Commentary

A History of the Ecological Sciences, Part 25. American Naturalists Explore Eastern North America: John and William Bartram

John Bartram (1699–1777) and his son William Bartram (1739–1823) were important naturalist–explorers who illustrate Basalla's model (1967) of the development of colonial science. In his model, there are three phases: European exploration (Egerton 2006), colonial exploration, and independent science, with an increase in activity with each new phase. The Bartrams began their activities in his second phase—colony-born scientists who conducted the same kind of science as did European-born scientists who came to the colony—and William made the transition from colonial to independent science.

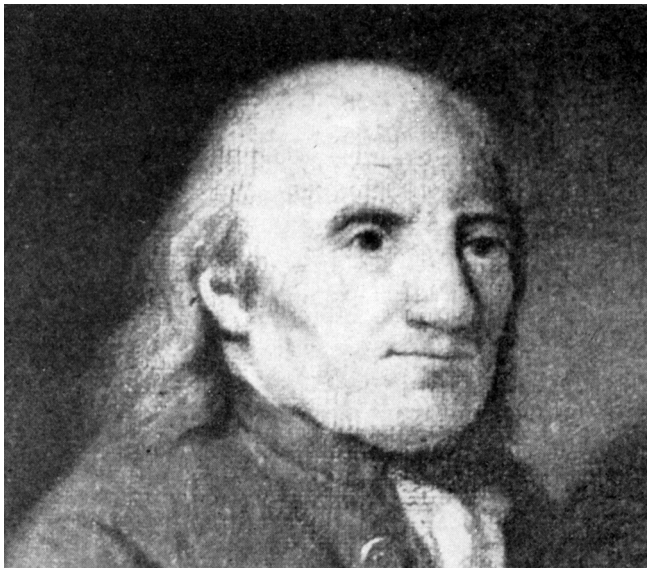

Fig. 1. John Bartram (Bartram 1942:Frontispiece).

John was the son of a farmer on the outskirts of Philadelphia, whose mother died when he was two. After remarriage, his father eventually moved with his pregnant wife and their child to eastern North Carolina in 1711, only to be killed (but his family spared) in the same Tuscarawas uprising that killed John Lawson (Egerton 2006:345). John had been left behind with his grandmother, and he received typical Quaker schooling before working on her farm. In 1723 he inherited her 200-acre farm and its resources (Earnest 1940, Berkeley and Berkeley 1982, Slaughter 1996, Thomas 1999, Egerton 2004*a*).

As a child, John was interested in science, and by age 12 he focused on medical botany. Although a farmer, he became acquainted with Joseph Breintnell in Philadelphia, whose hobby was making ink impressions of leaves. Breintnell sent a set of leaf impressions to his London correspondent, Peter Collinson, who wanted to find an American who would collect live plants or seeds for him, and Breintnell recommended Bartram. They began corresponding in 1733, and they exchanged several letters per year until Collinson died in 1768. In exchange for Bartram's botanical and zoological specimens and informative letters, Collinson sent him books, money, advice, and various other kinds of assistance, including introductions to other English collectors and American naturalists.

John Bartram became a careful observer and an independent thinker. Perhaps this latter trait owed something to the example of his close friend, Benjamin Franklin (Chaplin 2006:64). In 1739 Bartram suggested organizing a society to study nature and the arts, and in 1743 Benjamin Franklin organized the American Philosophical Society, which lasted a few years. Bartram was a charter member both then and when it was revived in 1769. As a result of such contacts, Bartram developed America's first botanical garden. He commented to Collinson on the fate of European introductions into America. For example, yellow toadflax (*Linaria vulgaris*) had been introduced as a garden ornamental but had escaped and become a pest (Mack 2003:83).

