VOYAGES AND EXPLORATION IN THE NORTH ATLANTIC FROM THE MIDDLE AGES TO THE XVIITH CENTURY

PAPERS PRESENTED AT THE
19TH INTERNATIONAL CONGRESS
OF HISTORICAL SCIENCES
OSLO 2000

EDITED BY
ANNA AGNARSDÓTTIR
UNIVERSITY OF ICELAND

INSTITUTE OF HISTORY – UNIVERSITY OF ICELAND
UNIVERSITY OF ICELAND PRESS
REYKJAVÍK 2001

First Edition 2000
Second Edition 2001

Institute of History
University of Iceland
Suðurgata,
101 Reykjavík
IS–ICELAND

University of Iceland Press
Suðurgata
101 Reykjavík
IS–ICELAND

ISBN 9979 – 54 – 417 – 1

Typeset and layout by Örn Hrafnkelsson
Cover by Kristinn Gunnarsson
Printed in Iceland by Prentsmiðjan Oddi hf.

The map on the cover is by Johne Rotz (John Ross)
made for King Henry VIII in 1542.
By permission of the British Library,
Royal Manuscripts.20.E.IX f21v-22.

POLITICS OF NATURE AND VOYAGES OF EXPLORATION: SOME PURPOSES AND RESULTS

ALEXANDRA COOK

Prologue

In 1814 Sir James Edward Smith wrote in praise of the transfer of the breadfruit from Tahiti to Jamaica:

> One man in our days, by his scientific skill alone, had given the breadfruit to the West-Indies, and his country justly honours his character and pursuits ... We are no longer in the infancy of science, in which its utility, not having been proved, might be doubted.[1]

Smith depicts a world transformed: a world in which plants no longer grew simply where the wind, birds or insects deposited their seeds, but were now transported by European governments to new locations to build profitable industries or feed enslaved populations (the object of the breadfruit expedition). Smith's comments on the breadfruit summarise an entire era of exploration in which the task of searching out, naming, classifying, preserving, transporting, portraying and cataloguing new forms of plant life increasingly provided a significant incentive for the ventures in the world beyond Europe.

New plants, encountered in the late eighteenth century in New Zealand, Australia or Tahiti, held the promise of enormous potential profit, as the success of tobacco, tea, coffee and sugar already had demonstrated over the previous two hundred years. However, the key to profit from new plants was to propagate these plants either in European colonies overseas (sugar in the British and French Caribbean, tea in India) or within Europe itself.[2] Joseph Banks was committed to identifying potentially profitable plants and arranging for their propagation in European botanical research centres such as Kew.[3] For "if the plant life of Britain's colonial dependencies were re-organised (and, from a certain perspective, improved) to benefit the motherland,

[1] James Edward Smith, *An Introduction to Physiological and Systematical Botany* (Philadelphia/Boston, 1814), p. 14. Smith does not clarify, however, who the "[o]ne man is". Possibilities include (1) Joseph Banks, who inspired and directed the transplantation, (2) Captain Bligh of the abortive *Bounty* expedition, who later succeeded in securing Tahitian breadfruit for the British West Indies, or (3) David Nelson, the gardener who cared for hundreds of breadfruit plants on board the *Providence*.

[2] "Crops such as cotton and tea, which were increasingly important staples of British trade, drained British wealth because they could not be produced within Britain itself". John Gascoigne, *Joseph Banks and the English Enlightenment: Useful Knowledge and Polite Culture* (Cambridge, 1994), p. 186.

[3] Banks probably acquired the idea of transforming Kew Gardens into "the great exchange house of the Empire" from his youthful association with Philip Miller, head gardener of the Society of Apothecaries, Chelsea, who collected rare and exotic plants from all over the world via an extensive network of correspondents. Hector C. Cameron, *Sir Joseph Banks K.B., F.R.S.: The Autocrat of the Philosophers* (London, 1952), pp. 63-4.

Britain could be self-sufficient in such products, with a consequent saving in both treasure and national prestige".[4] This strategy of spatial reorganisation of species paid its greatest dividends in the following century, especially for the British empire.[5]

Science, Politics and Interest

Science — the science of botany in particular — was increasingly integral to voyages of exploration. In botanical exploration the importance of the reform of botany by Carolus Linnaeus (1707–1778) of Sweden cannot be overestimated. The Linnaean reform of botanical taxonomy, nomenclature and classification was practical and useful. By simplifying and clarifying classification and nomenclature, Linnaeus produced a conceptual tool of great utility; in so doing, he revolutionised not only botany as a practice, but also transformed how others, including non-botanists, perceived it and used its results.

Botanical science had not always played this role; while some Europeans such as Reede and Rumphius had used their positions in the Dutch East India Company to facilitate the exploration of local flora (see below), they could not call upon a universal system of plant classification and nomenclature, and had to develop their own methods of description.[6] Their groundbreaking efforts were among the first European attempts to confront the wealth and diversity of non-European flora. In Reede's case, the motive to do so was explicitly economic.

Voyages of exploration were motivated by a Baconian agenda that is just as important today as it was in the seventeenth and eighteenth centuries; the mandate was to use nature and discover ever new ways of doing so; this Baconian agenda uses nature to relieve man's estate by subjugating the earth's life to human control. This agenda became ever more closely linked to the use of scientific methods of investigation, classification and experimentation. For the Enlightenment, science "should be the chief instrument in achieving the great Baconian goal of 'the relief of man's estate'".[7] This agenda was played out in the seventeenth and eighteenth centuries on a global stage of unprecedented scope.

