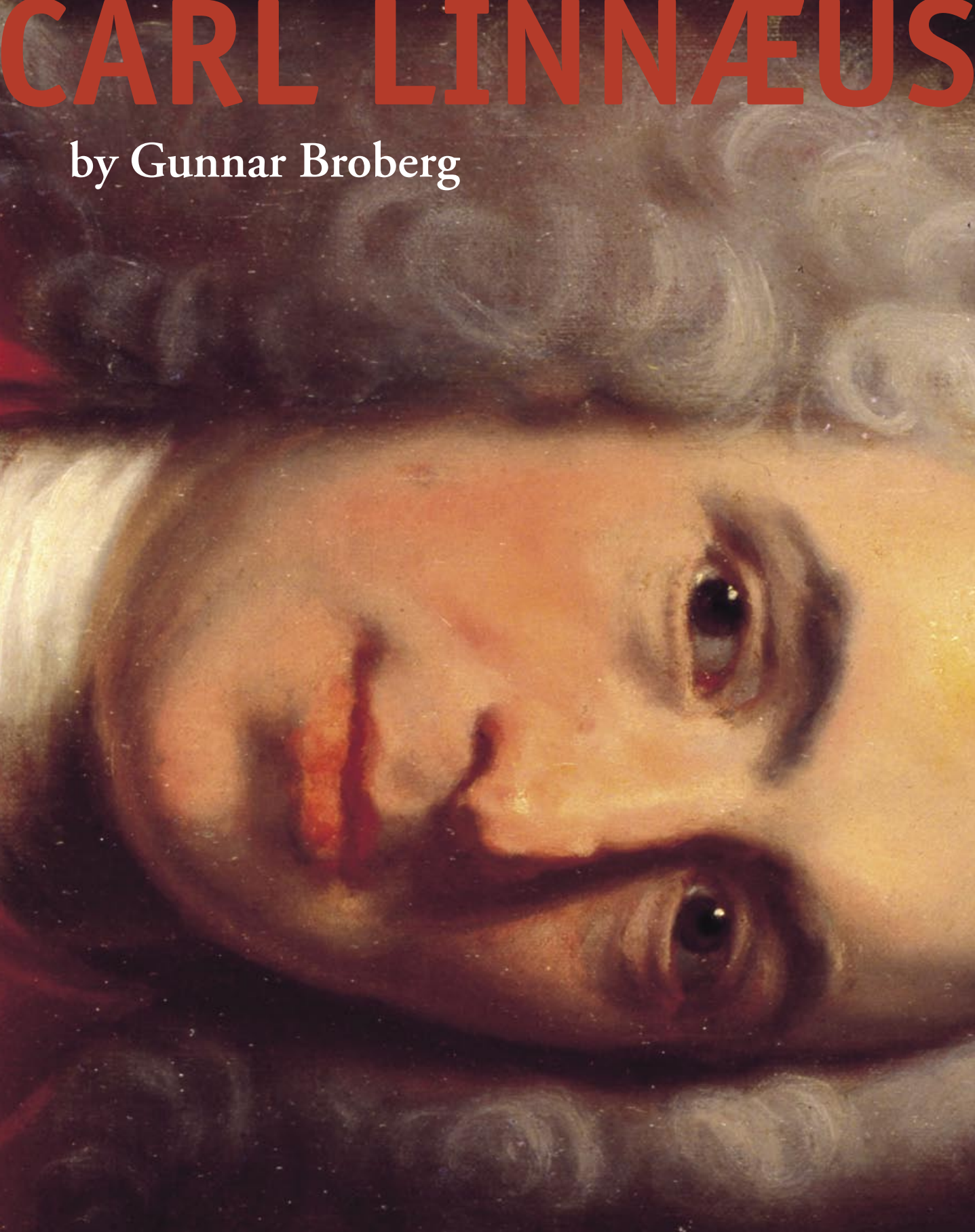
# CARL LINNÆUS

by Gunnar Broberg



# Carl Linnaeus

by Gunnar Broberg

**Swedish Institute**

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CARL LINNÆUS (1707–1778) is Sweden's most famous natural scientist. He set out to list and order the whole of Creation. His importance, however, is not confined to the international history of science. In a way he is also a part of Swedish everyday life today, as the author of living classics which people still read. The Swedes, perhaps, look on him primarily as a traveller and explorer of their own country, while to others he is the father of the modern classification of flora and fauna. But he was much more than this. For example, he was an inspiring teacher who sent his students on voyages of scientific discovery all over the world.

# THE PRINCE OF BOTANISTS, THE PLINY OF THE NORTH, THE SECOND ADAM, "L."

THE MAIN CHARACTER of this publication has a variety of names. Swedes know him as Carl von Linné, the name he took when raised to the nobility in 1757. In the Anglo-Saxon world he is normally referred to as Carl Linnaeus, which is the name he was given at his baptism. The Latin ending of his surname indicates academic status, without which he would have been called Carl Nilsson, after his father. (On one occasion Linnaeus styled himself Carl Nelin, a cryptonym of Carl N/ilsson/ Linné. That was in a prize competition, which he failed to win even though the alias probably deceived no-one.) Then again, Linnaeus has been called *Princeps botanicorum*, the Prince of Botanists, "The Pliny of the North", "The Second Adam" and other names besides. To present-day botanists and zoologists who concern themselves with matters of taxonomy, he is just plain "L.", the letter which indicates the naming of an outstandingly large number of important organisms.

A Swedish proverb says that a loved child has many names. Perhaps the same goes for an important person, and it was certainly no common occurrence for a scientist and professor to be elevated to the nobility. Not many scientists were accorded equality of status with Pliny, the great natural historian of antiquity. And of course it was grander still to compare Linnaeus with the ruler of Paradise and the first namer of animals. Thousands of plants and animals remind us of the person who named them, and innumerable garlands of flowers have been tied in honour of Linnaeus. Every Swedish province has its emblematic flower, and the Twinflower, provincial emblem of Småland, is called Linnaea after the great son of that province, putting all Swedes in mind of him personally. Not until the Earth once more lies empty and desolate will the name of Linnaeus be forgotten.


Linnaeus' coat of arms. He was ennobled in 1757.

OPPOSITE PAGE
Cowslips on the Baltic island of Öland to which Linnaeus made one of his famous journeys in 1741.

Linnaeus made rather a big thing of his humble origins. “A great man can step forth from a small hovel,” he wrote in one of his autobiographies. (He wrote no less than four of them, which is usually quoted as evidence of his self-infatuation, but that is not really fair because the biographies are more in the nature of curricula vitae and memoranda for subsequent memorial addresses. This also explains why Linnaeus writes them in the third person and not subjectively. And when he lists his exploits this is perfectly in order, because they were many and irrefutable.)

However charming and uncomplicated he might seem, he was supremely career-minded. This, however, is to moralise, and as a historian one ought rather to emphasise the social mobility so typical of Swedish society at the time. Linnaeus’ grandfather was a peasant, his father entered the Church, he himself became a physician and eventually a professor and a member of the nobility. One could scarcely advance

# LINNÆUS BECAME A BOTANIST WHILE STILL IN THE WOMB

any further than that. Sweden was a relatively open society whose agrarian population was traditionally endowed with strength and liberty.

Through the centuries, the culture of the parsonage has been the backbone of science and the arts in Sweden. This is due to the close connection between Church and State in Sweden during the 17th century, known in Swedish as "the Age of Greatness". The Lutheran Church was indispensable to the State as an educator of the peasant population in peacetime and as a shepherd of souls in the great wars of the period. The glory and the misery of the time demanded moral fibre. When the bubble burst, with the death of Charles XII on his Norwegian campaign in 1718, the established Church remained to pilot the country into the more pacific and culturally fertile Age of Liberty.