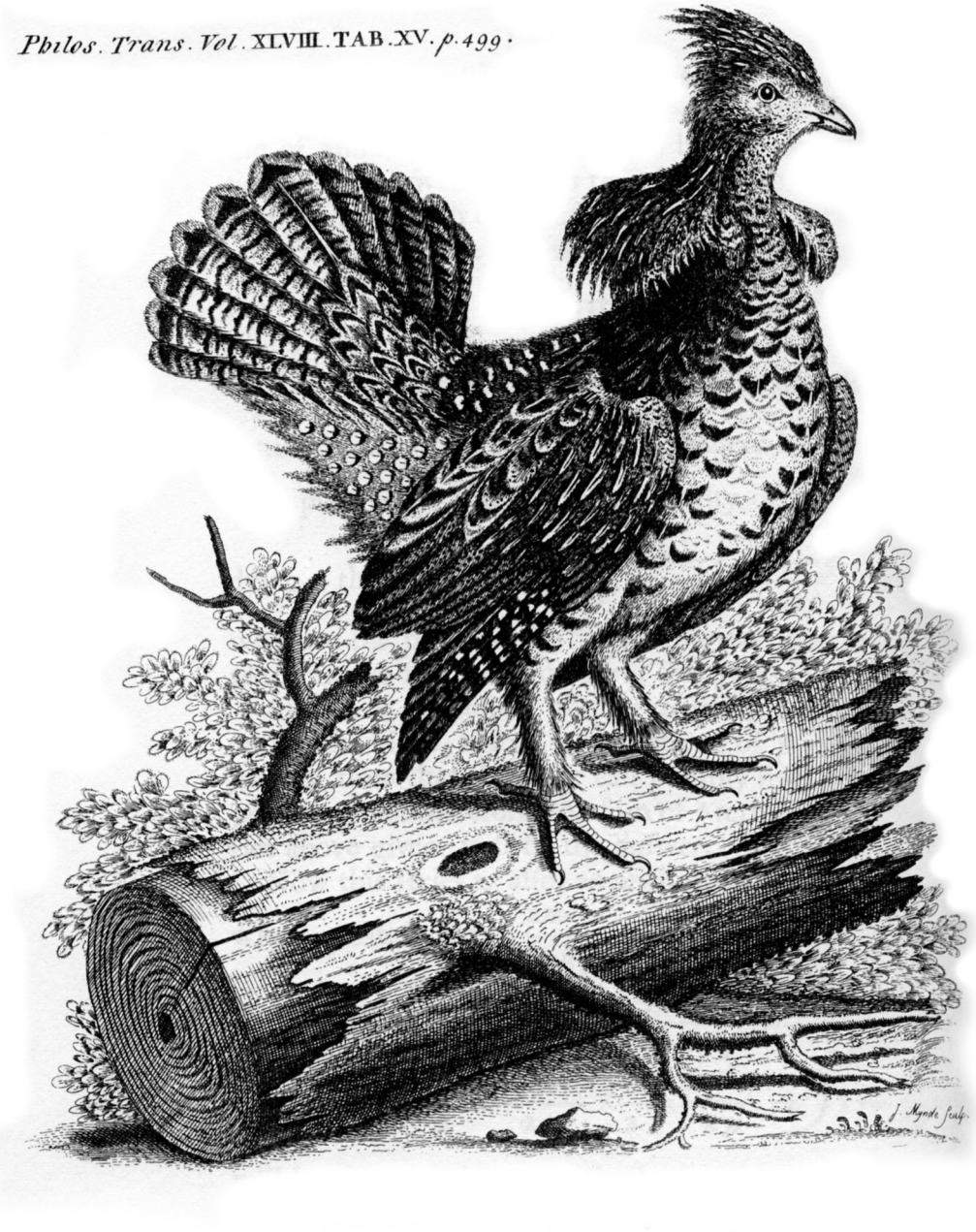

Fig. 2. Ruffed Grouse drawn from John Bartram's specimens sent to Collinson (Edwards 1754: facing 499).

Collinson published seven of Bartram's letters, on shellfish and insects, in *The Philosophical Transactions of the Royal Society*, 1734–1757. Those on insects may have contained little that was new to science (no effort was made to compare them to the findings of Swammerdam, Leeuwenhoek, or Réaumur), but did provide an opportunity to compare the form and behavior of American species to similar European species. His observations

on and specimens of 17-year cicadas ("locusts") were mentioned and illustrated in Part 22 (Egerton 2006:350–351), and his further observations on them appeared posthumously (Bartram 1804). His observations on the teeth of a rattlesnake (Bartram 1740) possibly did contain new information. Two Ruffed Grouse and a letter on them that he sent to Collinson became the basis of an account with illustration by the ornithologist George Edwards (1754).

Although Bartram's letter is quite informative, Edwards solicited additional information from another American to supplement it. It is a pity that Bartram's perceptive observations on bird migrations, in a letter to Collinson on 22 January 1757, remained unpublished until 1849 (Darlington 1967:211–212).

As Bartram's acquaintances increased, he began making more than a dozen botanical explorations into different parts of British America, 1736–1766 (listed with references in Bartram [1942:2] and described in Berkeley and Berkeley [1982], Coats [1969:273–276]), supported by British patrons and sometimes staying with other American naturalists. In 1736 he traveled to the sources of the Schuylkill River in Pennsylvania; and in 1738 he traveled for five weeks in Virginia, including the Blue Ridge Mountains, covering 1000 miles and spending only one night in each town. He made shorter trips into the pine barrens of New Jersey, the cedar swamps of Delaware, and the Catskill Mountains of New York State. In 1743 he accompanied a diplomat and a surveyor on a peace mission to the Iroquois country of New York, as far as Oswego and Lake George (see maps in Cruickshank 1957:31, Berkeley and Berkeley 1982:93). They left Philadelphia on 3 July and Bartram returned to his farm on 19 August. He kept a journal on "*the inhabitants, climate, soil, rivers, productions, and other matters worthy of notice*," which Collinson published in London in 1751. David S. Wilson (1978:89–122) tried to find positive comments to make on Bartram's "reportage" in both this and in his southern journal, as "literature." From our standpoint, this journal can be characterized as a diligent and competent "ecological survey" of the land through which they traveled, perhaps with future settlement in mind as one important motive for keeping the journal, together with satisfying Collinson's curiosity. Here is an interesting sample, dated 14 July 1743 (Bartram et al.1973:45)

> *At the foot of a hill we crossed the creek once more, and rode along a fine bottom, full of great wild nettles. The timber was sugar* [sic]*, birch, sugar maples, oak and poplar, our course N.W. continued until after 12 o'clock, then followed the east branch N.N.E. about a mile, all a rich bottom where we found a Liching Pond, where we dined, the back parts of our country are full of these liching ponds, some are of black sulphureous mud, some of pale clay, the deer and elk are fond of licking this clay, so that the pond becomes enlarged to a rood or half an acre, the soil, I suppose contains some saline particles agreeable to the deer, who come many miles to one of these places.*

In September 1753 he returned to the Catskills, taking along William, the only one of his four sons who shared his enthusiasms for nature and exploration. Their route has been established by a modern botanist, who provides a commentary on what they observed and collected and a photograph of a cave in which they slept (Evers 1972:73–96, photo facing 105). "Billy" added a new dimension to these trips with drawings of plants, animals, and scenes. After returning home, John Bartram sent Collinson a long letter describing their findings and adventures, including a list of the trees and shrubs of the "Katts kill mountains" (Bartram 1992:357–364). Following that list, John and William sent Collinson a list of 100 trees and shrubs from which they already had collected and sent him seeds; Collinson was so impressed that he sent the list to the *Gentleman's Magazine* (February 1754, 24:65) with the comment that this was "the largest Collection that has ever before been imported into this Kingdom" (Berkeley and Berkeley 1992:364–366).

Meanwhile, John Bartram had written to Collinson on 20 August 1753 that he was beginning to write descriptions of American trees and shrubs (Berkeley and Berkeley 1992:353–354), and later he sent Collinson sample descriptions. On 13 February 1754 Collinson responded that (Berkeley and Berkeley 1992:369)

> *The Descriptions are so exact and Natural that I am always delighted with reading them but my Good Friend I must Impart to thee my doubts—I am afraid the Species are so multiplied that it will be a difficult task to distinguish them Here.*
>
> *The Difference between the Low Land White Oke & the Mountain White Oke is purely owing to their Situation & that cannot be determined but by Experiments; take the acorns of Each & plant in thy Garden. A few years observation will putt the Matter out of Doubt, & the Like may be in the Swamp & Mountain Chesnutt a Difference owing to Soil & situation not Sufficient to constitute Two distinct Species & so of the Spanish & Swamp Spanish Oke. I know this Tribe of Trees Sport so in their Leaves that it is easy for thee to collect Specimens that shall have a great appearance of a distinct Species but the question is will this hold through the Forest.*

Although Bartram went ahead with his descriptions, it seems unlikely that he ever undertook the experiments that Collinson recommended, and this manuscript remains unpublished except for a small sample (Berkeley and Berkeley 1992:777–779).