Francis Bacon, one-time chancellor of England, acknowledged in the eighteenth century as a father of the *Encyclopédie* and empiricism, promoted an aggressive use of nature for the "relief of man's estate".[8] The legacy of

[4] Gascoigne, *Joseph Banks*, p. 186.

[5] See especially Lucille Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New York, 1979). Brockway points to Britain's highly successful transfers of rubber, quinine and sisal among climes to secure the most advantageous terms of exploitation, e.g. in labour rates.

[6] "No less than [Beccari and Hooker] does RUMPHIUS work methodically: he proceeds from main line to detail, from the basal part of the plant towards its top". See M. Jacobs, "Revolutions in Plant Description", in *Liber Gratulatorius In Honorem H.C.D. De Wit* (Wageningen, 1980), J.C. Arends et al. (eds.), p. 157.

[7] Gascoigne, *Joseph Banks*, p. 253.

[8] Francis Bacon, *The Advancement of Learning Book I* (London, 1975), W.A. Armstrong (ed.), p. 81.

Bacon's empiricism, inductive method and emphasis on making nature useful, was only one aspect of his influence, however. Bacon also conceived the autarkic utopia of Bensalem, the "new Atlantis", that would spy on other nations to make use of their useful discoveries and inventions. Eighteenth-century Europeans followed in this too the spirit of Bacon's thought, even to the point of sending out their own paid commercial spies — "agents of empire" — to find out the uses of tropical plants and to obtain knowledge and techniques relating likewise to those already known, such as cotton.[9] Europeans transplanted these "exotics" whenever possible for further observation and experimentation to European botanic gardens at Paris, Kew, Amsterdam, and Vienna, or to the new gardens being developed in the colonies at St. Vincent and St. Thomas in the West Indies, and at Sydney in New South Wales.[10]

Of particular interest for this paper is the tantalising prospect that intercontinental species transfers presented to enterprising Europeans such as Sir Joseph Banks and their governments; Banks, an influential Linnaean, worked with as many as 126 collectors in "a complex network of plant exchange intended to strengthen and rationalize the economic resources of empire".[11] Banks was instrumental in developing what Alan Frost terms the "habit of plant transfer ... an important aspect of British imperialism in the second half of the eighteenth century".[12] As the most famous practitioner of this "habit," Banks was so convinced of the viability of intra-tropical transfers, that he organised the initially disastrous, but finally successful, transfer of the breadfruit from Tahiti to the West Indies.[13] This achievement, well-documented by Frost, Cameron and others, epitomised Banks's "imperial philosophy".[14] In Sweden, the Netherlands and France the same motives operated: the French Compagnie des Indes was "curious about new products capable of being added to the growing list of trading resources. Rubber, coffee, tea, pepper, indigo, and quinine were the object, not only of numerous descriptions published by the Académie, but also of business deals in which the botanists reluctantly became involved".[15]

[9] Mackay argues that "the Baconian strand in British science was at its most forceful" at this time. David Mackay, "Agents of Empire", in *Visions of Empire: Voyages, botany and representations of nature* (Cambridge, 1996), D.P. Miller and P.H. Reill (eds.), p. 53.

[10] Brockway, *Science*, p. 75.

[11] Mackay, "Agents", p. 47.

[12] Alan Frost, "The antipodean exchange: European Horticulture and imperial designs", in *Visions of Empire: Voyages, botany and representations of nature* (Cambridge, 1996), D.P. Miller and P.H. Reill (eds.), p. 74.

[13] The first expedition to retrieve breadfruit plants from Tahiti foundered in the infamous mutiny on the *Bounty*, captained by William Bligh.

[14] Mackay, "Agents", p. 47.

[15] Jean-Paul Nicolas, "Adanson et le mouvement colonial", in G.H.M. Lawrence (ed.), *Adanson: The Bicentennial of Michel Adanson's Famille des plantes* (Pittsburgh, 1964), pt. 2, p. 438. Nicolas later states, however, that Adanson was hardly reluctant in his work for the Compagnie des Indes and the Ministère des Affaires Etrangères, and that he was especially interested in dyeing with indigo, and how the development of a better method for doing so could help his career.

