Carl Linnaeus[*]

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1. Synonyms (if possible)

Carolus Linnaeus, Carolus Linnæus, Carl von Linné, Karl von Linné, Charles Linné.

2. Related Topics

Natural history; natural philosophy; botany; zoology; mineralogy; taxonomy; nomenclature; natural system; Baconianism; Paracelsianism; balance of nature; physicotheology.

3. Introduction

Linnaeus was no philosopher, neither by profession, nor by inclination. He prided himself on writing simple prose, and disliked public disputes. His idiosyncratic natural philosophy built on baroque syncretism and rash theorizing by analogy, but always carried the mark of the naturalist and physician. As such, his work is exemplary of what Louis Althusser has called the “spontaneous philosophy” of scientists (Althusser 1990). This can explain why his impact on the history of philosophy was nonetheless profound. His self-styled “reform” of botanical and zoological taxonomy redefined the terms of philosophical debates about classification, and his concept of an “economy of nature” identified an entirely new level of phenomena at which life could be seen to operate on an evolutionary scale.

4. Biography

Born on May 23, 1707, in Stenbrohult, a small parish in the economically disadvantaged Swedish province Småland, Linnaeus studied medicine at the universities of Lund and Uppsala from 1726 to 1734. He could not afford the fees to attend lectures regularly, but from early on developed a talent for attracting patronage. At both universities, professors supported his keen interest in natural history by offering him board and lodging, private tutoring, and perusal of their libraries. From 1729, he was able to

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sustain himself, first by lecturing in the botanical garden of Uppsala, then by securing funds for scientific travels to Lapland (1732) and Dalarna (1734), a province renowned for its copper mines.
In these years, Linnaeus compiled several book manuscripts, which he brought with him – alongside a Sámi costume (fig. 1) – when he visited Holland from 1734 to 1737, initially to obtain his medical doctorate at the university of Harderwijk, and then to work as curator of the large botanical collection of the Dutch-English merchant-banker George Clifford III (1685–1760). Clifford also financed trips to London and Paris. During these years, he managed to publish no less then fourteen books, most of them dealing with botany. Two publications in particular laid the ground for his immediate fame throughout the republic of letters: *Systema naturae* (1735), a folio volume of just eleven pages that presented the three kingdoms of nature in a tabular arrangement of classes, orders, genera and species; and *Flora lapponica* (1737), a catalogue of plant species native to Lapland, considered uncharted territory at the time.

[Fig. 1: Linnaeus posing in a Samí dress in front of his publications. Mezzotint produced by Robert Dunkarton and Henry Kingsbury in 1805 after a portrait in oil painted by Martinus Hoffmann in the Netherlands 1737. © The Trustees of the British Museum; for information on copyright go to https://www.britishmuseum.org/collection/image/819589001.]

Returning to Sweden, Linnaeus initially practiced as a physician in Stockholm. In 1739, he married Sara Lisa Moræa (1716-1806), daughter of the miner and physician Johan Moræus (1672–1742), whom he had met when travelling through Dalarna. He remained active as a naturalist as well during this time, holding public lectures and excursions in botany and co-founding the Royal Academy of Sciences in 1739, together with engineer and amateur physicist Mårten Triewald (1691–1747), industrialist Jonas Alströmer (1685–1761), Count Anders Johan von Höpken (1712–1789) and Baron Sten Carl Bielke (1709–1753), the latter two members of the Riksdag of Estates (*Riksens ständer*, or *ståndsriksdag*). The composition of this group is typical of the "patriotic" circles that Linnaeus moved in, and from which he received patronage. In 1741, Linnaeus was appointed to the chair of theoretical medicine at Uppsala University, with teaching responsibilities in botany, chemistry, diagnostics, and dietetics. He stayed in this position until his death on January 10, 1778, continuing his astonishing literary output. His political connections, forged in his Stockholm years, brought him financial support in the 1740s from the Estates to carry out well-organized trips through several Swedish provinces (Västergøtland, Öland, Gotland and Scania) in order to survey natural resources in the spirit of the then dominant economic ideology of cameralism (Koerner 1999). The 1740s also saw the publication of *Flora suecica* (1745) and *Fauna suecica* (1746). Alongside this, Linnaeus continued to update and expand his taxonomic works in numerous re-editions, culminating in *Species plantarum* (1753) and the so-called tenth edition of *Systema naturae* (1758-59, which constitute the formal starting point of modern taxonomy and nomenclature.