In 1755 father and son explored in Connecticut. The French and Indian War inhibited travel for several years, but in the spring of 1761 John sailed alone to Charles Town (Charleston), visited Dr. Alexander Garden, and collected South Carolina plants. On the return voyage he visited relatives near Wilmington, North Carolina. In autumn 1761 he decided it was safe to explore western Pennsylvania.

In 1765 Collinson had him appointed as the king's botanist, with a stipend of £50 a year. He then decided to explore from Charleston to the St. John's River, which lasted from 1 July 1765 to 10 April 1766. He took along William as his assistant, which was fortunate, since John Bartram got malaria. That did not stop him very long from exploring and writing another journal. It was the same sort of "ecological survey" as his 1751 journey, though it lasted much longer and went through a very different terrain and vegetation. It may be very interesting to plant ecologists, but other readers could easily become overwhelmed by the many lists of plants found in the many places they visited. This journal's modern editor, Francis Harper, considerably enhanced its usefulness by adding comments, an annotated index, nine maps, and photographs of some of the places visited. Two of the more interesting examples of John Bartram's descriptions are of Wocoma Lake and of a cypress swamp. They reached the lake on 29 July, the early temperature was 79° and it rose to 90° at noon. Wocoma Lake is eight miles long, five miles across, and 12 feet deep. He listed four kinds of fish in it and the trees found along its shores, and described its banks, soil, and a marsh at the exit of the Wocoma River (Bartram 1942:16). His description of the cypress swamp was an exception to his general rule of giving location and date, apparently because they encountered several of them that were very similar (Bartram 1942:49).

Arthur Dobbs was a well-off member of the Protestant Irish gentry with an interest in gardening. He ordered plants from Bartram through Collinson by 1747 and began writing Bartram directly on 5 May 1749 (Berkeley and Berkeley 1992:285, 298). Although Dobbs published only five papers in the Royal Society of London's *Philosophical Transactions*, his competency as a naturalist is seen in his article, "Concerning Bees, and their

Method of Gathering Wax and Honey" (1750), which challenged Réaumur's report (1740) that a given bee might visit several species of flowers on a single collecting trip before returning to the hive (Grant 1949). Dobbs watched a number of bees and only saw them visit a single species of flower during a particular trip, and he pointed out that this habit was important for ensuring that bees distributed pollen only to flower pistils where it could pollinate seeds. This was 11 years before Joseph Gottlieb Kölreuter published his more famous account of the role of insects in pollination.

Dobbs became governor of North Carolina in 1754 (Snapp 1999), and William Bartram visited him there in July 1761. (John Bartram visited the governor of North Carolina on 8 August 1765, but it was not Dobbs, who had died on 28 March.) On 2 April 1759, Dobbs wrote to Collinson in London about a North Carolina plant Dobbs called a "Catch Fly sensitive," which we call Venus Flytrap (*Dionaea muscipula*). It grows wild only on the coastal plain of parts of North and South Carolina. Dobbs reported that it grows at 34° but not at 35° latitude (letter quoted in Nelson 1990:11–14). If Dobbs tried to send Collinson a specimen, it did not arrive, and it was not until May 1765 that John Bartram rewarded Collinson's persistent requests with flowers and leaves from one (Nelson 1990:20, Berkeley and Berkeley 1992:593). John's son William had apparently brought one back to Philadelphia from North Carolina. Collinson was pleased at last to see parts of a Venus Flytrap, but the public only became captivated by it when a live plant reached London in the summer of 1768. The botanist John Ellis sent a description to *The St. James's Chronicle* on 1 September (reprinted in Nelson 1990:38), and John Roberts made a good engraving of one based on Ellis' sketch. Ellis sent copies of the engraving to various botanists, including Linnaeus.

John Bartram, by taking William along on his longest, most arduous, and last trip in 1765–1766, inadvertently opened the door to the greatest adventure in William's life—an even longer trip: through North and South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana, from 20 March 1773 to January 1777. (Francis Harper provides a map of his route in Bartram 1958; 37 miles of his route in South Carolina is now marked as the Bartram Trail [Bolgiano 1998:131]). William Bartram had a pleasant personality, artistic talent, and shared his father's love of nature, but economically he was a ne'er-do-well (Earnest 1940, Slaughter 1996, Peck 1999, Simpson 2004). After leaving a business apprenticeship in Philadelphia and then another one with his father's half-brother in eastern North Carolina, his father bought him a site for a Florida plantation, which was a bust almost from the start—he discovered one had to whip new slaves to get them to work. This trip was, therefore, an escape from failure in the wrong context, to success in a context where he felt at home (Porter 1993).

William's exploration was funded by an English collector-friend of his father, Dr. John Fothergill (Corner and Booth 1971), who wanted William to send him plants, seeds, descriptions of his journey, and drawings. William fulfilled his commitments (Bartram 1968, Rice 1999:120–141), and two of his journals that were sent to Fothergill have survived and are now published (Bartram 1943), but they only cover William's travels for 1773–1774. Harper edited them in the same helpful way that he did for John Bartram's journal, with annotations, maps, and photographs. William Bartram's reputation is closely tied to his famous and only book, his *Travels* (1791), which covers the entire trip. The importance of his now-published journals (1943) is that they contain some details omitted from the book, and they show that William's writings were not polished by some anonymous editor but by himself.

William left home on 20 March and sailed to Charleston, where he contacted Dr. Lionel Chalmers, who became William's American agent for Fothergill. William's "ecological surveys" were rather similar in many respects to those of his father, but they also revealed more of his personality and emotions than his father's did. For example, at a time before the Bald Eagle became our national symbol, he complained that it was "an execrable tyrant: he supports his assumed dignity and grandeur by rapine and violence, extorting unreasonable tribute and subsidy from all the feathered nations" (Bartram 1958:5).

Fig. 3. Young William Bartram. (Philadelphia) *North American*, 20 December 1908. From Berkeley and Berkeley 1992:326.