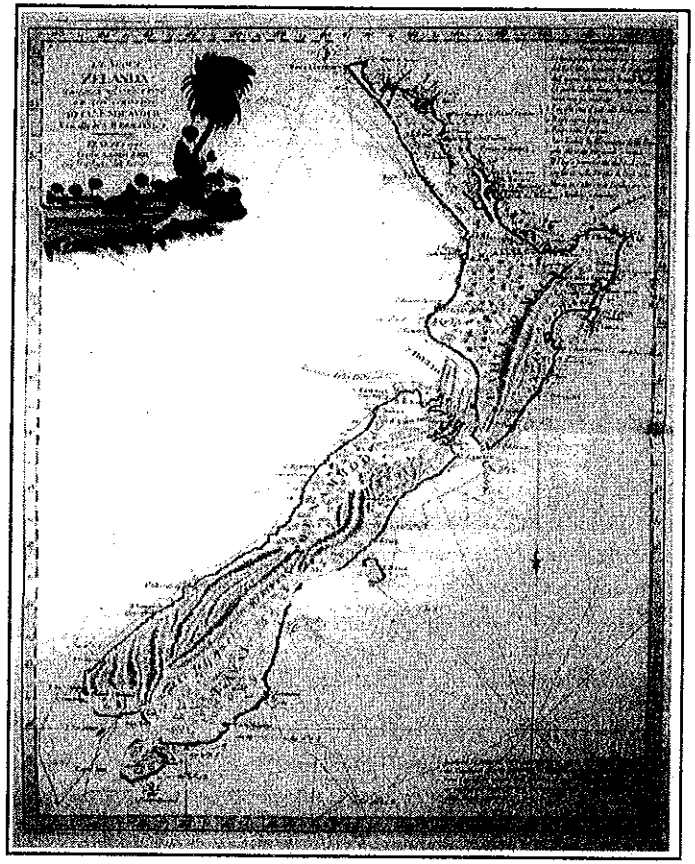

Figure 1. From Nuova Zelanda. Published in *Atlante novissiomo* ... 1ª ed. Venezia 1779–[85]. National Library of New Zealand. Alexander Turnbull Library, Wellington, N.Z. MapColl-f100a/1779–[85]/Acc. 187-)

Explorers, such as James Cook, had a mandate to find likely sites for propagation of European plants on the one hand and to search out new ones on the other. In his journal Cook writes first of the suitability of New Zealand for European species (see Figure 1):

> It was the Opinion of every body on board that all sorts of European grain, fruit, Plants, etc., would thrive here; in short, was this Country settled by an industrious people, they would very soon be supplied not only with the necessaries, but many of the Luxuries, of Life.[16]

"[E]very body on board" included, of course, Joseph Banks and Daniel Solander, botanists practicing under the imprimatur of Linnaean methods and motives.

[16] A.H. and A.W. Reed (eds.), *Captain Cook in New Zealand: Extracts from the Journals of Captain James Cook* (Wellington, 1969), p. 139.

> In the woods are plenty of Excellent Timber, fit for all purposes ... There grows spontaneously everywhere a kind of very broad-bladed grass, like flags of the Nature of Hemp, of which might be made the very best of Cordage and Canvas, etc.[17]

Here Cook points to the suitability of non-European species, such as the New Zealand flax, *Phormium tenax,* to European exploitation.

The agendas of researchers, voyagers and institutions were therefore well-articulated and understood. Sir William Thiselton-Dyer, director of Kew, spoke tellingly in 1880 of the "Botanical enterprise of the empire" in an address to the Colonial Institute of London.[18] The bold assertion of interests by leading naturalists leaves little doubt about the significance of this influence in late eighteenth-century voyages of exploration.

Scientific Transformations

> For Banks and for many of his contemporaries natural history meant first and foremost botany — a point well appreciated by Banks's Australian collector, George Caley, who prudently wrote to assure Banks in 1800 that ... he would undertake to explore 'the three kingdoms of nature ... but botany I shall make the principal pursuit'.[19]

Botany was undergoing rapid change in this period, in large part due to the impetus and pressures exerted by exploratory travel and the desire to exploit ever more of the earth's plant resources. As Linnaeus wrote, botanists were overwhelmed by "the multitude of species ... both the [east and west] Indies daily furnishing them with so many novelties, that no memory was strong enough to retain them".[20]

Identification — classification and naming — played a key role in the process of assimilating the flora of the new world to the priorities of the old world. As Smith wrote in 1814, "if any judicious or improved use is to be made of the natural bodies around us, it must be expected from those who *discriminate* their kinds and *study* their properties".[21] Writing eighty years before Smith in his *Systema naturae* of 1735, Linnaeus opined: "All that is *useful* to man originates from ... natural objects". "Hence, the necessity of natural science is self-evident".[22]

The transformations of botany in this period are well-documented, and can be briefly summarised here. Between the sixteenth and the eighteenth centuries, European botany evolved from the pharmaceutical practice of physicians and herbalists to a systematic and theoretical (as well as practical) en-

[17] Reed and Reed (eds.), *Cook in New Zealand*, p. 140.

[18] Ray Desmond, *Kew: The History of the Royal Botanic Gardens* (London, 1995), p. 445.

[19] Gascoigne, *Banks*, p. 111.

[20] Emphasis added; Carolus Linnaeus, *A Dissertation on the Sexes of Plants* (Dublin, 1786), trans. J.E. Smith, p. 3.

[21] Emphasis added; Smith, *Introduction*, p. 14.

[22] Emphasis added; *Systema naturae 1735: Fascimile of the First Edition* (Amsterdam, [1735] 1964), trans. with an introduction by M.S.J. Engel-Lederer and H. Engel, I § 9, p. 19.

deavour for which botanists offered a variety of systems of plant classification and nomenclature, notable among which were those of Ray, Tournefort and Linnaeus. While sixteenth-century botanists had only the plants of their own regions and the Mediterranean (drawing on Pliny and Dioscorides) as their frame of reference, eighteenth-century botanists confronted an ever-growing body of plants, which they themselves helped to search out and import from all over the world. It is therefore indisputable that botany (meaning botanists acting individually and collectively) altered its focus, scope and priorities in tandem with social and economic transformations of the time; in one sense, though, its goals remained fundamentally the same: discoveries of use to humanity. Botany's metamorphosis therefore has to be seen against the backdrop of some European nations' transformation into expansive, colonial powers with interests in Asia and the Americas.