Linnaeus acquired the empirical material for these publications through a far-flung network of correspondents who sent him seeds, living and preserved specimens, as well as descriptions and drawings, both in manuscript and print. In addition, he managed to secure opportunities for some of his students to accompany merchant ships and scientific expeditions around the globe. Some of the better-known among Linnaeus's "apostles" are Pehr Kalm (1716–1799), who travelled to North America 1728–1751, Daniel Solander (1733–1782), who went with Joseph Banks (1743–1820) on Cook's first circumnavigation (1768–1771), and Carl Peter Thunberg (1743–1828), who travelled as a surgeon with the Dutch East India Company all the way to Japan (1771–1778) (on Linnaean travel, see Sörlin 2000). Closer to home, numerous occasions for academic speeches, presidency over 186 academic dissertations, and publications in almanachs and learned journals, both in Sweden and abroad, resulted in an array of minor essays on medical, natural historical and natural philosophical subjects. When Linnaeus died on January 10, 1778, leaving his chair to his son Carl (1741–1783), he had become an institution, as witnessed by the fact that *Species plantarum* and *Systema naturae* continued to be re-edited under his name until the 1830s. (For biographies, see Blunt 1971, Broberg 2019; a full bibliography of Linnaeus's works, including re-editions and translations, is provided by Soulsby 1933, with more than 4000 references.)

5. Natural Philosophy

Linnaeus was largely self-taught, and the tutelage that he did enjoy came from a motley crew of academic teachers (Malmeström 1964). Johan Stensson Rothman (1684–1763), lector in physics and logic at Växjö gymnasium, liked to describe himself as an "Aristotelian Cartesian". Kilian Stobæus (1690–1742), professor in natural philosophy and experimental physics in Lund, was primarily interested in mineralogy, especially fossils, but he also taught Linnaeus physiology in private lessons (he was a Stahlian). Olof Rudbeck the younger (1660–1740) in Uppsala held the chair in theoretical medicine, but was mainly engaged in reducing all languages to the language spoken by Adam and Eve. Anders Celsius (1701–1744), professor of astronomy, was a chief representative of Leibniz-Wolffian philosophy, which dominated Swedish university teaching at the time (on Linnaeus's teachers and their backgrounds, see Broberg 2019). By the end of 1729, Linnaeus had built up a personal library of 200 volumes, which not only included classical authors like Hippocrates and Aristotle, but also many obscure magical and alchemical works (Cain 1992).

This peculiar academic upbringing may explain why it is difficult to allocate Linnaeus to any school early modern philosophical thought. Aristotle is cited, but only his zoological works. One can find endorsements of Cartesian scepticism and Bacon's inductivism (Müller-Wille 2008), but there is no evidence that Linnaeus ever read Newton, Boyle or Locke, or any of the French enlightenment philosophers like Voltaire, Diderot or Rousseau. In matters of contemporary natural philosophy, Linnaeus seems to have trusted Boerhaave. However, he could also rely on a mix of earlier, Paracelsian and Hermeticist authors, especially in his mineralogical and medical works (Wikman 1970). He explicitly rejected both preformation and epigenesis (as formulated by Harvey), and, while he generally followed Boerhaave's iatromechanism in his physiological outlook, citing authors such as Santorio Santorio (1561-1631), Friedrich Hoffmann (1660-1742) or Stephen Hales (1677–1761), he also considered electricity as a fundamental life force, especially in his later writings (Broberg 1975). In striking contrast to his natural history, which relied on painstaking observations of empirical details, Linnaeus's natural philosophy was speculative, often out-of-date, and sometimes simply uninformed (Lindroth 1983). As a consequence, it had almost no impact on the major debates in eighteenth-century natural philosophy.