## The young medic and botanist

LINNÆUS HIMSELF MAINTAINED that he was predisposed for botany by growing up in a beautiful part of Sweden, Småland, as the son of a keen botanist. The fact of his being born "just when spring was at its loveliest and the cuckoo was proclaiming summer" was in itself an augury of the scientific flowering that was to follow. His father had created a small garden containing many unusual plants which he appreciated more for their beauty than for their utility. And during her pregnancy, his mother could feast her eyes on it, so that Linnaeus became a botanist while still in the womb. Subsequent biographers have elaborated the theme of Linnaeus' mother, Christina Brodersonia, decorating his cradle with flowers. All this, coupled with his humble origins, has been turned into an edifying national saga, with Linnaeus as the embodiment of an impoverished, exhausted small nation rising to maturity, power and authority. The saga of Linnaeus is one of the highlights of Sweden's national mythology.

OPPOSITE PAGE
The 32-year-old Linnaeus in his wedding finery. Oil painting by J. H. Scheffel, 1739.

OPPOSITE PAGE
Råshult in the province of Småland,
Linnaeus' birthplace.

Born at Råshult in 1707, Linnaeus was the eldest son of a typical Swedish clerical family. He had three sisters and a brother, Samuel, who was to succeed their father as vicar of Stenbrohult in Småland. Samuel is known as the author of a work on bee-keeping, a subject true to the 18th century interest in useful science. A Church career was pre-ordained for Carl but required one or two years at university.

Linnaeus attended grammar school in nearby Växjö and, if legend is to be believed, was a lack-lustre pupil; this again is a tradition emanating from Linnaeus himself and his not altogether reliable autobiographies. His physics teacher, a doctor called Johan Rothman, spotted his genius and supported his interest in the less utilitarian study of plant life. (In schools of the past there was nearly always a mentor of Rothman's kind, may their names be praised.) He told the worried parents that their first-born should abandon theology for medicine. This is indeed what happened, but the parental anxiety was understandable. Medical posts in Sweden were extremely few in number, whereas theologians had a guaranteed job market. Then again, they had heard rumours about the godlessness of medical science, for after all, it was the physicians who, a generation or so earlier, had imported the seditious doctrines of Descartes to the universities.

From Växjö Grammar School, Linnaeus ventured forth to the relatively new Lund University in the province of Skåne. Linnaeus' capacity for finding benefactors is attributable not only to his rare ability but also to his charm and boldness. This time it was the Professor of Medicine, Kilian Stobaeus, who took Linnaeus into his home, though the mistress of the house objected to the new resident reading in bed by candlelight, thereby threatening to send everything up in flames.

Lund suited Linnaeus' purposes for only a year or so. In 1728 he moved to Uppsala in the

OPPOSITE PAGE
Copper engraving of Carl Linnaeus by August Ehrensvärd, 1740.

province of Uppland, where there was a bigger and more ancient university, founded in 1477. There he found two Professors of Medicine, Olof Rudbeck the Younger and Lars Roberg, both of them on the point of retirement. Linnaeus naturally took a sidelong glance at their positions and was anxious to display his capabilities then and there. With a few intermissions he spent seven years in Uppsala. The intermissions were occasioned by journeys to Lapland (1732) and Dalarna (1734). Most of his studies were pursued unaided, but he also got a foot inside the door of Olof Rudbeck the Younger. Linnaeus ministered to the Rudbeck family until, for uncertain reasons, Mistress Rudbeckia showed him the door. He also earned the confidence of Lars Roberg. Roberg was an interesting man, a cynic in the philosophical sense and outstandingly erudite. He had a reputation for being rather odd—badly dressed and the owner of a great library—but Linnaeus rightly admired him.

The early medical studies reflected by Linnaeus' notes from this period present a remarkable blend of traditional belief or superstition and modern mechanistic medicine. One is certainly intrigued to find Linnaeus, visiting his family in Stenbrohult, saving his sister from the ague by wrapping her in the carcase of a newly slaughtered sheep. In his lectures he tells his students that, if you apply snaps to a puppy it will remain small, and that the male progeny of a white woman and a black man acquires a black penis. He is famous for his persistent belief that swallows did not migrate southwards but hibernated at the bottom of lakes, as if they had gills and fins. (This popular belief has been put down to the fact that swallows fly close to the surface of the water in pursuit of insects, but one is entitled to demand better things of an academic naturalist.) Mistakes like this may seem embarrassing, but they are more appropriately to be regarded as tensions in a culture of many different strata.

At the same time, as hinted above, Linnaeus was convinced of the truth of the new mechanistic physiology, readily summarised in the thesis of "Homo machina est", i.e. man is a machine. Lars Roberg, for example, could put this in the following terms: "The heart a pump, the lung a bellows, the stomach a mixing bowl". Coupled with another of Linnaeus' favourite adages, "Homo est animal", this way of looking at humanity had a bold and modern ring. The fundamental notion was that of "the simple plan of Nature", as confirmed by the new physics, and ultimately by Newton. In other words, on closer inspection Creation proved to be based on a few sensible laws and not on a welter of exceptions. Nature, thus viewed, was readily comprehensible, which can sometimes excuse the conclusions which Linnaeus and others jumped to, including breathtaking analogies between the natural kingdoms and between nature and culture.

OPPOSITE PAGE
Linnaeus' study in the Linnaeus Museum, Uppsala. In Linnaeus' day both the house and the garden were an international centre for scientific research and teaching.

Linnaeus was above all attracted to natural history, and especially botany. He was a divinely talented botanist, but like any other great scientist or artist still had to work hard to achieve his position. During excursions of different kinds in and around Uppsala and through his teaching in the University Botanical Gardens, originally laid out by Olof Rudbeck the Elder in the 1650s, he gained knowledge, contacts and reputation. Olof Rudbeck the Younger, his employer and benefactor, showed him the famous bird book he had painted in the 1690s, based partly on material from a journey to Lapland, Sweden's first scientific expedition. Also in Uppsala at that time was Petrus Artedi, another medical student and Linnaeus' interlocutor and rival in terms of scientific acumen. Together they hatched magnificent plans for a reformed science characterised by order and breadth of perspective. At home in his student's den, Linnaeus collected more and more natural exhibits, books and manuscripts of his own writing. A quotation:

"Reader, you should have seen his museum, which was open to the listeners, and, full of admiration and delight, you would have loved its host. The ceiling he had adorned with bird skins, one wall with a Lapp costume and other curiosities, the other wall with large plants and crustaceans, while both the others were lined with books of natural science and medicine, and with docimastic* instruments and stones neatly arranged. The corners of the room were occupied by high branches of trees which he had taught birds of nearly thirty species to inhabit; on the inside of the windows, finally, there were large clay vessels filled with soil in which rare plants found nourishment."

Linnaeus prepared for his professional début, but to qualify for a doctorate in medicine he had to travel abroad. Since the second half of the 17th century, it had become customary for Swedes to travel to Holland for their doctoral

* Docimasy: the assaying of ores or metals.

disputations. The country had thus become an important influence on Swedish intellectual life. (Artedi arrived there at the same time as Linnaeus but drowned one dark evening in an Amsterdam canal.) The Netherlands were also a much more suitable place for publishing works of scholarship. As an experience, a foreign stay of this kind was invaluable and, given the chance, would be extended in both time and space. Linnaeus was to spend three years on the continent of Europe, mostly in the Netherlands, but with brief visits to France and England. Not that this really made him a cosmopolitan—modern languages, for example, did not come easily to him—but the academic contacts and friends thus acquired were immensely beneficial in the long run. It was through them that he was to gain a worldwide reputation.