Fig. 4. Limpkin (*Aramus guarauna pictus*), drawn, described, and named by William Bartram (Barton 1818).

Most of his observations were not that anthropomorphic. Here are his close observations of lupine and its soil, which he made some 60 miles south of the Alatamaha River (Bartram 1958:14)

> *...a beautiful species of Lupin, having pale green villous lingulate leaves; the flowers are disposed in long erect spikes, some plants produce flowers of the finest celestial blue, others incarnate, and some milk white, and though they all three seem to be varieties of one species, yet they associate in separate communities, sometimes approaching near each other's border, or in sight at a distance. Their districts are situated on dry sandy heights, in open pine forests, which are naturally thin of undergrowth, and appear to great advantage; generally, where they are found, they occupy many acres of surface. The vegetative mould is composed of fine white sand, mixed, and coloured, with dissolved and calcined vegetable substances; but this stratus is not very deep….*

Although most of his travels were on the coastal plain, he also ventured into the edge of the Appalachian Mountains, describing both the topography and trees encountered, much as his father had in his 1743 trip to Lake Ontario, even including a visit to a Buffalo Lick, which is near Philomath, in Oglethorpe County, Georgia

(Bartram 1958:24–26 and Harper's Fig. 7). In a shoal on a branch of the Broad River, he saw (Bartram 1958:28)

> *...a number of little gravelly pyramidal hills, whose summits rose almost to the surface of the water, very artfully constructed by a species of small cray-fish (*Cancer macrourus*) which inhabited them: here seemed to be their citadel, or place of retreat for their young, against the attacks and ravages of their enemy, the gold-fish [*Notropis lutipinnis*, Harper's Fig. 8]: these, in numerous bands, continually infested them, except at short intervals, when small detachments of veteran cray-fish sallied out upon them, from their cells within the gravely pyramids, at which time a brilliant sight presented: the little gold-fish instantly fled from every side, darting through the transparent waters like streams of lightning; some even sprang above the surface, into the air, but all quickly returned to the charge, surrounding the pyramids as before, on the retreat of the cray-fish; in this manner the war seemed to be continual.*

Later, he borrowed a canoe and drifted down the Alatamaha River, merely using his paddle to steer. Along the way, he discovered what he called the crying bird, which was a translation of the Indian name for it. Bartram (1958:93) described it for the first time and gave it a scientific name, *Tantalus pictus*. It is now called the Limpkin (*Aramus guarauna pictus*); his drawing of it was not included in his book, but was finally published 27 years later (Barton 1818).

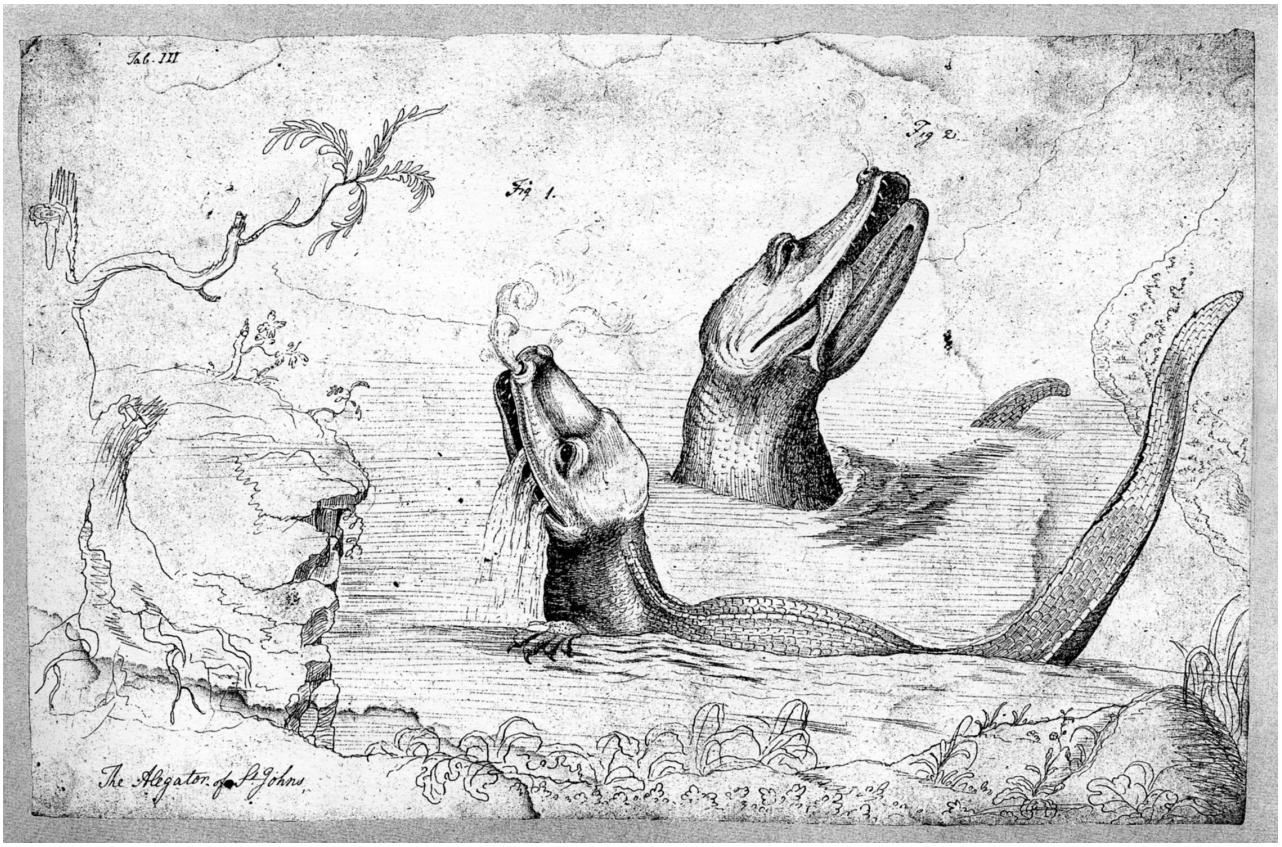

Fig. 5. Alligators in St. John River. Bartram 1943: Plate XIV.

