



A Passion for Order

Swedish botanist Carl Linnaeus was an early information architect. He believed that every kind of plant and animal on Earth should be named and classified.

By David Quammen

Springtime comes late in Sweden. So it was still springtime on May 23, 1707, when a son was born to the wife of the curate of a small Swedish village called Stenbrohult. The season was raw, the ground was wet, the trees were in leaf but not yet flowering as the baby arrived, raw and wet himself. The child's father, Nils Linnaeus, was an amateur botanist and an avid gardener as well as a Lutheran minister, who had concocted his own surname (a bureaucratic necessity for university enrollment, replacing his traditional patronymic, son of Ingemar) from the Swedish word *lind*, meaning linden tree. Nils Linnaeus loved plants. The child's mother, a rector's daughter named Christina, was only 18. They christened the boy Carl, and as the story comes down, filtered through mythic retrospection upon a man who became the world's preeminent botanist, they decorated his cradle with flowers.

When he was cranky as a toddler, they put a flower in his hand, which calmed him. Or anyway, again, that's what later testimony claims. Flowers were his point of entrance to appreciating beauty and diversity in nature. He seems even to have sensed, at an early age, that they were more than just beautiful and diverse—that they also encoded some sort of meaning.

He grew quickly into a boy fascinated not just by flowers, and by the plants that produce them, but also by the names of those plants. He badgered his father to identify the local wildflowers that he collected. "But he was still only a child," according to one account, "and often forgot them." His father, reaching a point of impatience, scolded little Carl, "saying that he would not tell him any more names if he continued to forget them. After that, the boy gave his whole mind to remembering them, so that he might not be deprived of his greatest pleasure." This is the sort of detail, like Rosebud the sled, that seems too perfectly portentous for real history, as opposed to screen drama or hagiography. Still, it might just be true. Names and their storage in memory, along with the packets of information they reference, are abiding themes of his scientific maturity. But to understand the huge renown he enjoyed during his lifetime, and his lasting significance, you need to recognize that Carl Linnaeus wasn't simply a great botanist and a prolific deviser and memorizer of names.

He was something more modern: an information architect.

If you read a thumbnail biography, in an encyclopedia or on a website, you're liable to be told that Carl Linnaeus was "the father of taxonomy"—that is, of biological classification—or that he created the Latin binomial system of naming species, still used today. Those statements are roughly accurate, but they don't convey what made the man so important to biology during his era and afterward. You might read that he coined the name *Homo sapiens* for our own species and placed us, daringly, within a category of mammals that included monkeys and apes. That's true too, but somewhat misleading. Linnaeus was no full-blown evolutionist. On the contrary, he heartily embraced the prevailing creationist view of biological origins, which stipulated that studying nature reveals evidence for the creative powers and mysterious orderliness of God. He wasn't such a pious man, though, that he sought nothing but godliness in the material world. Here's what makes him a hero for our time: He treasured the diversity of nature for its own sake, not just for its theological edification, and he hungered to embrace every possible bit of it within his own mind. He believed that humankind should discover, name, count, understand, and appreciate every kind of creature on Earth.

In order to assemble all that knowledge, two things were required: tireless and acute observation, and a system. In spring of 1732, just before his 25th birthday, Linnaeus set off on an expedition through Lapland, the wild northern region of the Swedish kingdom, inhabited by a sparse population of the Sami people, who lived as herders of reindeer. Over the next five months he traveled some 3,000 miles (4,800 kilometers), by horseback and foot and boat, making collections and taking notes as he went. He was interested in everything—birds, insects, fish, geology, the customs and technology of the Sami—but especially in plants. He made drawings in his journal, some of which were crude sketches, some of which (again, those of plants) were delicate and

lovingly precise. Eventually, he produced a book, *Flora Laponica*, describing the botanical data he had gathered.

He went abroad in 1735 to advance his career prospects. He spent three years on the Continent, mostly in Holland, taking a medical doctor's degree quickly, then turning back to plants.