A few weeks later Linnaeus had taken his doctorate at the little university of Harderwijk. The subject of his thesis was ague caused by a

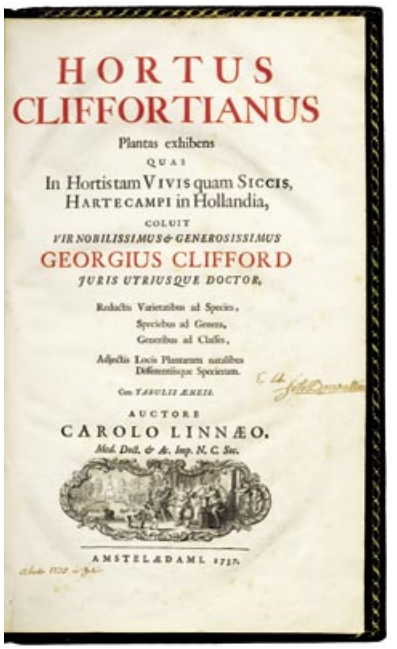
## IF EVER THERE WAS SUCH A THING AS THE LINNÆAN PROJECT, THIS WAS IT

spanner—clay, actually—in the human works, a truly modern, mechanistic exposition, presented with the massive self-assurance that typifies all Linnaeus' medical writings. In addition, the little collection of botanical rules entitled *Fundamenta botanica* (1736) was printed, together with greater and lesser works like *Bibliotheca botanica* (1736), *Genera plantarum* (1737) and *Classes plantarum* (1738), the illustrated work *Hortus Cliffortianus* (1737), his friend Artedi's posthumous *Ichtyologia* (1738) and a few more besides. Linnaeus was his own science industry. He had been put in charge of the garden at Hartecamp, an estate belonging to the wealthy banker Georg Clifford, and his duties there sometimes prevented him from seeing his own writings through the press. Instead he enlisted the aid of his friends. He certainly didn't waste time!

It was in the Netherlands, then, that Linnaeus made a name for himself and, after a couple of detours to France and England, one feels he might very well have settled in Europe for good, but in 1738 he returned home to Sweden, never again to venture into the great wide world.

### Everything in order: the new natural science

IN AMSTERDAM HE WAS lucky enough to make friends with a kindred spirit, the wealthy natural historian Johannes Burman, who promised to help him publish his *Systema naturae* (1735), the manuscript of which he had brought with him from Sweden. If ever there was such a thing as the Linnaean project, this was it. Typographically, not least, the composition of its great tables was a magnificent achievement. Perhaps the *Systema naturae* was originally intended to consist of a number of "maps" which could be put up on the wall, illustrating the three kingdoms of Nature, with everything displayed, both the great units and the progressively smaller individualities. Quite often, in fact, he referred to his system as a kind of


HORTUS
CLIFFORTIANUS
Plantas exhibens
QUAS
In Hortis tam Vivis quam Siccis,
Hartecampi in Hollandia,
COLUIT
VIR NOBILISSIMUS & GENEROSISSIMUS
GEORGIUS CLIFFORD
JURIS UTRIUSQUE DOCTOR,
Redactis Varietatibus ad Species,
Speciebus ad Genera,
Generibus ad Classes,
Adjectis Locis Plantarum natalibus
Differentiisque Specierum.
Cum TABULIS ÆNEIS.
AUCTORE
CAROLO LINNÆO.
Med. Doct. & Ac. Imp. N. C. Soc.
AMSTELÆDAMI, 1737.

Title-page of the first edition of Linnaeus' *Hortus Cliffortianus*, Amsterdam 1737.

OPPOSITE PAGE
The botanical garden in Harderwijk. The gingko biloba tree is the oldest in the Netherlands and may even have been planted by Linnaeus.

military mapping: Nature, like society, consisted of kingdoms, provinces, districts and individual smallholdings from which the soldier was collected. Linnaeus having grown up during the great wars, the analogy came naturally. Not that he was an adherent of the old political system which had now been toppled, but he was almost obsessed with lucidity and order. On one occasion he appointed himself general of Flora's army, an apt title in spite of that goddess's peaceful attributes.

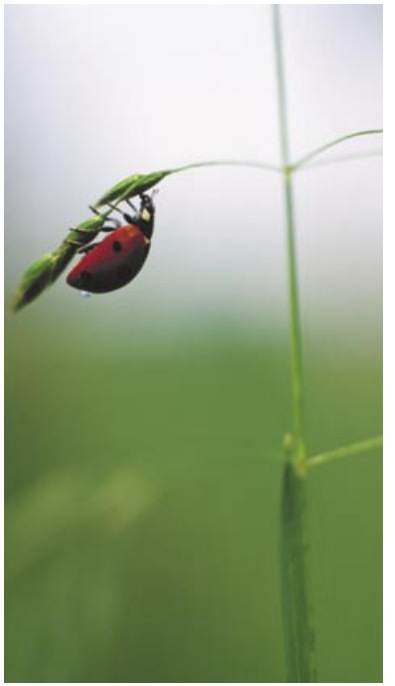
Linnaean science was founded on *divisio et denominatio*, division and naming, which meant breaking Nature down into a number of larger or smaller boxes to be labelled and put in the right places. As the criteria of division, Linnaeus used, for plants, their sexual characteristics, which had been discovered at the end of the 17th century but were by no means universally accepted. One could go to great lengths in interpreting Linnaeus' fascination with the ubiquitous procreative games of Nature, from which not even the innocent flowers were excluded. In addition to perhaps the first explanation that springs to mind, that Linnaeus was a kind of Peeping Tom of natural history, one can also identify a religious motif, that of Nature, in obedience to its Creator's call, being fruitful and multiplying. This, to Linnaeus, is its prime task, and it is in this way that life is sustained in all its diversity. His delight in the resemblance of plants to man also harks back to ideas concerning the simple plan of Nature. Further inspiration may have come from alchemy, which excelled in a kind of scientific nuptial metaphor very similar to Linnaeus'. Plants also celebrate weddings, in a whole variety of configurations, either openly as in the case of the "phanerogams" or secretly as with the "cryptogams".

The animals, in turn, are divided according to more varied criteria: the quadrupeds, or as Linnaeus would perceive and term them, *Mammalia*, were divided, among other things,

according to the number and position of their breasts/udders. Minerals or "stones", similarly, were divided according to external characteristics and not with reference to any chemical composition. Like plants and animals, they are arranged in the Linnaean hierarchy beginning with the largest and ending with the smallest, viz *regnum, classis, ordo, genus* and *species*. The different species were given long names to begin with, but from 1753 (*Species plantarum*) and 1758 (*Systema naturae,* tenth edition, animal section), they were given the dual names which have since become standard practice in natural science. The white anemone is still called *Anemone nemorosa* and the domestic cat *Felis domestica*, both with "L." added to show who named them.

These are technicalities, of which Linnaean science has many. Not that this makes it "difficult"; on the contrary, it can be reduced to a refined hobby. On the other hand, the device has been infinitely effective as a means of getting a mental hold of Nature and in this way gaining control of it. There is more to a name than meets the ear.