Near St. Augustine he saw millions of mayflies (*Hexagenia orlando*), which he called Ephemera, emerging from the St. John River near shore. He was aware that they mate and die in the same day, and he described their life history. After watching various birds, frogs, and fish eating them, he thought that one is "apt to imagine them created merely for the food of fish and other animals" (Bartram 1958:54). He also saw in the river vast quantities of water lettuce (*Pistia stratiotes*) "in large communities, or floating islands, some of them a quarter of a mile in extent, and are impelled to and fro, as the wind and current may direct" (Bartram 1958:57). He noted that they have long fibrous roots and that in storms they were often blown ashore. His editor, Francis Harper, noted that water hyacinth (*Eichhornia crassipes*) was introduced about 1884 and largely replaced the water lettuce (Bartram 1958:352). The St. John River flows through Lake George, and William explored an island in it and found the remains of an Indian village. Now that the Indians were gone, the island contained abundant deer, turkey, bear, wolves, wild cats, squirrels, raccoons, and opossums. He described from there the shrub "Lantana (perhaps Lant. Camerara. Lin. Syst. Veget. p. 473)" that grew "in coppices in old fields" to five or six feet high (Bartram 1958:67). At Lake Dexter he saw families of painted summer teal (Wood Duck, *Aix sponsa*) swimming along, with the young being eaten by trout (= large-mouthed bass, *Micropterus salmoides*), which were, in turn, eaten by alligators (Bartram 1958:75). He became appropriately fearful of a gigantic alligator that menaced his canoe until he beat it off, and then he fled to shore.

Even then, others came ashore as he cleaned fish, and at night he had to fire his gun at two bears to chase them away (Bartram 1958:76). Equally fearsome were rattlesnakes. On his previous trip to Florida, he came close to stepping on one, but his father saw it and warned him in time. He was so agitated that he seized a stick and killed it. On another occasion, at the request of Indians, he killed one that had wandered into their camp (Bartram 1958:164–170), yet on other occasions he was glad to spare their lives.

An animal that he did not find threatening, and the subject of a long verbal description as well as two illustrations (one of the head at natural size is not reproduced here), was the southern soft-shelled turtle (*Amyda ferox*), whose habits he also observed (Bartram 1958:114)

> *They bury themselves in the slushy bottoms of rivers and ponds, under the roots of flags and other aquatic herbage, leaving a hole or aperture just sufficient for their head to play through; in such places they withdraw themselves when hungry, and there seize their prey by surprise, darting out their heads as quick as lightning, upon the unwary animal that unfortunately strolls within their reach: they can extend their neck to a surprising length, which enables them to seize young fowl swimming on the surface of the water above them, which they instantly drag down.*

Spending years in Florida, he inevitably experienced a hurricane, which was frightening, and afterwards he visited a plantation where the buildings were flattened and the crops destroyed, but no one was hurt (Bartram 1958:89–91). The plantation owner took him to see a vast mineral spring of hot, transparent water which had a bad taste and smell, but it contained a prodigious number and variety of fish.

Bartram provided in his *Travels* numerous lists of plants for places where he stopped. One of the plants which he discovered and illustrated in his book he named *Ixea caelestina* (= *Salpingostylis caelestina*), but all he said about it was "*behold the azure fields of cerulean Ixea!*" (Bartram 1958:98). It was not seen again until 156 years later (Bartram 1958:360).

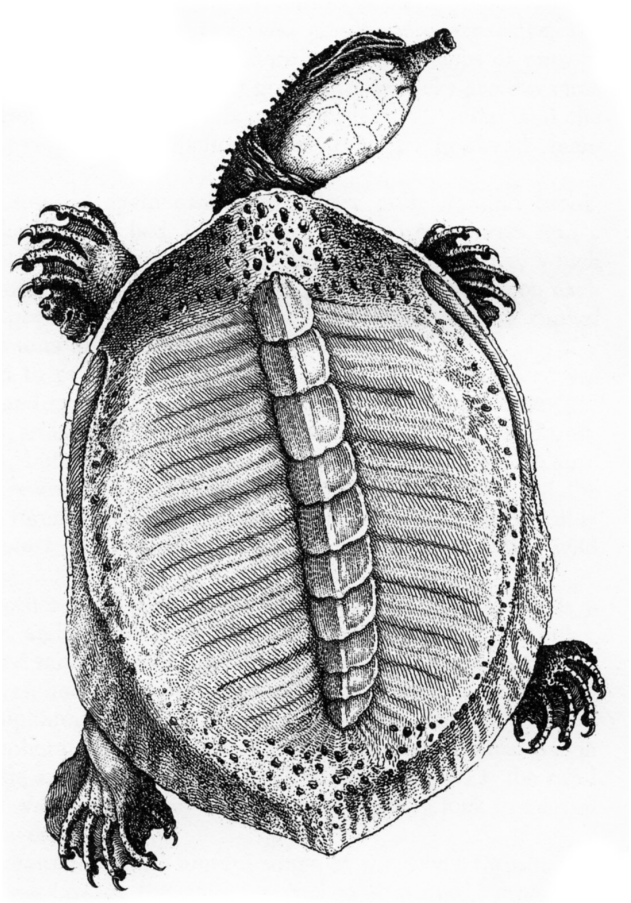

Fig. 6. Southern soft-shelled turtle. Bartram 1928: facing p.110.

Fig. 7. Cerulean Ixea (*Salpingostylis caelestina*) (Bartram 1928: facing p. 142).

When he found a Venus flytrap, which he called by its scientific name, *Dioneae muscipula*, he credited his father with first sending it to the Old World (Bartram 1958:299). In the introduction to his book, he discussed plant physiology and briefly noted that the *Sarracenia* (pitcher plants), *Drossea rotundifolia* (sundew), and *Dioneae muscipula* are all insect catchers. For that brief statement, William Bartram is credited with first pointing out that pitcher plants capture insects (Bartram 1958:liv, 335). He also drew the pitcher plant, but the illustration was among those sent to Fothergill and was not available for use in his own book (Bartram 1968:49, 61, Plates 5, 22). However, he drew another illustration of it for a fold-out frontispiece to the first American textbook of botany (Barton 1803). I own a copy of Barton's book, but the picture's paper is too discolored to reproduce here.

