success, where others before him had failed, was due to the early publication of his most popular work, an artificial system of classifying plants. In this he employed the number, structure and disposition of the stamens of the flower to define 23 classes, each subdivided into orders on the basis of the number of parts constituting the pistil, with a 24th class containing those plants which had their reproductive organs hidden to the eye – the orders of which were the ferns, mosses, algae (in which he placed liverworts, lichens and sponges), fungi and palms. This 'sexual system' provided an easy way of grouping plants and of allocating newly discovered plants to a group. Originally designed to accommodate the plants of his home parish, it was elaborated to include first the arctic flora and later the more diverse and exotic plants being discovered in the tropics. It continued in popular use into the nineteenth century despite its limitation of grouping together strange bedfellows: red valerian, tamarind, crocus, iris, galingale sedge and mat grass are all grouped under *Triandria* (three stamens) *Monogynia* (pistil with a single style).

In 1735, Linnaeus published *Systema naturae*, in which he grouped species into genera, genera into orders and orders into classes on the basis of structural similarities. This was an attempt to interpret evolutionary relationships or assemblages of individuals at different levels. It owed much to a collaborator and fellow student of Linnaeus, Peter Artendi (d. 1735), who, before an untimely death, was working on the classification of fishes, reptiles and amphibians, and the *Umbelliferae*. In *Species plantarum*, published in 1753, Linnaeus gave each species a binomial name. The first word of each binomial was the name of the genus to which the species belonged and the second word was a descriptive, or specific epithet. Both words were in Latin or Latin form. Thus, the creeping buttercup he named as *Ranunculus repens*.

It now required that the systematic classification and the binomial nomenclature, which Linnaeus had adopted, should become generally accepted and, largely because of the popularity of his sexual system, this was to be the case. Botany could now contend with the rapidly increasing number of species of plants being