The late editions of *Systema naturae* scan the entire range of creation, from the stars down to the microorganisms. The extra-terrestrial world, admittedly, commands only a mention but is nonetheless important as a framework. Linnaeus is more exhaustive on some points than others. As usual the insects predominate while only the rough outlines of the cryptogams were known. Thus the path descending from the stars through the whole of creation is a jagged one. Often the diversity was overwhelming; sometimes the right transitions were lacking. Linnaeus was really contending with a fundamental difficulty, because at one and the same time he was looking for differences and connections, both "ladders" and "chains", as it were. The former fitted in better with the emphasis of traditional religion on man's supremacy, for example. The latter was



LARGE PICTURE
Aquilegia vulgaris

SMALL PICTURE
Paeonia festiva

LARGE PICTURE

Aesculus pavia

SMALL PICTURE

Lilium bulbiferum

more in keeping with the thinking of the times. A new epistemology and a succession of new discoveries in natural history demonstrated the impossibility either philosophically or scientifically, of keeping Nature within bounds. John Locke's critique of essentialism (that is, the theory that species could be defined in terms of "essence") and a number of observed borderline organisms—such as the freshwater polyp, the corals and the primates —came as challenges to the old structure.

One of the patterns of thought most dear to the 18th century was the concept of the great chain of being. To Linnaeus this became more and more important. Naturally he regarded Creation as a hierarchy with man at the top; his startling positioning of the human race in the same order as the apes has endured, man being dubbed in 1758 *Homo sapiens* of the order of *Primates*. But the chain had to hang together at the bottom, and Linnaeus searched, through his reading and through colleagues, for transitional human beings. He lent his confidence to dubious reports of a captured mermaid, and he wrote longingly of the possibility of examining her. He also allowed himself to be deceived by other travellers' tales, which seemed to confirm the existence of sub-humans with tails or humans with the arms of apes. These are even admitted to *Systema naturae*, under names like *Homo troglodytes* (referring among other things to albinos) and *Homo lar* (the gibbon). These elements bear witness to his aim of doing justice to the diversity and coherence of Nature, two properties which not only agreed with what scientific research seemed to be saying but also with the concept of an infinitely wise and generous Creator. They are at one and the same time unprejudiced—"pre-Darwinist"—and prejudiced.

The Linnaean project had begun. Cast in the mould of the Linnaean books of rules, it also had the purpose of listing and ordering the

# AT ALL EVENTS, THIS LOVE STORY WAS NO COINCIDENCE

whole of Creation. All that now remained was to carry it out.

## Professor in Uppsala

LINNÆUS, THEN, HAD LEFT the Netherlands. Traditional biographies usually put this down to his promise to his betrothed, Sara Lisa Moraea. (Thus the autobiography: "Travelled straight to Falun to see his beloved, who for nearly four years had been waiting for her dear Ulysses.") But it is also conceivable that he needed to put his house in order in a more material sense. At all events, this love story was no coincidence. Sara Lisa's father was physician at the Falun copper mine, which was one of the best appointments open to a Swedish physician and something worth banking on if the academic plums fell in the wrong direction. Her betrothed was a promising young medic, a future "somebody". By all the laws of higher romance, Linnaeus ought to have returned home earlier. There was in any case no enduring romance about their ensuing marriage. Sara Lisa was a worthy woman and Linnaeus was probably made to keep his distance. But once again, let us not romanticise yesterday's loves nor expect great men to be uncalculating and their wives to be self-sacrificing slave girls.

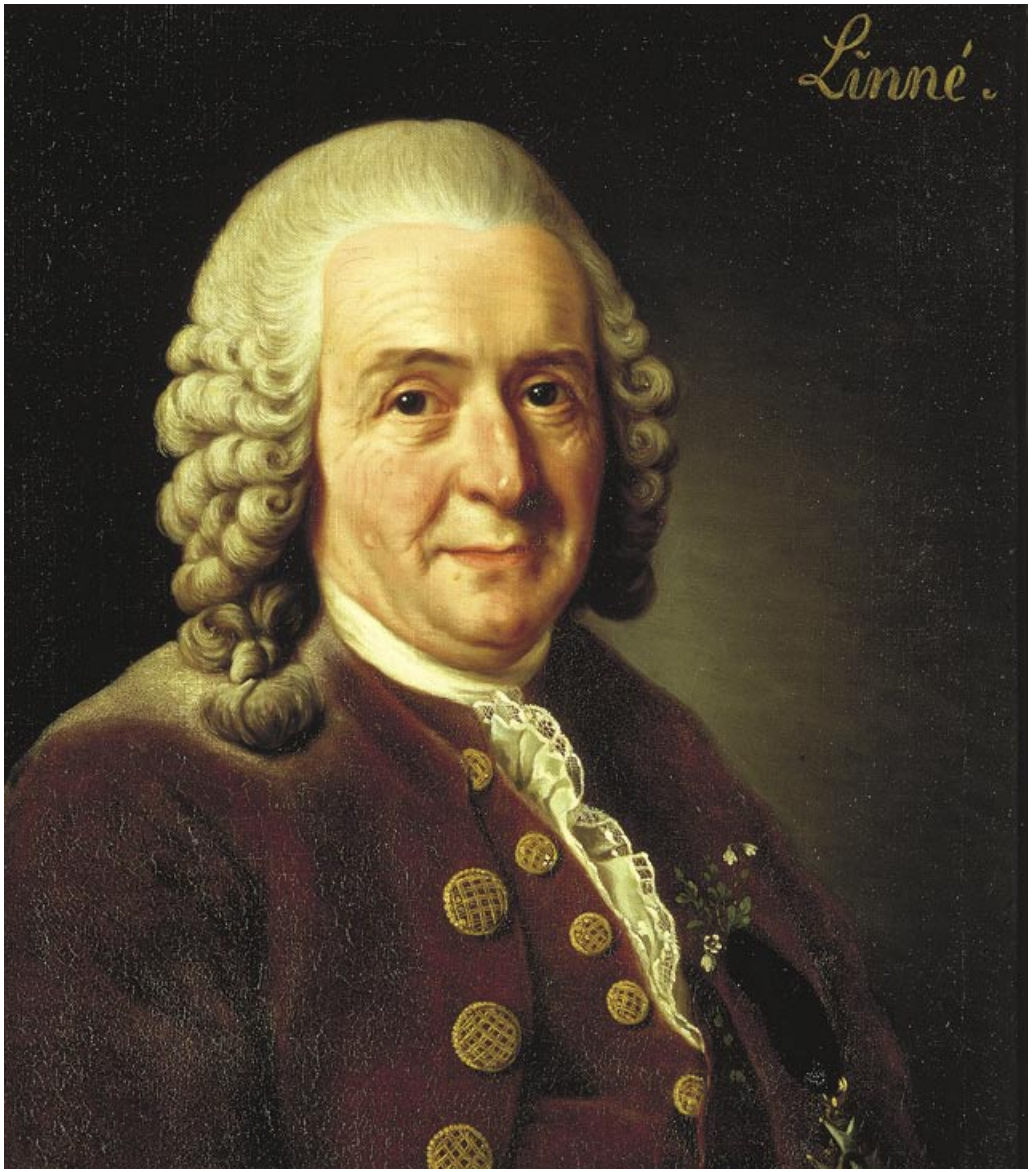
Linnaeus spent a couple of years in medical practice in Stockholm before, after a good many ins and outs, becoming Professor of Medicine in Uppsala in 1741. Once in position he displayed a rare degree of energy rivalled only by that of Olof Rudbeck the Elder. His professorial duties involved teaching dietetics, materia medica, and natural history. He was in charge of the botanical gardens, the success of which must be weighed against the economic and climatological difficulties he had to contend with. Nor must we forget that it also involved looking after a small menagerie. Linnaeus was several times Vice Chancellor of Uppsala University, which had something like a thousand students. For many years he

OPPOSITE PAGE
Alexander Roslin's portrait of Linnaeus from 1775.

was Inspector to the Småland Student League (a sodality of students from that part of Sweden). In addition he was several times President of the Royal Swedish Academy of Sciences, founded by himself and a number of like-minded people in 1739. He also became, in 1744, Secretary to the Uppsala Scientific Society. From time to time, and with mixed feelings, he served as a kind of court naturalist to the King and Queen in Stockholm. In the summer he went on his provincial tours.