Bartram's *Travels* is a valuable first-hand account of southeastern Indians, and the passages that discuss them are collected by two anthropologists into a book, with his other writings on Indians, some of which were not previously published. We might consider William Bartram as among the first to see humans as interacting with the

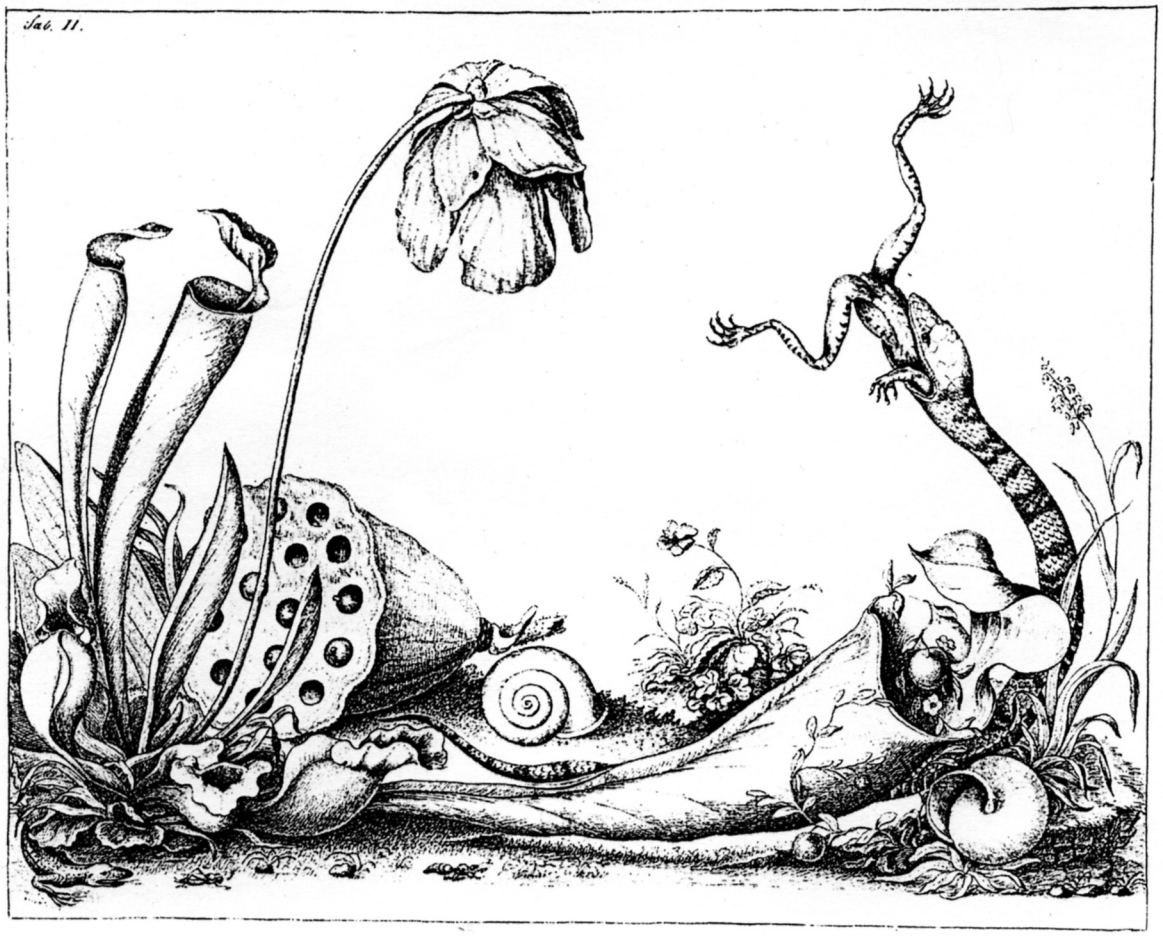

Fig. 8. One of William Bartram's illustrations of a pitcher plant in bloom, with other plants and animals—sent to Collinson in London.

environment in a way comparable to the interactions of other species. On Colonel's Island, he found a prehistoric shell midden and dug into it to find both shells and broken pottery (Bartram 1995:34). On the banks of the Little River, he found evidence of prehistoric settlements and commented that the fruit and nut trees found there (he listed seven) had obviously been planted by the Indians, even though they were native to the area (Bartram 1995:39). He also described an Indian successfully spearing a 15-pound "salmon trout" (= large-mouthed bass, *Micropterus salmoides*) with a "reed" (probably *Arundinaria tecta*) harpoon (Bartram 1995:40). As he canoed up the slow-moving St. John River he passed an Indian village of 8 or 10 dwellings and listed seven different crops grown on "several hundred acres of cleared land" (Bartram 1995:45), beside an orange grove.

Indians frequently burned "deserts" to drive game into the open, and the fires attracted eagles, vultures, and crows to eat roasted frogs, snakes, and lizards. Indians used the teeth of gar to arm arrows, and they cooked gar by covering them with hot embers. The village of Cuscowilla, with about 30 habitations, treated him to a banquet of venison cooked in bear oil, corn cakes, milk, and hominy, and a drink of honey and water. They formerly lived at the edge of the wet Alachua Savanna but moved about two miles away because of the alligators, stench of putrid

Fig. 9. Mico Chlucco (Long Warrior) (Bartram 1928:facing 184).

fish, and the mosquitoes. Bartram listed a dozen plants grown in individual gardens. Youths and the elderly, armed with bow and arrows, guarded the fields against birds and mammals that might eat the vegetables, and at night men guarded corn fields from bears, raccoons, and deer (Bartram 1995:49–55).

At Spalding's Lower Store on Lake George, in late July 1774, Bartram observed a long negotiation between the Seminole chief, Mico Chlucco (Long Warrior), and Charles McLatchie, who ran the store. The Seminoles wanted McLatchie to provide them with goods on credit, to be paid later with deer skins, assuming they survived a war on which they were embarking. He was reluctant to do so but eventually gave in (Bartram 1995:65–70). While watching the negotiations, Bartram drew Mico Chlucco's portrait, and it became the frontispiece of Bartram's *Travels* (1791).