Epistemological debate and innovation in botany became acute as European forays into Asia and the Americas introduced ever greater numbers of new plants to Europe. These forays were neutral neither in origin nor in motive; Europeans had sought since at least the time of Marco Polo to gain access to the vaunted treasures of the East, and were at last successful in the sixteenth century. The Spanish and Portuguese states exploited the New World and parts of Asia, while the Dutch and English East India companies organised the profitable exploitation of Asia; two important officials of the Dutch East India Company (the "VOC"), Reede tot Drakenstein and Rumphius, appreciated in a truly prescient way the importance of a detailed knowledge of indigenous plants and published important florae of India and southeast Asia, including local names (later rejected by Linnaeus).[23] While late-medieval herbals mention between 500 and 1,000 plant species, John Ray's *Methodus plantarum nova* (1682) refers to 18,000.[24] The *Endeavour* voyage alone returned to England in 1771 with 1300 new species and 110 genera collected by Banks and Solander in South America, Tahiti, New Zealand and Australia.[25] Organising, preserving, identifying, naming and depicting the new finds entailed literally years of effort and application; in the end, Solander never published the results.

[23] Hendrik Adriaan van Rheede (Reede) tot Draakenstein (Drakenstein) (1636–1691), an important officer of the Dutch East India Company ("VOC"), gathered together a team of physicians, translators, painters and plant experts to provide a polyglot guide to the plants of India in his *Hortus indicus malabaricus*, 12 vols. (Amsterdam, 1678–1693). He included Latin, Portuguese, Dutch, Arabic, Malay and Malabar plant names, the presumed medical "virtues" of the plants and a rich collection of illustrations depicting them, thereby laying the basis for the West's botanical knowledge of this region. Linnaeus termed him one of the "exoticae and pereg rinatores." See also M. Fournier, "Enterprise in botany: Van Reede and his *Hortus Malabaricus* – Part I", *Archives of Natural History* 14 (2) (1987), pp. 123-158. Georg Eberhard Rumphius (Rumpf) (1628–1702), a German botanist and physician, travelled widely in the Dutch East Indies in the employ of the Dutch East India Company. He is known as "the Indian Pliny" for his *Herbarium amboinense* (Amsterdam, 1741–1750), J. Burman (ed.), 6 vols.; this landmark work on the flora of Ambon (an island part of present-day Indonesia), "considered one of the most remarkable books of its time", described 1700 plants, 1060 of which were illustrated. See Alice M. Coats, *The Quest for Plants: A History of the Horticultural Explorers* (London, 1969), p. 201.

Linnaeus's great innovation was his so-called artificial system of sexual classification. The system "judiciously instituted ... by a naturalist" centres on the fructification, which, significantly in Linnaeus's definition, comprises the entire apparatus of reproduction, not just the fruit. By the principle of logical division, Linnaeus devised a systematic method of classification based on a priori identification of certain defining parts, to the exclusion of all others. Only on the basis of such principles, could, in his view, an efficient exploitation of the ever-burgeoning plant realm take place. Similarly, focussing merely on useful plant parts does not yield a workable system of classification that can confront the practical problem of a large number of new plants, imported "daily" into Europe. Linnaeus believed, moreover, in the absolute validity of sexual classification: after relating a series of experiments in sexual reproduction, he writes, "All nature proclaims the truth I have endeavoured to inculcate, and every flower bears witness to it".[26]

While not all the plants collected beyond Europe necessarily presented as much taxonomic novelty as was often assumed or asserted by naturalists,[27] the influx of new species and genera was unprecedentedly enormous, and posed novel problems of identification and classification. Linnaeus attests the daily influx of new plant material, much of it sent directly to him: "[t]he disciples and friends of Linnaeus — Thunberg, Sparrman, Forsskkål, Osbeck, Kalm — scoured the world for specimens to bring to their master".[28] To paraphrase Hegel, an efficient system of plant classification was needed, and Linnaeus soon presented himself as the man uniquely prepared to do the job.

Linnaeus, Economic Botany and the World Beyond Europe:

Linnaeus came to maturity in an age of European exploration and expansion, in which Sweden — not destined to become a colonial power — nevertheless participated to a degree; the Swedish East India Company was founded in 1731. This encounter with the world beyond Europe was formative. As Stannard writes, "this activity [of exploration and colonisation] continued through Linnaeus' own lifetime as the dissertations of many of his students testify, Africa, Asia, and portions of the New World were more deeply penetrated".[29]

[24] A.C. Crombie, *Styles in Scientific Thinking* (London, 1994), vol. II, p. 1263.

[25] W.T. Stearn, "A Royal Society Appointment with Venus in 1769: The Voyage of Cook and Banks in the *Endeavour* in 1768–1771 and its Botanical Results", *Notes and Records of The Royal Society of London* 24 (1969), pp. 64-90.

[26] Linnaeus, *Sexes*, p. 43.

[27] Peter Stevens, "J.D. Hooker, George Bentham, Asa Gray and Ferdinand Mueller on Species Limits in Theory and Practice: A Mid-Nineteenth-Century Debate and Its Repercussions", *Historical Records of Australian Science* 11 (June 1997), pp. 345-370.