Above all, though, Linnaeus was responsible for large groups of students and tutored no fewer than 186 dissertations, nearly all of which he wrote himself. Over the years an immense quantity of scientific writings came from his pen, to the quite considerable financial benefit of his publisher. To this must be added his prolific correspondence, only a minor portion of which has been published, running to about twenty volumes. The full quantity was once estimated at upwards of 6,000 letters, but the true figure is much higher.

This efficiency is hard to account for, but let us once more indulge in a climatological speculation. A colleague during the Romantic period, geobotanist Göran Wahlenberg, declared in 1822 that "Linnaeus, then, in common with his science, is an excellent child of the natural history of his native country"—the brief, intense summer when the long daylight allows late nights of study, the cold winter which hones the intellect. Above all Wahlenberg points to the combination of forest and plain resulting from the intrusion of the Uppland Ridge into the landscape. To this is added the impact of the air on the slopes, "stimulating and capable of activating the senses". Or rather, "sensual life"—a necessary attribute of the naturalist-researcher. Such are the surroundings suitable for universities and successful scientists.


Linné.

Compass, magnifying glass and pocket book with Linnaeus' notes from the Lapland journey of 1732.

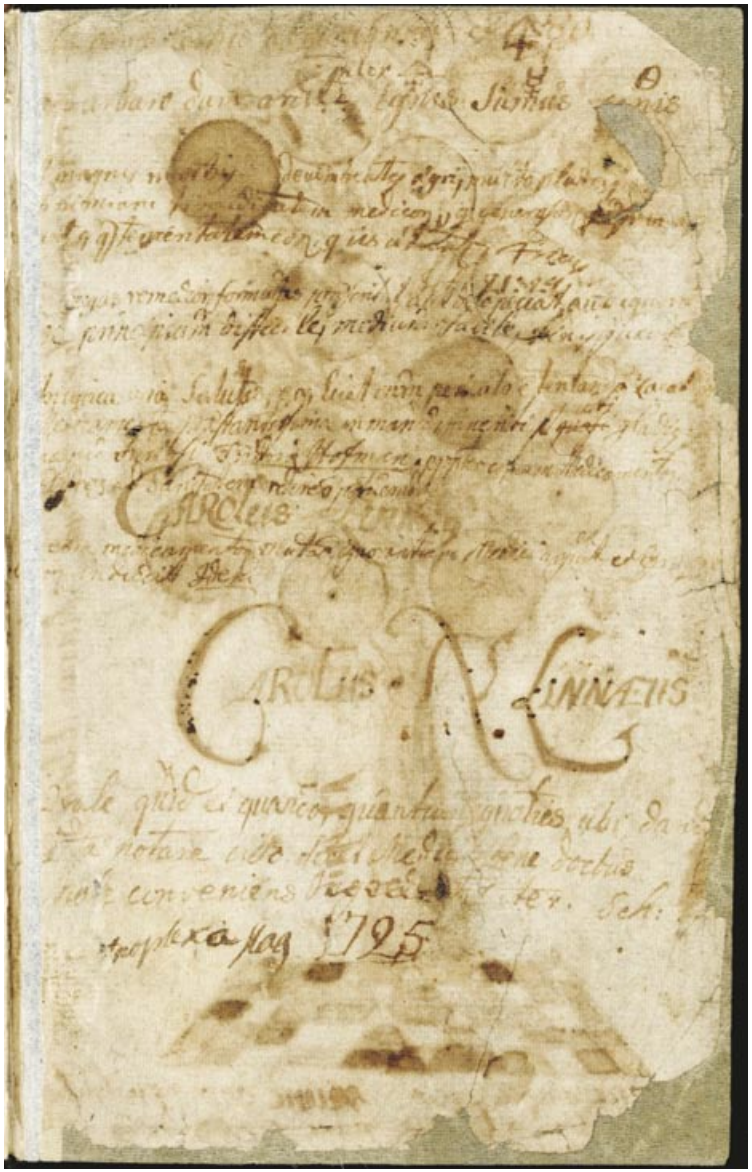
# IN SWEDEN, LINNÆUS IS KNOWN ABOVE ALL FOR HIS TRAVEL BOOKS

## Linnaeus the traveller

IN SWEDEN, LINNÆUS IS KNOWN above all for his travel books. Topographical writings are popular everywhere because they have so much to tell us about past ages. Another of the attractions of the Linnaean journeys is that they are written in Swedish, and a very bracing Swedish at that. They are not so uncontrived as Linnaeus implies when, with false modesty, he disclaims membership of "the nightingales of Pliny", but they are less stilted than other contemporary writings and outstandingly concrete. Linnaeus' curiosity and immense knowledge of his subject are an unfailing guarantee of the *mot juste*. He was capable of clothing his impressions in a concise, often antithetical and reiterative style à la Baroque, with dashes of classical mythology, hastily jotted down as he went. Even today they are a favoured travelling companion of the Swedish reading public.

It is tempting to see in them the foundations of a specific Swedish feeling for nature. They were already viewed in this light, for example, by the statistician Gustav Sundbärg when, in 1911, he published an influential collection of aphorisms about the Swedish national character. Swedes, unlike Danes, are uninterested in people but very interested in nature, and this love of nature was greatly inspired by Linnaeus. Invariably, he mistakenly continues, the focus of attention is on summer. For Linnaeus, both summer and winter in the Nordic countries have their peculiar merits, though winter's come often in disguise. In all fairness, the Swedish feeling for nature is certainly rooted in Linnaeus, but it did not begin growing in earnest until the turn of the last century, as the old agrarian society became urbanised and industrialised. But be this as it may, Linnaeus' journeyings are Swedish classics, and it is a pity that their delights should largely be accessible only to Swedish readers.

The first of these provincial journeys, to Lapland, was financed by the Uppsala


CAROLUS LINNÆUS


Virgo

OPPOSITE PAGE
Title-page and 'may tree' from *Örtaboken*, Linnaeus' earliest known manuscript from 1725.

Scientific Society at the instance of Olof Rudbeck the Younger. Linnaeus was then a vigorous 25-year-old. It was a journey full of privations. Later on, it is true, he was to exaggerate its length and the perils it entailed, but his narrative (which remained unpublished until 1811) inspires admiration enough. Linnaeus travelled on his own along the east coast of Sweden up to Luleå, where he turned in towards the mountains, crossing them on foot and continuing as far as the Arctic coast on the Norwegian side. Returning the same way, he continued, with various minor detours, round the Gulf of Bothnia and down the coast of Finland, crossing back to Sweden and Uppsala by way of the island of Åland. In five months he had covered over 2,000 km. The scientific harvest was a rich one. The *Flora Laponica* (1737) was a trump card in his Dutch publishing. An unknown corner of Europe had now been described and published. There was also the harvest of personal experience. The time spent in the mountains and together with the Sami (Lapp) people had convinced him of the superiority of the simple life over urban comforts. When it suited him, Linnaeus readily preached a kind of medical primitivism and greenwave gospel.