It wasn't a stretch to combine both activities, since botany in that era was considered a branch of medicine, through the pharmaceutical uses of vegetation. He found temporary work with a rich man named George Clifford, a director of the Dutch East India Company, as botanical curator and house physician at Clifford's country estate near Haarlem. Linnaeus's work there led to another book, a descriptive catalog of Clifford's botanical holdings, titled *Hortus Cliffortianus* and gorgeously illustrated by a young artist named Georg Dionysius Ehret. Although they became lifelong friends, Ehret later recalled the Linnaeus of these years as a self-aggrandizing opportunist. By any account, he was full of energy and plans, full of ideas and opinions, and hungry for success as well as for deeper knowledge. Confident to the point of arrogance but charming enough to compensate, he proved good at making friends, finding sponsors, and cultivating powerful contacts. During the three years abroad he published eight books—an amazing spurt of productivity, partly explained by the fact that he had left Sweden carrying some manuscripts written earlier. One of those manuscripts became *Systema Naturae*, now considered the founding text of modern taxonomy.

Linnaeus wasn't the first naturalist to try to roster and systematize nature. His predecessors included Aristotle (who had classified animals as "bloodless" and "blooded"), Leonhart Fuchs in the 16th century (who described 500 genera of plants, listing them in alphabetical order), the Englishman John Ray (whose *Historia Plantarum*, published in 1686, helped define the species concept), and the French botanist Joseph Pitton de Tournefort, contemporary with Ray, who sorted the plant world into roughly 700 genera, based on the appearance of their flowers, their fruit, and their other anatomical parts.

Linnaeus emerged from this tradition and went beyond it. His *Systema Naturae*, as published in 1735, was a unique and peculiar thing: a folio volume of barely more than a dozen pages, in which he outlined a classification system for all members of what he considered the three kingdoms of nature—plants, animals, and minerals. Notwithstanding the inclusion of minerals, what really mattered were his views on the kingdoms of life.

His treatment of animals, presented on one double-page spread, was organized into six major columns, each topped with a name for one of his classes: Quadrupedia, Aves, Amphibia, Pisces, Insecta, Vermes. Quadrupedia was divided into several four-limbed orders, including Anthropomorpha (mainly primates), Ferae (such as canids, felids, bears), and others. His Amphibia encompassed reptiles as well as amphibians, and his Vermes was a catchall group, containing not just worms and leeches and flukes but also slugs, sea cucumbers, starfish, barnacles, and other sea animals. He divided each order further, into genera (some with recognizable names such as *Leo*, *Ursus*, *Hippopotamus*, and *Homo*), and each genus into species. Apart from the six classes, Linnaeus also gave half a column to what he called *Paradoxa*, a wild-card group of chimerical or simply befuddling creatures such as the unicorn, the phoenix, the dragon, the satyr, and a certain giant tadpole (now known as *Pseudis paradoxa*) that, weirdly, shrinks during metamorphosis into a much smaller frog. Across the top of the chart ran large letters: CAROLI LINNAEI REGNUM ANIMALE. It was a provisional effort, grand in scope, integrated, but not especially original, to make sense of faunal diversity based on what was known and believed at the time. Then again, animals weren't his specialty.

Plants were. His classification of the vegetable kingdom was more innovative, more comprehensive, and more orderly. It became known as the "sexual system" because he recognized that flowers are sexual structures, and he used their male and female organs—their stamens and pistils—to characterize his groups. He defined 23 classes, into which he placed all the flowering plants (with a 24th class for cryptogams, those that don't flower), based on the number, size, and arrangement of their stamens. Then he broke each class into orders, based on their pistils. To the classes, he gave names such as Monandria, Diandria, Triandria (meaning: one husband, two husbands, three husbands) and, within each, ordinal names such as Monogynia, Digynia, Trigynia, thereby evoking all sorts of scandalous ménages (a plant of the Monogynia order within the Tetrandria class: one wife with four husbands) that caused lewd smirks and disapproving scowls among some of his contemporaries. Linnaeus himself seems to have enjoyed the sexy subtext. And it didn't prevent his botanical schema from becoming the accepted system of plant classification throughout Europe.