[28] Michael Roberts, *The Age of Liberty: Sweden: 1719–1772.* (Cambridge, 1986), p. 216; see also Frans A. Stafleu, *Linnaeus and the Linnaeans: The Spreading of Their Ideas in Systematic Botany, 1735–1789* (Utrecht, 1971), pp. 147-55 on Linnaeus's "Apostles".

[29] Jerry Stannard, "Linnaeus, Nomenclator Historisque Neoclassicus", in J. Weinstock (ed.), *Contemporary Perspectives on Linnaeus* (Lanham, MD, 1985), p. 23.

In a number of ways Linnaean taxonomy is not comprehensible without a consideration of its emergence against the background of European travel, expansion and conquest of peoples, continents and nature. These developments not only form the background for the Linnaean endeavour, but also infuse that endeavour with a politics of expansion, control of nature and, ultimately, colonialism, in conjunction with a liberal political model.[30] The marriage between botany and empire is especially pronounced in the career of one of Linnaeus's most enthusiastic English disciples, Sir Joseph Banks. But Michel Adanson, one of Linnaeus's severest critics, was also deeply involved with French imperial interests. As Dean notes, "The practical value of the [Linnaean] system was especially evident in late-18th and [early] 19th-century Britain, where it served the needs of an expanding empire in ordering a flood of exotic new plant materials which had scientific, medical, and horticultural importance".[31]

Linnaeus was associated with the Hat party, which promoted scientific research as "an obligation to the community to be useful, and ... deserving of support especially for its practical applications [including] ... botany". The famous travels of Linnaeus over the length and breadth of Sweden were not merely designed to furnish material for the new taxonomy of which he was the begetter, not to charm the reader ... but also to benefit the community by the identifications of plants which might have values for medicine, for industry, or for agriculture".[32] This agenda led by extension to travels overseas to find new resources.

Linnaeus is most often presented as the progenitor of taxonomic innovations. However, he did not limit himself to name-giving and classification; he actively sought to make nature useful by advocating the spatial reorganisation of plant species. This reorganisation was predicated upon the economically advantageous transfer or transplantation of plant species among quite different climates and continents. Tea, cotton, quinine, cochineal — all could flourish in Sweden, or so thought an optimistic Linnaeus, who assessed climatological and ecological differences between Europe and other regions more optimistically than was probably warranted. He tried to extend the ecological limits he himself had exposed (see below). Indeed, the possibilities appeared boundless.

[30] In emphasising the Linnaean warrant for the control of nature, explicit in such acts as naming and making practical use of plants, as well as transferring them among climes, I adopt a different emphasis from those writers who have stressed an ecological element in Linnaeus's thought. See e.g. Gunnar Eriksson, "Linnaeus the Botanist", in G. Broberg (ed.), *Linnaeus: The Man and his Work* (Berkeley, 1983) and Donald Worster, *Nature's Economy: A History of Ecological Ideas* (Cambridge, [1977] 1985). I do not deny this element, and have pointed to it in the dissertation "On the Use of Natural History"; however, I argue that ecology, like botany itself, was used to secure a Baconian knowledge of ecological relationships and gives men the capacity to exploit nature in ever more effective ways.

[31] John Dean, "Controversy over Classification: A Case Study from the History of Botany", in B. Barnes and S. Shapin (eds.), *Natural Order: Historical Studies of Scientific Culture* (London, 1979), p. 215.

[32] Roberts, *The Age of Liberty*, p. 142.

Transplantation was an idea dear to the heart of Linnaeus, a Swedish patriot and self-styled national hero, who sought ways to improve the political and economic standing of a backward, shrunken and impoverished Sweden, fallen on hard times since its imperial boom of the preceding century. As his contribution to improving Sweden's economic position, Linnaeus developed a teaching for political, as well as natural, economy. He saw economics as a constructive and positive science of establishing Sweden's self-sufficiency.[33] For Sweden to achieve such an end, technological innovations and import substitution would be necessary, but how would Sweden achieve the latter goal? Foreign lands would providentially — and Linnaeus was, if anything, a providential thinker — provide the plant resources Sweden needed.

To this end, Linnaeus espoused the economic as well as scientific efficacy of exploratory travel; his first lecture as professor addressed "the utility of scientific voyages within the fatherland", of which his own Lapland journey was one famous example.[34] Swedes saw Lapland as their own West Indies, ripe for exploitation. Linnaeus believed such voyages must make the economic uses of plants as medicines, foodstuffs and raw materials one of their primary concerns. Sir Joseph Banks gave this dream reality by ensuring the inclusion of naturalists (usually physicians) on all voyages undertaken by the Royal Navy.[35] Banks himself stands at the head of this tradition as a participant in the *Endeavour's* three-year voyage to observe the transit of Venus over Tahiti in June 1769.