He devoted a very long Chapter 10 in Part II to lists and discussions of all the vertebrates he encountered, excepting fish, which he discussed often, especially when caught to eat. His brief descriptions of appearance and habits of amphibians, reptiles, and mammals (Bartram 1958:170–178) was the sort of inventory science that Basalla (1967) discussed. When he got to birds, the scope of his account expanded to encompass birds of

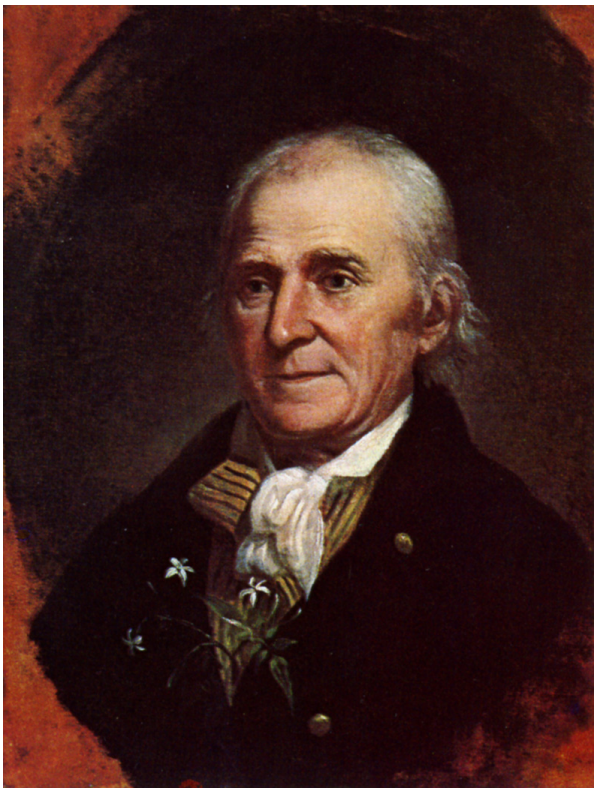

Fig. 10. William Bartram, by Charles Willson Peale, 1808. Independence National Historical Park, Philadelphia.

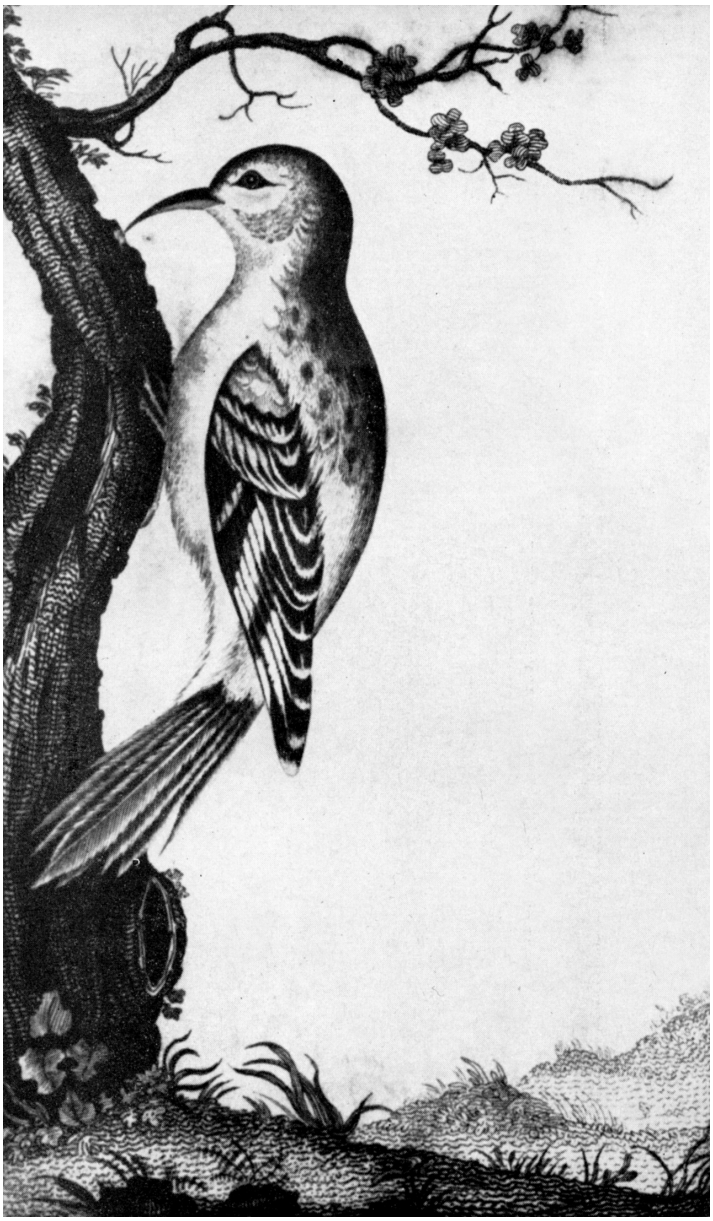

Fig. 11. Brown Creeper (Bartram 1805; from Cruickshank 1957, facing p. 203).

Pennsylvania and North Carolina, as well as those of Florida, and the length of the account was almost twice that for the other vertebrates (Bartram 1958:178–191). For 215 bird species he used symbols to indicate whether they (1) arrive in Pennsylvania in spring from the South and return there in fall, (2) arrive in Pennsylvania in fall from the North and return there in spring, (3) arrive in Carolina and Florida in spring from the South and return there toward winter, (4) are year-round natives of Carolina and Florida, and (5) are year-round natives of Pennsylvania. This was the most thorough list of eastern birds published by then, which included species previously unknown (Allen 1951:536–543). Bartram also corrected Catesby's account of only single notes of the Catbird, Brown Thrasher, and Wood Thrush—all accomplished singers—as due to his having heard them only in winter (Bartram 1958:189–190).

After returning home from his frontier explorations in early 1777, he lived at his father's farm, which a brother inherited, and wrote his book. He had had a good education, inherited his father's talent for careful observation and his enthusiasm for nature, and William's respect for Indians came across very well in his *Travels* (1791). Being in the wilderness was a romantic religious experience for William Bartram, yet his emotional highs were never an excuse for vague observations. On the contrary, they motivated him to make close observations, and his emotional responses appealed to his readers. His book was an unanticipated success in America and even more so in Europe (Fagin 1933). Editions appeared in London (1792) and Dublin (1793), and the work was translated into German (Berlin, 1793) and French (Paris, 1799).