The artist Georg Ehret helped popularize Linnaeus's ideas by producing a handsome *tabella*, a poster, illustrating the diagnostic features for Linnaeus's 24 classes. The *tabella* sold well and earned Ehret some guldens. Linnaeus himself, always stingy about sharing credit, included Ehret's drawing without acknowledgement in one of his later books. But he wouldn't forget his old pal, and evidence left after his death—we'll come to it—suggests that he valued Ehret's botanical vision as he valued few aside from his own.

After returning to Sweden, becoming a husband and father and a professor at Uppsala University, Linnaeus continued to churn out books. He published

revised and expanded editions of *Systema Naturae*, as well as strictly botanical volumes such as *Flora Suecica* (*Swedish Flora*) in 1745, *Philosophia Botanica* (1751), and *Species Plantarum* (1753). *Philosophia Botanica* is a compendium of terse, numbered postulates in which he lays out his botanical philosophy. For instance: "The foundation of botany is two-fold, arrangement and nomenclature." Arrangement of plants into rational categories and subcategories is crucial for three reasons: Because there are so many kinds (and more every year, during the great age of discovery in which Linnaeus lived), because much is known about many of those kinds, and because classification makes that knowledge accessible. Alphabetical listing may have worked well enough with 500 plant genera, but as the count rose into many thousands of species, it didn't serve.

There was also a deeper purpose, for Linnaeus, to this enterprise. Find the "natural method" of arranging plants into groups, and you would have discovered God's own secret logic of biological creation, just as Isaac Newton had discovered God's physical mathematics. Linnaeus knew that he hadn't achieved that, not even with his 24-class sexual system, which was convenient but artificial. He couldn't see, couldn't imagine, that the most natural classification of species reflects their degree of relatedness based on evolutionary descent. But his passion for order—for seeking a natural order—did move taxonomy toward the insights later delivered by Charles Darwin.

As for nomenclature, it contributes to the same purpose. "If you do not know the names of things, the knowledge of them is lost too," he wrote in *Philosophia Botanica*. Naming species, like arranging them, became increasingly problematic as more and more were discovered; the old-fashioned method, linking long chains of adjectives and references into fully descriptive labels, grew unwieldy. In *Species Plantarum*, he established the Latin binomial system for naming plants, and then in the tenth edition of *Systema Naturae*, published in 1758-59 as two fat volumes, he extended it to all species, both plant and animal. A pondweed clumsily known as *Potamogeton caule compresso, folio Graminis canini, et cetera*, became *Potamogeton compressum*. We became *Homo sapiens*.

His life back in Uppsala entailed more than authorship. He was a wonderful teacher, with a vivid speaking style, clear and witty, and a terrific memory for facts. His lectures often packed the hall, his private tutoring earned him extra money, and he made botany both empirical and fun by leading big festive field trips into the countryside on summer Saturdays, complete with picnic lunches, banners and kettledrums, and a bugle sounding whenever someone found a rare plant. He had the instincts of an impresario. But he was also quietly effective in mentoring the most talented and serious of his students, of whom more than a dozen went off on adventuresome natural history explorations around the world, faithfully sending data and specimens back to the old man. With his typically sublime absence of modesty, he called those travelers the "apostles." In 1761, the government ennobled him, whereupon he upgraded his linden-tree name to von Linné. By then he was the most famous naturalist in Europe.

His wife sternly guarded their privacy, and his son became only a middling botanist, but his teaching role delivered rich satisfactions, and he had an abundance of brilliant intellectual offspring. Despite the limitations of his language skills (he may have known some Dutch and German but did all his writing in Swedish and Latin) and of his geographical experience (he never left Sweden again), he became a global encyclopedist of flora and fauna; in lieu of personal travel, he relied on written correspondence with naturalists all over the world and on information received from the apostles, such as Daniel Solander (who sailed on Cook's first voyage), Pehr Kalm (in North America), and Anders Sparrman (China, South Africa, then Cook's second voyage). Linnaeus himself had no appetite for the rigors and climate of the tropics, though he was voraciously curious about tropical plant diversity. Let the young men gather the information; he would systematize it.