Apart from one long absence as a young man (1735–1738), Linnaeus himself did not travel beyond Sweden, but strongly encouraged his students — his "Apostles" to do so, often under foreign sponsorship. He arrived at the brilliant stratagem of their taking degrees in theology or medicine (the latter a profession requiring botanical knowledge), so that they could be hired for voyages of exploration as shipboard physicians or clergymen even if funds were limited. Some students, like Daniel Carl Solander, jumped ship entirely, but even then "Linnaeus felt that their data and specimens belonged ... to the Swedish nation".[36]

Ironically, Linnaeus's brilliant organisational efforts and plant transfer strategies were to bear the greatest fruit not for Sweden, but for more expansive nations, especially Great Britain. Unlike Sweden, Britain was beginning a new period of colonisation, and was well-equipped to move plants, animals and men around the world in the ships of merchants and the Royal Navy. Britain's growing possessions allowed ample scope for such projects as the transplantation of the Tahitian breadfruit to the West Indies and Chinese tea to India.

[33] Lisbet Koerner, "Purposes of Linnaean Travel: A Preliminary Research Report", in *Visions of Empire: Voyages, botany and representations of nature* (Cambridge, 1996), D.P. Miller and P.H. Reill (eds.), pp. 124-5.

[34] Koerner, "Purposes", p. 127.

[35] Stearn, "Appointment", p. 87.

[36] Koerner, "Purposes", p. 127.

Linnaeus supported a practically-oriented study of natural history in which taxonomy would play a leading role.[37] He justified this practical enterprise on the basis of man's place in the chain of being. In "On the Use of Natural History", a dissertation defended by a Russian student of Linnaeus, Matthew Aphonin, and published in Stockholm in 1769 in the seventh volume of the *Amoenitates academicae*,[38] Linnaeus explains that systematic natural history enables man to use nature:

> In this age Natural history first began to put on an appearance of practical application and utility: this we owe to the works of Ray; who, in his History of Plants[39] ... added their œconomical uses to his account of many species; but his collections of this kind were extremely narrow and confined. Most of what has been done upon this subject we owe to the illustrious Linnæus; who has cast so many new lights upon the abstract part of this science, and directed his labours so, that they all tend to this end.[40]

Among the plants of interest to eighteenth-century horticulturalists are those termed "exotic": hence, "those who are desirous of adorning their gardens with exotic trees ought to be well versed in natural history ... and not see great trouble and great expence [sic] terminate in disappointment".[41]

Linnaeus hereby introduces the topic du jour: transfers of exotic species. The transfers of tropical plants require botanists to be ecologists: "In a word, all cultivation of exotic plants must be directed by their native stations".[42] Having introduced the all-important topic of exotic plants, Linnaeus acquaints the reader with the *pièce de resistance* — what he believes to be his breakthrough in economic botany:

[37] "Linnaeus's travel books and some dissertations reveal him as truly an economic botanist [citations deleted]. Thus it was important to him first to provide a botanical framework to which economic plants could be referred". William Louis Stern, "The uses of botany, with special reference to the 18th century", *Taxon* 42 (1993), p. 775. Yet "Linnaeus, with notable exceptions ... did not achieve renown through the applied and practical aspects of his botany" (p. 776), and Linnaeus's practical interests were "subordinate" to his theoretical ones (p. 778). Linnaeus travelled to Lapland under the aegis of the Swedish Academy of Sciences and recorded its life, customs and natural features in detail; *Lachesis lapponica*, the diary of the Lapland journey, was published in English translation by J.E. Smith in 1811. See also "Linnaeus's Öland and Gotland Journey, 1741", *Biological Journal of the Linnean Society* (London, 1973), trans. M. Åsberg and W.T. Stearn.

[38] Carolus Linnaeus, *Select Dissertations from the Amœnitates Academicæ* (New York, 1977), trans. F.J. Brand, p. 3; see also Stearn, "The *Amoenitates academicae* and the Authorship of Linnaean Dissertations", in *Species Plantarum: A Facsimile of the first edition* (London, 1957), vol. I, p. 23. The *Amoenitates academicae*, a ten-volume collection of the 186 dissertations completed under Linnaeus at the University of Uppsala, were published between 1749 and 1790 in Leiden, Stockholm, Amsterdam, and Erlangen. In the Swedish academic tradition, "the student defended in public debate a thesis for which the professor was primarily responsible"; the defense took place in Latin and was a test of memory and skill in disputation rather than originality. See W. T. Stearn, "The *Amoenitates academicae*", p. 51.

[39] John Ray, *Historia plantarum* (London, 1686–1704), 3 vols.

[40] Linnaeus, *Dissertations*, p. 15.

[41] Linnaeus, *Dissertations*, p. 23.

[42] Linnaeus, *Dissertations*, p. 30.

> It has been an object of wonder that the tea-plant has not been introduced into Europe, for which such immense quantities of specie are annually remitted to China.[43] The seed is easily procured there ... a number of attempts have been made to obtain the shrub itself but every endeavour has been frustrated, and we must look for the cause of our want of success in the plant itself. This has been overcome by the most consummate Botanist of his age;[44] and we may now promise ourselves, that the Tea plant will in [sic] be in a little time as common in Europe as the Syringa, a native of the same country.[45]

In the notes to the dissertation, we read how Linnaeus sought in vain to grow tea from seed for twenty years; he finally instructed a Swedish ship's captain to obtain fresh tea seeds in China and sow them in a pot prior to departure; the live plants arrived in October 1763 and were sent to Linnaeus in Uppsala. Linnaeus believed his transplantation would succeed, so that "tea may become a common object of cultivation in Europe"; tea grows as far north as Peking, where the winters are colder than those of Stockholm.[46]

The transfer of the tea plant to Sweden had no significant impact on European agriculture or trade. However, Linnaeus's note on the tea plant demonstrates several noteworthy features of Linnaean science: (1) its interest in practical results; (2) its interest in how botany can address wider issues of political economy — trade and money supply (note the reference to the export of specie, or gold); and (3) its faith in the efficacy of plant transfers, based on an understanding of ecological principles.