A good example of Linnaeus's ventures into natural philosophy is provided by his speculations on sexual reproduction. His interest in this subject was piqued when his teacher Rothman introduced him to Sebastian Vaillant's *Discours sur la structure des fleurs* (1718), and it soon evolved into a central theme (Müller-Wille 2018). In 1730, Linnaeus developed a method to classify plants into classes and orders on the basis of the number and arrangement of "male" and "female" organs. Known as the "sexual system" (*systema sexuale*), its subversive play on gender stereotypes made it very popular in the eighteenth century (Schiebinger 1993; Shteir 1999). A chapter on "sexuality" (*sexus*) was also included in *Fundamenta botanica* (1736), and later expanded into an essay entitled *Sponsalia plantarum* (1746; the title can be translated as "plant marriages"). The point of this essay was to reject spontaneous generation (*generatio æquivoca*) in favour of a view that all organisms, including plants, reproduce sexually (*omne vivum ex ovo*, a clear affront to the age-old idea of a scale of nature). Evidence was largely provided by interpreting observations of flower mechanisms in analogy with animal fertilization (Müller-Wille 2007a).

In the 1750s and 1760s, Linnaeus's writings on reproduction took on a more speculative tone. Taking cues from Theophrastus (c. 371 – c. 287 BC) and Andrea Cesalpino (1519–1603), Linnaeus posited that all living beings consist of two substances, *medulla* ("marrow", in animals associated with the nervous system) and *cortex* ("bark"). The former was supposed to be endowed with the capacity to grow and multiply indefinitely, the latter to provide nourishment and protection, thereby constraining growth. The medullar substance, he further claimed, was transmitted by the mother, the cortical substance by the father, and their antagonistic interaction gave the offspring its specific form (*Generatio ambigena*, 1759). This theory had a crucial integrating function for Linnaeus. It not only explained to him why offspring exhibit both maternal and paternal traits, but also why one should expect taxonomically similar plant species to have similar medical effects on the human body (*Fundamentum fructificationis*, 1762; Hövel 1999). It became the cornerstone of Linnaeus's most peculiar and obscure work, *Clavis medicina duplex, exterior & interior* (1766), in which he tried to correlate human diseases, therapies, tastes, odours, and herbal remedies (Stevens and Cullen 1990).

6. Systema naturæ

Linnaeus himself considered *Clavis* to be "one of the greatest jewels in medicine", but it seems to have "dropped dead from the presses" (Broberg 2012, 45). This does not mean that Linnaeus's engagement with theories of generation and sexual reproduction had no legacy at all. For one, plant sexuality and development remained a major biological theme, which especially Romantic *Naturphilosophen* like Johan Wolfgang von Goethe (1749–1838) picked up from Linnaeus (Kelley 2012). In addition, Linnaeus had developed the theme in part to account for the production of new species by hybridization (*Plantæ hybridæ*, 1751; *Metamorphoses plantarum*, 1755), and in 1759 carried out a single hybridization experiment (*Disquisitio de sexu plantarum*, 1760) that formed the starting point for a research tradition that led all the way to Gregor Mendel's famous experiments (Müller-Wille and Orel 2007). Whatever philosophical sense Linnaeus himself made of them, the phenomena that he highlighted, and partly produced, could not be ignored by contemporary philosophers.

This is especially true of his main work, *Systema naturæ,* published in Amsterdam in 1735. The neat arrangement of all known minerals, plants and animals on eleven folio pages measuring 53 x 42 cm does not accidentally recall the image of an atlas (fig. 2). In fact, Linnaeus had originally planned to publish it under the title *Geographia naturæ*. However, the arrangement of genera and species in columns and rows that represent orders and classes does not reflect any concrete, physical order of nature. It entirely resulted from applying a small set of distinguishing features, like dentition in mammals, beak form in birds, or number and position of stamina and pistils in the case of plants. The "system" thus seemed nothing more than the product of a mind aspiring to bring order to nature through the medium of language alone (Foucault 1966; Pratt 1985; Lesch 1990).