The purpose of the Lapland journey in 1732 was primarily scientific (although the list of topics for investigation included some fairly odd problems, such as the question as to whether Noah's Ark had come to rest on the Åreskutan mountain peak in the province of Jämtland). Linnaeus travelled on his own and took considerable risks. His journey to Dalarna, in 1734, was commissioned by the Governor of that province in Falun and had the economic purpose of identifying common assets in the country at large as well as unknown natural resources and, for example, collecting intelligence about Norwegian mining activities at Röros. This time Linnaeus headed a small group of students who assisted him and at the same time received instruction from their young leader.

Linnaeus painted in his Lappish costume by Martin Hoffman, 1737. When he went to the Netherlands in 1735 he took the costume, his herbarium and the manuscript of *Flora Lapponica* with him.

OPPOSITE PAGE
*Hortus Cliffortianus*, both the book and an allegory by Jacob de Wit.

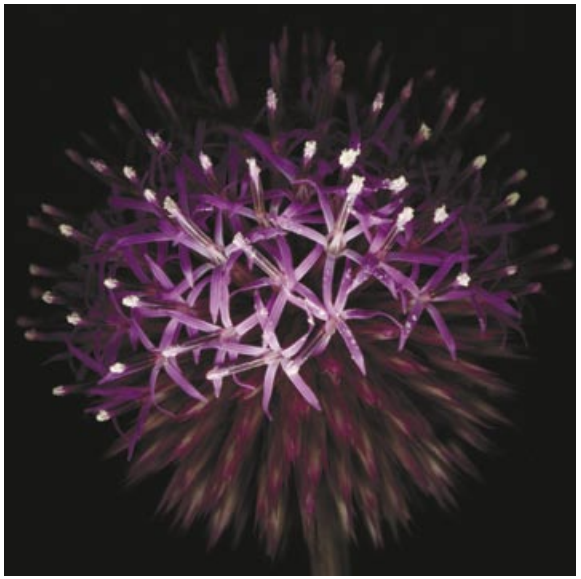
The pattern resembles that of the journeys undertaken by Linnaeus as an Uppsala professor in the 1740s. The first of those journeys, to the islands of Öland and Gotland in 1741, preceded his inauguration; the subject of his inaugural lecture was "the necessity of exploring one's own country". These expeditions were paid for by the Estates (i.e. Parliament), in the hope of a payback through the reform of economic policy. Linnaeus' journeys, accordingly, were to be published, and published in Swedish—the sole exception to this rule being the recurrent Latin descriptions of species. It is very doubtful, though, whether the Swedish peasantry paid all that much attention to Linnaeus' writings, which were not to become best-sellers until much later.

We find ourselves travelling in the company of an all-seeing eye, a horseman continually dismounting to scrutinise the flowers at the roadside, making notes and gathering material. The utilitarian aspect is very much in evidence,

for example, in the Västergötland Journey (1746), which took Linnaeus to the small model society of Alingsås with its industries, which were cherished by the Hat* régime and viewed with approbation by Linnaeus, and to Göteborg (Gothenburg), where he felt the spindrift of Holland. Much is made of Linnaeus' feeling for some kind of pristine natural environment, but he was also favourably disposed to towns, so long as they conformed to his image of a modern community. The town, admittedly, could mean vanity and idleness, but it could also echo with the hammer blows of honest toil.

The journeys, then, reflect not only Linnaeus' love of nature but also his patriotism. And it was above all the cultivated landscape which commanded his attention. On the last of his provincial journeys, to Skåne in 1749, he

* The prominent, pro-reform political party between the 1740s and 1760s. The Caps were their principal adversaries.



UPPER LEFT
Echinops ritro

UPPER RIGHT
Tropaeolum majus

LOWER LEFT
Sempervivum tectorum

LOWER RIGHT
Papaver orientale

# EVERYWHERE HE SAW A PURPOSE IN NATURE

travels in style, by coach, and in the midst of pouring rain and bad temper he delights in the fertility of the soil. As he grew older, it was man-made Skåne rather than the thin, stony soil of his native Småland which became his ideal province and landscape. He was no true Rousseauan.

## "The Linnaean project"

THE LINNÆAN PROJECT WAS a combination of themes religious and secular. It was man's duty to wonder at Creation in all its diversity and in doing so to give thanks to the Creator for His generosity. Linnaeus never tires of praising the deity, but as a Creator, not as a Saviour. There was a certain element of tactics involved here: natural science, natural history, could benefit from the backing of religion, but this gratitude also contained the seeds of a worldly interest in nature, concerned with things beneficial to man. The utilitarian aspect is one of the foremost characteristics of 18th century Sweden and Linnaeus was one of its leading lights.

Everywhere he saw a purpose in Nature, each individual thing had its purpose and usefulness, and most things, in the ultimate analysis, existed for man's benefit. On the other hand, Linnaeus did not lapse into a trite enumeration of all the benefits derived by man from divine benevolence. His optimism is counterbalanced by lamentations over man's wretchedness and by a profound insight into the workings of Nature.

To this very subject of the workings or interaction of Nature he was to devote a number of dissertations, such as *Oeconomia naturae* (1749) and *Politia naturae* (1760). Nature has three consecutive stages: *propagatio, conservatio* and *destructio*. These are so ingeniously connected that, in the blunt words of the Swedish proverb, one man's death is the other man's breath. In *destructio*, for example, Nature's police, the predators, dominate the scene. They too are needed, and they keep Creation clean and beautiful. This version of the old theodicy

Linnaeus' home and place of work for 35 years in Uppsala now houses the Linnaeus Museum.

problem—that of reconciling a good and omnipotent deity with the presence of imperfections and evil in Creation—is not original, but Linnaeus' solution, instead of being Rococo and superficial, is sincerely felt and redolent of blood and pain. It also incorporates man, who like everything else is included in the cycle of Nature. The following excerpt comes from the Västergötland Journey, as Linnaeus, in a churchyard, muses lightheartedly on a serious subject:

"When I dig the soil of churchyards, I take the parts which have constituted and been transformed by human beings into human beings; if I take them to my kitchen garden and put plants in them, from this I get cabbage heads instead of human heads, but if I boil these /cabbage/heads and give them to people, they are transformed once again into people's heads or to other parts etc. Thus we come to eat up our dead, and in so doing we prosper."

One can of course attempt to attribute Linnaeus' infatuation with order to some inner unease. That certainly existed and there would indeed be justification for pursuing a more psychological line of interpretation. (If so, of course, one must guard against tarring present-day taxonomists with the same neurotic brush.) But there is also a "big-Swedish" megalomania, rooted in the Rudbecks, father and son, who also entertained grandiose but impossible plans for covering the whole of Nature, all ages, full scale and in great detail, conclusively. It all sounds like a Gothic dream, a patriotic thought that everything great and remarkable should emanate from the ancient Scandinavians, but the remarkable thing is how very nearly it came true. Above all we should note the fruitful inspiration of modern science, which was well on its way toward integrating every corner of Europe. Linnaeus was a disciple of Bacon and wanted to be a Newton of the life sciences—Newton whom, otherwise, he barely comprehended.

Carl Gustaf Ekeberg's zoological wall charts with notes, ca. 1749. The Latin names are believed to have been added by Linnaeus himself.