French Opponents: Daubenton, Buffon, Adanson

Linnaeus was perceived by some, especially in France, to be very wrong. The principal objections to the Linnaean system were, in the first instance, biological. These critics did not object to the Linnaean pursuit of Baconian goals, however. Daubenton constructively articulated positive Baconian goals for botany with which Linnaeus would seem to have been in full accord. Indeed, the goals of Daubenton and Linnaeus differed little, if at all. Instead, it appeared to the eminent French naturalists, Georges Louis Leclerc, comte de Buffon, and his close collaborator, Louis-Jean-Marie Daubenton, that Linnaeus had conceived a very roundabout, if not downright useless, approach to nature study. Buffon's critique is well-known and has been examined in depth.[47] The French naturalists' disagreement with Linnaeus lay

[43] M. Desfontaines makes a similar point in his "Observations sur le thé," *Annales du Muséum national d'histoire naturelle* 4 (1804), pp. 30-31: "the quantity of tea exported from China to Europe from 1776 to 1794, has weighed annually from 15, 20, 25 29 and even 56 million [pounds?], an enormous consumption for which Europe pays every year a very considerable sum from which it could doubtless free itself".

[44] The "most consummate Botanist of his age" is Linnaeus, the author of the dissertation.

[45] Linnaeus, *Dissertations*, p. 31.

[46] Linnaeus, *Dissertations*, p. 68.

[47] See Jacques Roger, *Buffon: A Life in Natural History* (Ithaca, 1997), trans. S.L. Bonnefoi, pp. 309ff.

not in their understanding of where they wanted to end up, but in how they sought to reach the ends common to both approaches.

Daubenton was unstinting in his criticism of Linnaean classification as useless: "The nomenclature of plants is not necessary for the discovery of their properties; this is so true that it would be ridiculous to have ever questioned it, if it were not proved by the present state of Botany and by experience of the past".[48] Daubenton engaged in thinly-veiled criticism of the Linnaean system of classification, which was based on certain fixed features of plants: "There are in plants no parts that appear in every species ... Nevertheless it is on the basis of the reproductive organs that the most vaunted systems have been established". Daubenton, it turns out, was right: "the Linnaean system as [the] table of contents [of the book of nature] was a failure, even when detailed descriptions were provided".[49]

Michel Adanson (1727–1806), a brilliant non-conforming botanist, likewise rejected Linnaeus. The first European to explore the flora of Senegal, Adanson believed that Linnaeus's system could not be applied there. Adanson's rejection of Linnaeus was so complete that in his *Familles des plantes* he even refused to provide synonyms to Linnaean names for purposes of simple clarity.[50]

However, Adanson, like Linnaeus, Banks and most practicing botanists of the day, was rather deeply involved with the profitable exploitation of non-European plant life. Jean-Paul Nicolas documents this aspect of Adanson's career in the volumes commemorating the bicentennial of *Familles des plantes*. "He felt", for instance, "that his personal success rested on his method of treating indigo for dyeing purposes".[51] As one of the few experts on Africa, Adanson was frequently consulted by the Ministère des Affaires Etrangères concerning France's attempts to colonise Guiana. Adanson's academic activities were likewise influenced by French rivalries with other colonial powers, especially Britain. Nicolas speculates "that the Compagnie des Indes ... influenced the author to limit the information in his publications to the barest minimum. This is especially possible as regards publication of new species ... During the period when Senegal was under the British and when

[48] Emphasis original; Denis Diderot and Jean le Rond d'Alembert (eds.), *Encyclopédie, ou dictionnaire raisonné des sciences, des arts, et des métiers* (Stuttgart-Bad Cannstatt, 1966), facsimile ed., s.v. "Botanique".

[49] Peter F. Stevens, *The Development of Biological Systematics: Antoine-Laurent de Jussieu, Nature, and the Natural System* (New York, 1994), p. 267.

[50] Michel Adanson, *Familles des plantes* (Paris, 1763-64), 2 vols. Rousseau suggests in his "Introduction" that nationalistic chauvinism played an important role in the rejection of Linnaeus by French (Parisian) naturalists. Jean-Jacques Rousseau, "Botanical Writings", in *The Collected Writings of Rousseau* (Hanover, NH, 1999), trans. Alexandra Cook, vol. 8, p. 98. That leading French naturalists opposed the Swedish Linnaeus is beyond doubt, but these opponents were concentrated in Paris, while in the provinces, e.g. at Lyon and Montpellier, enthusiastic Linnaeans controlled important posts and botanic gardens. See Pascal Duris, *Linné et la France* (Geneva, 1993). So we can speak perhaps of a Parisian opposition to Linnaeus; the case in the German-speaking world is even less clear-cut.