In Uppsala, I discussed this manipulative, homebody aspect with Professor Carl-Olof Jacobson, a retired zoologist who serves as chairman of the Swedish Linnaeus Society. No, Linnaeus didn't want to travel abroad, Professor Jacobson told me. "What he wanted to be was a spider in the net."

The center of that net, that vast web of scientific silk, was in and around Uppsala—including the university, its splendid botanical garden, and a small farm known as Hammarby, about five miles (eight kilometers) outside the city. Linnaeus bought Hammarby and built a large, simple house there to be his summer retreat. It might have served also as his retirement home, though he never retired. Each autumn, having savored his time in this getaway, he moved back into town, where the living was less austere. He grew feeble and ill, then suffered a seizure after one last escape to the countryside, strictly against doctor's orders, and died on January 10, 1778. They buried him beneath the stone floor of Uppsala's cathedral, the Westminster Abbey of Sweden.

Six years later, following Linnaeus's posthumous instructions, his widow sold his library, his manuscripts, and most of his collections to a buyer who would care for them well. That buyer, a young Englishman named James Edward Smith, founded a scientific society to receive the treasures and called it the Linnean Society of London (its spelling derived not from his original name but from the noble version, von Linné), where they lie protected in a basement vault but available in physical (and, soon, digitized) form to scholars. Linnaeus himself would approve; knowledge, he believed, is meant to be communicated and used.

Linnaeus's country home, Hammarby, remained in the family for a century and then was bought by the Swedish state to be made a museum. Although his house near the university in Uppsala has also been saved, and lately restored, Hammarby conveys a more vivid sense of his character, his foibles, his loneliest joys. Inside the old farmhouse, overlooking muddy crop fields, his collection of walking sticks is on display. So is the red skullcap he often wore over his short-cropped hair, in lieu of a formal wig. There are portraits of his four daughters, his son, and his pet monkey, in no particular order of fondness. His wife and he kept separate bedrooms at opposite ends of the second floor. His is tucked away, accessible only through another room that functioned as his study.

The bedroom, preserved much as he left it, contains a small curtained bed of the sort known in Sweden as a *himmelssäng*, a bed of heaven. Against the west wall is a wooden desk and, above it, a window. The walls are covered with flowers.

That is, they are wallpapered wildly from floor to ceiling with large floral images cut from books. The plants are robust, exuberant, some of them garish, some elegant, all suggesting fecundity and fruition: pineapple, banana, magnolia, lily, cactus, papaya, frangipani, and others. Many of these hand-colored engravings came from paintings by his old friend Georg Dionysius Ehret. Rare and magnificent, they would be collectibles in their own right, even absent the association with Linnaeus. But, once bright and crisp, they are now faded, smeary, streaked with the punishments of moisture and time. On the day I visited, accompanied by a botanical curator named Karin Martinsson, still another damp January chill hung in the air.

Linnaeus was warned that such damage would occur, but evidently he didn't care. He wanted the pictures around him. Never mind if they decayed. So what? His own body was doing that too.

Even now these antique prints could be peeled carefully off, Martinsson told me, and preserved under better conditions. But that's not going to happen. "Taking them down from the walls," she said, "would be like ripping the heart out of Hammarby." Left as is, the heart of the house reflects the heart of its original owner: full of plants. The pilgrims who visit this room during the tercentenary year—presumably there will be many, from around the world—can look at that improvised wallpaper and sense an important truth about the lifework of Carl Linnaeus.

It wasn't just about knowledge. It was about knowledge and love.

Write a response to the article that includes the following information:

- 1) What did you learn about the life of Carl Linnaeus?
- 2) What were some things in the article that you found to be interesting or surprising?
- 3) What were some things in the article that you found to be boring or confusing?
- 4) Did this article help you better understand or appreciate our study of classification/taxonomy?
Explain why or why not.

****I have no set length of response that I am looking for; write as little or as much as you think is appropriate.***