[Fig. 2: Two pages displaying the "kingdom of animals" from Carl Linnaeus, *Systema naturæ* (Amsterdam, 1735). Source: Wikimedia Commons (public domain).]

The criticism that Linnaeus's system was "artificial" was already formulated by George Louis Leclerc, Comte de Buffon (1707–1788), in his "Premier discours de la manière d'étudier et de traiter l'histoire naturelle", which introduced the first volume of his monumental *Histoire naturelle, générale et particulière* (1749–1788). Historians of ideas have traced back Buffon's scepticism towards Linnaeus's project of cutting nature at its joints to the influence of John Locke (Lyon 1976; Sloan 1976), while Linnaeus's realism has been identified with an essentialist tradition, going back to Aristotle (Cain 1958; Larson 1971; Mayr 1982, ch. 4). Still others, including Foucault, have seen a lot of common metaphysical ground shared by the respective projects of Buffon and Linnaeus, despite Buffon's harsh critique (Foucault 1966; Schmitt 2010).

The confusion is partly due to the fact that Linnaeus's sexual system quickly became the paragon of eighteenth-century botanical and zoological "systems", despite the fact that he himself considered it to be "artificial". In fact, it was Linnaeus who drew the distinction between "artificial" systems and "the" natural system, and contemporaries acknowledged this as one of his main achievements (Lefèvre 1999 and Müller-Wille 2014). Artificial systems, he contended, resulted from the ancient method of logical analysis *per genus et differentiam* and tended to result in classifications that separated otherwise similar organisms. The natural system, in contrast, built on inductive methods of description and comparison, and related groups of organisms in a web of mutual similarities, just like "territories on a geographical map", as Linnaeus stated in a famous aphorism in *Philosophia botanica* (1751; Rheinberger 1986; Barsanti 1992; Müller-Wille 2007b). The distribution of traits in organisms, and the curious taxonomic patterns it produced, thus became itself a central epistemic object of eighteenth-century natural history, raising deep questions about the nature of species, the continuity of the "great chain of beings", and the potential historicity of natural processes (Daudin 1926; Lepenies 1976; Stevens 1994; Larson 1994; Lefèvre 1999; Winsor 2015; Dietz 2016).

What gave Linnaeus's realist assumptions about the "natural system" lasting pertinence were not so much emphatic statements – as when he claimed in *Philosophia botanica* (1751) that it is "not the character that produces the genus, but the genus that produces the character" – but the fact that these assumptions were built into the taxonomic tools he created. That names could be understood as conventional "labels", and the Linnaean hierarchy of classes, orders, genera and species as a hierarchic system of containers, or "boxes within boxes", presupposed that species and other taxonomic groups of higher rank could be treated as "things" to be named, described, compared, rearranged and exchanged (Müller-Wille and Charmantier 2012; Müller-Wille 2017). In this sense of a "metaphysics in action", Linnaeus and his followers defined the terms of a philosophical debate about "natural kinds" that lingers with us to this very day (Daston 2004; McOuat 2001).

7. Œconomia naturæ

It has often been stated that Linnaeus's science was heavily influenced by his religious outlook. References to God and his role in creation do indeed abound in his work. One of his earliest, formative experiences was reading Johann Arndt's (1555–1621) *Vier Bücher von wahrem Christenthumb* (1610), which used Paracelsian cosmology to argue that the "book of nature" was a particularly valuable object of religious contemplation. In a similar fashion, Linnaeus emphasized again and again that the role of the naturalist was to exalt God by contemplating his creation, and showing how every being serves a purpose, both with respect to each other, and to human economy (*De curiositate naturali* 1748; *Cui bono* 1752). Building on the precedent set by John Ray (1627–1705) and William Derham (1657–1735), and in line with Christian Wolff's (1679–1754) *Vernünfftige Gedanken von den Absichten der natürlichen Dinge* (1723), Linnaeus played an underappreciated role as one of the chief propagators of physico-theological arguments by design in the eighteenth century (Malmeström 1926).