[51] Nicolas, "Adanson", p. 447.

the treaty of Paris was signed, there appears to have been very few French academic theses dealing with products of the tropics".[52] In accordance with the wishes of the Compagnie, "Adanson never failed to forward to his masters (de Jussieu, Réaumur, and Rouelle) plants, animals, and minerals which he collected personally or obtained through the intermediary of caravans from the interior".[53]

Rousseau's Critique of Transplantation

Unlike most botanists of his day, Jean-Jacques Rousseau took a critical view of interclimatic transplantation; he distrusted the results of species introductions from the tropics into Europe on purely empirical grounds. He exhibited on this question more caution than Linnaeus, although Rousseau termed him his "master" in botany.[54] In "Vivace," one of the last entries in his *Dictionary of terms of usage in botany*, he writes, "[p]lants transported out of their climate are subject to variation ... Some plants that are perennials in hot countries become annuals among us, and this is not the sole alteration they undergo in our gardens". "Hence," he concludes, "the exotic Botany studied in Europe, provides often very false observations".[55] "[F]alse observations" are only useful if one wants to learn how plants grow in a climate different to their own; this question was always problematic for Rousseau. To pose such a question was, in his view, to ask nature to be unnatural for human purposes; it is nature, not men, who never lies.

Rousseau did not oppose the study of exotics altogether, however. Like everyone interested in plants at this time, Rousseau was acquainted with the "curious gardens" of the collectors; he visited the Jardin du roi frequently, and noted his relative lack of acquaintance with its exotic contents.[56] While always confessing himself ignorant with regard to "exotics", Rousseau studied treatises on South American plants and acquired the seeds of imports from that region, such as okra.[57]

Rousseau rejected not only the observations gathered from hothouse flowers forced in a strange climate, but also the profit motivations that often lay behind transplantation ventures. He rejected the "interest of the body" as a reason to study, much less change, nature.[58] Rousseau inveighed against the

[52] Nicolas, "Adanson", p. 440.

[53] Nicolas, "Adanson", p. 439.

[54] Rousseau gushed to a visiting Swede, "my master, my teacher, the great Linné! If you write to him ... greet him on my behalf, and say to him that I know on the earth no man greater than he. Say to him that I owe to him health and life. Rousseau testified again, by the most emphatic expressions, his high esteem for the greatest botanist in the world". Rousseau, "Botanical Writings", p. 242.

In citing Rousseau's admiration for Linnaeus, I do not wish to suggest that Rousseau's view of Linnaeus and nomenclature was uncritical; quite the contrary. Despite his respect for Linnaeus, Rousseau was well aware of deficiencies in what Linnaeus had done, cautioned his readers not to make a fetish of nomenclature, and adopted Jussieu's families for his letters on botany to Madeleine-Catherine Delessert. See e.g. "Botanical Writings", pp. 98, 170-2.

[55] Rousseau, "Botanical Writings", p. 129.

[56] Rousseau, "Botanical Writings", p. 221.

[57] Rousseau, "Botanical Writings", pp. 218, 275, n. 57, 326, n. 317.

traditional subservience of botany to medicine, and by extension, therefore, against all those who sought to reduce plant study to a search for something useful (food sources being a notable exception). Rousseau rejected any form of interested science beyond the search for nutrition; in the *Reveries* he cites those who practice botany simply to advance their careers, "to obtain a position or write books";[59] he derides the search for ingredients for enemas, or other medicines.[60]

The contemporary enthusiasm for transplanting and collecting exotic species was therefore not Rousseau's first priority as a botanist; in a letter of 19 December 1771 he wrote to Chrétien Guillaume Lamoignon de Malesherbes, "I do not ever expect to be rich in foreign plants; and, in my view, the greatest charm of botany is to be able to study and know the nature around one rather than [nature] in the Indies".[61] Rousseau saw the botanic gardens of collectors and official botanists as destructive of the botany he espoused: "In denaturing this pleasant study people transplant it to the midst of cities and academies where it degenerates no less than the exotic plants in the gardens of the curious".[62] The botany of empire — the practice of transplantation and "denaturing" — is not true botany; just as exotics introduced to European gardens are no longer truly themselves. Rousseau thus returned a copy of Rumphius's magnificent *Herbarium amboinense*[63] to the Duchess of Portland, writing that "in my greatest passion for botany, content with the hay which I found underfoot, I never had a taste for foreign plants that we find among us only exiled and denatured in the gardens of the curious".[64]

Conclusion

Until recently, Rousseau's views have gone largely unheeded in the ongoing quest for profit-yielding plants; Banks, not Rousseau, epitomises the Enlightenment man of science and action. The Baconian-Banksian agenda continues to be compelling today in the use of nature for nations.

[58] "Non rien de personnel, rien qui tienne á l'interest de mon corps ne peut occuper vraiment mon ame". Jean-Jacques Rousseau, *Oeuvres complètes* (Paris, 1959), vol. I, p. 1065; cf. Jean-Jacques Rousseau, "Reveries", in *Collected Writings*, vol. 8, trans. C. Butterworth, p. 61. Butterworth omits the words "l'interest de" from his rendering of this passage.

[59] Rousseau, "Reveries", p. 64.

[60] Rousseau, "Botanical Writings", pp. 93, 252.

[61] Rousseau, "Botanical Writings", p. 231.

[62] My translation; Rousseau, *Oeuvres*, vol. I, p. 1070. Cf. Rousseau, "Reveries", p. 65.

[63] See n. 23 above.

[64] Rousseau, "Botanical Writings", p. 248.