The Linnaean project was outstandingly successful. Innumerable people were induced, and still are, to take part in it. All over the world, research is working on it. But in one sense it was a fiasco, namely because it cannot be brought to a conclusion. Linnaeus, dubbed "the second Adam" by one of his colleagues, clearly believed that fairly soon, and at all events during his lifetime, he would have created for himself a comprehensive view of Creation. His diligence was enormous and a growing network of contacts left him no rest. And so the various editions of his *Systema naturae* grew in number and bulk, from the 12 folio pages of the first (1735) to the 2,300 pages of the twelfth (1766–68), including something like 15,000 mineral, plant and animal species. Classifying and naming such an immense number was a remarkable achievement, but of course it was only the beginning of what can never be finished. Already by the end of the 18th century, the number of species on Earth was estimated at one million, while nowadays there is talk of some 30 to 40

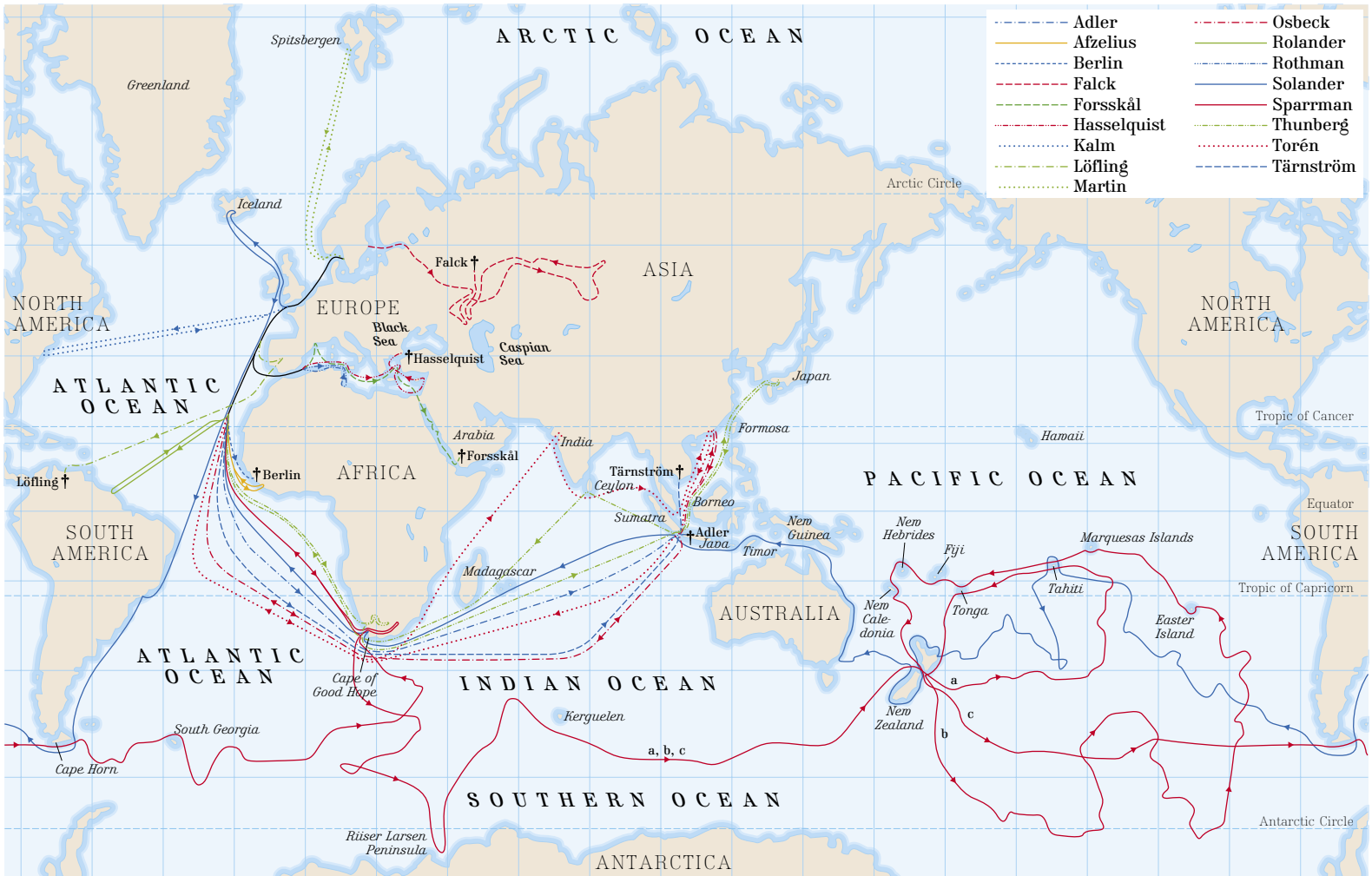
## LINNÆUS' CHARISMA WAS ESPECIALLY BESTOWED UPON AN INNER CIRCLE, KNOWN AS THE APOSTLES

million, perhaps more, untold numbers of which will never come to be described.

Linnaeus must, sometime or other, have doubted the possibility of completing his task, or at least of doing so personally. Confronted by the bottomless wealth of Nature, he must have felt not only enthusiasm but also exhaustion.

### The Apostles

LINNÆUS WAS A MODERN PROFESSOR, a project creator and organiser with excellent contacts in the community at large. He was capable of inspiring his pupils to great deeds, and he knew the right strings to pull when money was needed. Benefactors included the King and Queen (Adolf Fredrik and Lovisa Ulrika) and the Swedish East India Company. Linnaeus' charisma was especially bestowed upon an inner circle, known as the Apostles, who were sent forth on voyages of exploration. Many of them actually suffered martyrdom in the field, sacrificing their lives for science and its master. They travelled in all directions: one large group voyaged eastward, in the direction of the East Indies and China. On their way they stopped off in Spain and at the Cape, often for considerable periods, and these places were an important research field for some of them, including Anders Sparrman and Carl Peter Thunberg. Once in China, their movements were severely constricted. Pehr Osbeck, for example, was hounded back to his ship from innocent botanical excursions by Chinese boys throwing stones. Similar conditions prevailed in Japan, which Thunberg visited with the Dutch East India Company. Through patience and cunning, Thunberg overcame the difficulties, thereby becoming the pioneer of modern research into the Japanese flora. To cover the interior of Asia, Linnaeus was planning to dispatch Pehr Kalm to China overland through Russia, but nothing came of this. Instead it was Johan Peter Falck who travelled eastward. His findings proved among other things to be of ethnographic


Adler
Afzelius
Berlin
Falck
Forsskål
Hasselquist
Kalm
Löfling
Martin
Osbeck
Rolander
Rothman
Solander
Sparrman
Thunberg
Torén
Tärnström
ARCTIC OCEAN
Spitsbergen
Greenland
Iceland
Arctic Circle
NORTH AMERICA
EUROPE
ASIA
Falck †
Black Sea
Caspian Sea
†Hasselquist
ATLANTIC OCEAN
Japan
Formosa
Tropic of Cancer
Hawaii
Arabia
India
†Forsskål
†Berlin
Löfling †
AFRICA
Tärnström †
Ceylon
Borneo
Sumatra
†Adler
Java
Timor
New Guinea
PACIFIC OCEAN
Equator
SOUTH AMERICA
Madagascar
New Hebrides
Fiji
Marquesas Islands
Tahiti
Tropic of Capricorn
AUSTRALIA
New Caledonia
Tonga
Easter Island
ATLANTIC OCEAN
Cape of Good Hope
INDIAN OCEAN
Kerguelen
a
c
b
New Zealand
South Georgia
Cape Horn
a, b, c
SOUTHERN OCEAN
Antarctic Circle
Riiser Larsen Peninsula
ANTARCTICA

OPPOSITE PAGE
Linnaeus sent his 'apostles' around the world on perilous voyages of discovery. Many of them did pioneering scientific fieldwork; some of them failed to return.

interest. The unfortunate Falck took his own life in Kazan, while the benign, ever useful Kalm went on the long voyage to North America, calling on Benjamin Franklin and visiting Niagara, of which he penned the first scientific description.