Yet there are some notable idiosyncrasies in Linnaeus's physico-theological thought as well. As far as creation was concerned, he defended a strikingly simplistic vision. At the beginning of time, God had created a pair of individuals – or, in the case of hermaphrodites, a single individual – for each species, placed in its respective habitat on a mountainous island near the equator. The subsequent history of the earth then consisted in nothing but propagation and a concurrent expansion of landmasses through coastal sedimentation, leading to the present-day distribution of continents and the floras and faunas that inhabit them (*Oratio de telluris habitabilis incremento,* 1744). Linnaeus argued for this view by "calculating backwards": that is, by assuming that the number of individuals in each species diminishes if one moves back in time from generation to generation. In addition, empirical observations of "diminishing waters" in his home country lent empirical support to the idea that the continents had been growing. Linnaeus's arguments, then, where entirely naturalistic and "actualist" – he rejected the Biblical idea of a Great Flood –, and he ended up in a considerable brawl with his colleagues in theology over it as a consequence (Frängsmyr 1983).

Later commentators have gone so far as to call Linnaeus's theory of creation "peculiar, almost puerile" (Broberg 2019, 179). Such retrospective judgements miss the fact that this theory formed the backbone of Linnaeus's highly influential concept of an "economy of nature" (*Oeconomia naturae*, 1749). Expanding the concept of an "animal economy", which referred to the division of labour between different organs in individual animal bodies, to nature at large, Linnaeus argued that each species produces offspring at a rate that was exactly proportionate not only to its own needs, but also to the needs of all other species in whose life it played a vital role. Two features are remarkable about this concept. First, that "ecological relations", as we would call them, were conceptualized as entirely symmetrical. Prey did not only serve predators as food, but predators also served their prey by controlling their numbers. Even parasites and contagious diseases could be seen as "useful" (*Politia naturae*, 1760). And second, that the concept of a "proportion" between two independent processes, (re-)production and consumption, lent itself to quantification (Limoges 1972; Egerton 2007).

For Linnaeus, the economy of nature depended entirely on the "laws" instituted by God. Each species had its predestined "place" (*statio*) in nature, and nature as a whole formed a balanced system. It is easy to see, however, that this balance was highly precarious. One only needed to assume – as Thomas Malthus (1766–1834) famously did in his *Essay on the Principle of Population* (1798) – a slight mismatch in rates of reproduction and available resources for a picture of the economy of nature to emerge that included competition, supersession and eventual extinctions among species. It is this feature that kept Linnaeus's economy of nature alive as a theoretical concept well into the nineteenth century. Both Augustin Pyrame de Candolle (1778–1841) and Charles Lyell (1797–1875) relied on it in their early explorations of the "struggle for existence", and it continued to play a foundational role in Charles Darwin's conceptualization of nature as a dynamic system in which "all organic beings are striving, it may be said, to seize on each place in the economy of nature" (Pearce 2009).

Ironically, then, it was precisely Linnaeus's species fixism – in part religiously justified, but also geared towards his grand taxonomic project of cataloguing the species of the world – that lead later figures to consider the ecological and geographical distribution of plant and animal species as entirely contingent. This constituted a problem that exercised Immanuel Kant (1724–1804) in his critique of teleological judgement (Larson 1994; Töpfer 2019), and provoked reflections on humanity's place in nature. Much to the chagrin of contemporaries, Linnaeus had placed the species *Homo sapiens* in the order "Anthropomorpha", alongside apes and the sloth, in *Systema naturae*, and preceded to divide it up into four "varieties: whitish Europeans, reddish Americans, tawny Asians, and blackish Africans" (Broberg 1983; Müller-Wille 2015). In one stroke, again showing his genius for "spontaneous philosophy", Linnaeus had constituted the object of a "natural history of mankind" (Sloan 1995), and hence the object of philosophical reflections on race, civilisation and empire that should occupy philosophers around 1800 (Lettow 2014).

8. Cross-References

Life, Mechanization of; Alchemy, Chemistry, and Metallurgy; Natural Theology; Botany and Medicine; Iatromechanism and Iatrochemistry; Apes; Generation Theory; Nature and Taxonomy, Systems of; Sexual Dimorphism and Hermaphroditism in Nature; Human Diversity.

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