Anton Martin travelled to the Arctic Ocean, suffered frostbite in his legs and spent the rest of his days in a miserable condition. Daniel Rolander travelled to South America, returning in a state of mental confusion. Linnaeus' "favourite pupil", Pehr Löfling, died in Venezuela after successful botanical researches there. Fredrik Hasselquist, supported both by Linnaeus and by the Uppsala faculty of theology, went to the Holy Land but died in Smyrna, after which his collections were purchased by the Queen of Sweden, Lovisa Ulrika. Peter Forsskål, one of the really interesting disciples and of dissident political persuasions, joined a Danish expedition to Arabia, where he and the other members, except for their leader, Carsten Niebuhr, died of malaria.

The results of these enormous efforts may seem relatively limited. The travellers sent home descriptions of plants and animals, wrote in wonderment about the life of strange peoples and the magnificence of the natural scene. The travel descriptions, several of them published by Linnaeus, evidently sold well, even though they consist mainly of descriptions of species for the initiated. Often the explorers did little more than scratch at the surface of things. But perhaps the main significance of their journeys was symbolic, as a scientific adventure and form of sacrifice. They were also of importance for the future, in the sense of scientists thus having assured themselves of a place on the great voyages by land and sea. Linnaeus' pupils Anders Sparrman and Daniel Solander circumnavigated the globe with James Cook, and when, just over half a century later, HMS Beagle set out on its voyage round the world, there was a place on board for the young Charles Darwin.

Linnaeus left his personal imprint on a great deal of 18th century science, not only in Sweden but in the whole of the western world. His concentration on collecting and classifying may sometimes appear quirky, but clearly it fills an important gap. Natural history had closed the lead which physics had gained in the scientific revolution of the 17th century, and it did so very much by continuing with a kind of Baroque rationalism and system-building. *L'esprit de système*, the urge to trap reality in a comprehensive net, is typical of this Linnaean 18th century. To this end, increasingly specialised manuals and journals came into being, as well as popular presentations, e.g. for women. Rousseau, that sorrowful amateur botanist, for example, wrote his *Lettres sur la botanique* according to Linnaean method.

The passion for system extended beyond the three realms of natural history, to which a colleague of Linnaeus wished to add a fourth, namely "the aquatic kingdom". Linnaeus himself went to a great deal of trouble to classify diseases in his nosology* (*Genera morborum, 1763*); Jeremy Bentham accorded much the same treatment to the virtues, while other writers classified books or economy in Linnaean fashion. The classification of human races, an activity which in time was frequently to produce questionable results, also begins with *Systema naturae*. In all this, and in other things besides, one can speak of a "Linnaeanism" of the time, the boundaries of which had yet to be defined by historical research.

Linnaeus, then, achieved remarkable success. During his lifetime he was elected to membership of most existing academies. After his death the Linnean Society of London was founded, based on his collections, which had been sold to England by his widow, Sara Lisa.

* The classification of diseases.

Soon afterwards came the foundation of the Société Linnéenne in Paris, which was to flourish soon after the Revolution of 1789. For various reasons beyond the scope of this essay, Linnaeus was internationally viable. He was needed, not least by virtue of the language reform he had introduced. Linnaeus created a kind of Linnaean which is not spoken but is still being written. With his *Systema naturae* he gave research an overriding task, a project. And in Sweden, as we have already seen, he created a special way of travelling and of experiencing nature.

Was Linnaeus a satisfied man? What joy did he have of his success? Laudatur et alget—he is renowned but feels cold—was Linnaeus' motto. And so, for his own use and for the edification of his rather unruly son, the ageing Linnaeus collected examples of the darkness of human life, a theologia experimentalis, which he called *Nemesis divina*, over all the injustices committed by other people, adversaries and those who envied him, against their own kinsmen, against God and against Nature. Nature's interpreter was not the happiest of men. His miraculous memory was obliterated by a stroke, after which he admired his own writings but could not understand that he himself was the author of them. His only son, Carl, succeeded him but lived for only a few more years after his father's death in 1778.

## The sexual system and the binary nomenclature

Linnaeus first published his sexual system in 1735 in the *Systema naturae*, later applying it to every then known species in the *Species plantarum* (first edition 1753), which was based to a great extent on material from his garden. The sexual system is not now accepted as a classification corresponding to the actual relationships between plants, and it has therefore been abandoned, but at the time it represented a method of definition and classification far surpassing anything previously known. Linnaeus was aware of the theoretical weaknesses and artificial character of the sexual system, but quite justifiably he remained convinced of its practical usefulness until the end of his life.

The sexual system first divides the plant kingdom into 24 *classes* according to the number of stamens (I Monandria, II Diandria, etc) or, from No. XII onwards, according to the arrangement of the stamens or sex distribution between the flowers. Class XXIV represents the cryptogamia, with "concealed" sexual organs. It is exemplified in the garden by the ferns. The number of the class is written in Roman numerals.

The classes are divided into *orders* according to the number of styles or pistils in the flowers. The designations of the orders are similar from class to class. Monogynia (with 1 style), Digynia (with 2 styles or pistils), etc., to Polygynia (with a great number of styles or pistils). The number of the order is written in Arabic numerals.

The orders are divided into *genera*, many of which agree with those we recognise today *(Linnaea, Betula)*, although others have been subdivided or recombined since Linnaeus' day. Thus Linnaeus' genus designations are not always the same as those we use now.

The genera are divided into *species*, which have double names (the system of binary nomenclature which Linnaeus introduced) e.g. *Linnaea borealis, Betula nana.* Linnaeus' species classifications have by and large survived, although for various reasons many of their names have had to be changed.


Georg Dionys Ehret's original illustration of Linnaeus' sexual system from 1736.

## Chronology in brief

| | |
|---|---|
| 1707 | Born at Råshult, Småland |
| 1727 | Studies in Lund |
| 1728 | Studies in Uppsala |
| 1732 | Travels to Lapland |
| 1734 | Travels in Dalarna |
| 1735–1738 | Travels to Denmark, Germany, Netherlands, England and France |
| 1735 | Takes his doctorate of medicine at Harderwijk, Netherlands |
| | First edition of *Systema naturae* |
| 1736 | *Fundamenta botanica* |
| 1737 | *Flora Laponica* |
| 1739 | Medical practice in Stockholm |
| | Founder member of the Royal Swedish Academy of Sciences and its first President |
| | Marries Sara Lisa Moraea |
| 1741 | Professor of Medicine, Uppsala |
| | Öland and Gotland Journeys |
| 1744 | Secretary of the Uppsala Scientific Society |
| 1745 | *Flora Suecica* |
| 1746 | Västergötland Journey |
| | *Fauna Suecica* |
| 1749 | Skåne Journey |
| 1751 | *Philosophia botanica* |
| 1753 | *Species plantarum* |
| 1757 | Ennobled |
| 1758 | Buys Hammarby, near Uppsala |
| | Tenth edition of *Systema naturae* |
| 1766–1768 | Linnaeus' last edition of *Systema naturae* |
| 1778 | Dies in Uppsala |
| 1783 | Death of Carl Linnaeus the Younger |
| 1784 | Linnaean collections sold in England |

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**CARL LINNÆUS (1707–1778)** is Sweden's most famous natural scientist. He set out to list and order the whole of Creation. His importance, however, is not confined to the international history of science. In a way he is also a part of Swedish everyday life today, as the author of living classics which people still read. The Swedes, perhaps, look on him primarily as a traveller and explorer of their own country, while to others he is the father of the modern classification of flora and fauna. But he was much more than this. For example, he was an inspiring teacher who sent his students off on extraordinary voyages of scientific discovery all around the world.

2007 is the 300th anniversary of the birth of this great scientist whose legacy lives on into our own age.

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