Bartram was 52 when his *Travels* appeared. He continued his natural history observations for the rest of his life, and he lived to be 84. He published an interesting account of a pet crow's behavior in 1804 (reprinted in Bartram 1996:573–576), and published the first account of the brown creeper in 1805, which included these observations (reprinted in Bartram 1996:582–583 and Cruickshank 1957:305–306)

> *This species of Certhia is an autumnal bird of passage from the North. They arrive and appear in the environs of Philadelphia about the first of October (sooner or later, according to the severity of the season) and continue with us during the winter, if it be temperate. Or they pass on southerly as far as Carolina and Florida, where they winter, but return northerly in the spring to breed and rear their young. I have not heard of their breeding in Pennsylvania, yet they may breed in the most northern district of the state.*

> *Their place of residence is in the woods or high forests, where we see them climbing up and running about the trunks of large trees, searching the crevices of the bark for spiders and other insects, which constitute their food. And for this purpose, their slender, curved beak is well adapted. They utter a feeble, chirping note.*

> *This species of Certhia has the form and habits of the woodpecker, except in the position of its toes. Neither is its bill like that of the woodpecker, strong and shaped for the purpose of perforating wood.*

Bartram's further observations on bird migrations and the weather, from the vicinity of his home, were published a century later (Stone 1913). His most important contribution to ornithology was more intangible; he mentored Alexander Wilson, who became America's first great resident ornithologist (Burtt and Davis 1995:193–198, Egerton 2004*b*).

John and William Bartram illustrate the successful transfer of European science to America. Their discoveries, writings, and William's drawings were of great interest to other naturalists at home and abroad, and they made important contributions to an ecological natural history. Furthermore, nature writers for the general public have ensured that both Bartrams are part of America's remembered heritage (Peattie 1936:186–215, Herbst 1954, Cruickshank 1957, Sutton and Sutton 1963, Borland 1975, Elman 1977:26–47, Welles 1978, Oeland 2001).

Literature cited

Allen, E. G. 1951. The history of American ornithology before Audubon. American Philosophical Society Transactions 41:386–591.

Barton, B. S. 1803. Elements of botany: or outlines of the natural history of vegetables. Barton, Philadelphia,

Pennsylvania, USA.
Barton, B. S. 1818. Some account of the Tantalus ephouskyca, a rare American bird. Linnean Society of London Transactions 12:24–27 + 1 plate.
Bartram, J. 1740. Concerning a cluster of small teeth observed at the root of each fang or great tooth in the head of a rattle-snake, upon dissecting it. Royal Society of London Philosophical Transactions 41:358–359.
Bartram, J. 1744. Some observations concerning the salt-marsh muscle, the oyster-banks, and the fresh-water muscle, of Pennsylvania. Royal Society of London Philosophical Transactions 43:157–159.
Bartram, J. 1745. An account of some very curious wasps nests made of clay in Pennsylvania. Royal Society of London Philosophical Transactions 43:363–365 + Figs. 1–8 on Tab. III.
Bartram, J. 1749. A description of the great black wasp, from Pennsylvania. Royal Society of London Philosophical Transactions 46:278–279 + Figs. 20–21 on Tab IV.
Bartram, J. 1750*a*. Some observations on the dragon-fly or Libella of Pennsylvania. Royal Society of London Philosophical Transactions 46:323–325.
Bartram, J. 1750*b*. A further account of the Libellae or may-flies. Royal Society of London Philosophical Transactions 46:400–402.
Bartram, J. 1751. Observations on the inhabitants, climate, soil, rivers, productions, animals, and other matters worthy of notice. Made by John Bartram, in his travels from Pennsylvania to Onondago, Oswego and the Lake Ontario, in Canada. J. Whiston and B. White, London, UK.
Bartram, J. 1763. Observations made at Pennsylvania, on the yellow wasp of that country. Royal Society of London Philosophical Transactions 53:37–38.
Bartram, J. 1804. Additional observations on the Cicada septendecim. Medical and Physical Journal 1:56–59.
Bartram, J. 1942. Diary of a journey through the Carolinas, Georgia, and Florida from July 1, 1765 to April 10, 1766. F. Harper, editor. American Philosophical Society Transactions 33:iv + 1–120 + 22 plates.
Bartram, J., L. Evans, and C. Weiser. 1973. A journey from Pennsylvania to Onondaga in 1743. Imprint Society, Barre, Massachusetts, USA.
Bartram, W. 1791. Travels through North & South Carolina, Georgia, East & West Florida, the Cherokee Country, the extensive territories of the Muscogulges, or Creek Confederacy, and the country of the Chactaws; containing an account of the soil and natural productions of those regions, together with observations on the manners of the Indians. James & Johnson, Philadelphia, Pennsylvania, USA.
Bartram, W. 1804. Anecdotes of an American crow. Philadelphia Medical and Physical Journal 1:89–95. Reprinted in Bartram 1996:573–576.
Bartram, W. 1805. Description of an American species of certhia, or creeper. Philadelphia Medical and Physical Journal 2:103–106. Reprinted in Bartram 1996:582–583.
Bartram, W. 1928. Travels. Mark Van Doren, editor. Macy-Masius, New York, New York, USA.
Bartram, W. 1943. Travels in Georgia and Florida, 1773–74: a report to Dr. John Fothergill. F. Harper, editor. American Philosophical Society Transactions 33:121–242 + 26 plates.
Bartram, W. 1958. The travels of William Bartram: naturalist's edition. F. Harper, editor. Yale University Press, New Haven, Connecticut, USA.
Bartram, W. 1968. Botanical and zoological drawings, 1756–1788. J. Ewan, editor. American Philosophical Society Memoirs 74:xii + 1–180 + 60 plates.
Bartram, W. 1995. William Bartram on the southeastern Indians. G. A. Waselkov and K. E. L. Braund, editors. University of Nebraska Press, Lincoln, Nebraska, USA.
Bartram, W. 1996. Travels and other writings. T. P. Slaughter, editor. Library of America, New York, New York, USA.
Basalla, G. 1967. The spread of western science. Science 156:611–622.

Berkeley, E., and D. S. Berkeley. 1982. The life and travels of John Bartram: from Lake Ontario to the River St. John. University Press of Florida, Gainesville, Florida, USA.

Berkeley, E., and D. S. Berkeley, editors. 1992. The correspondence of John Bartram, 1734–1777. University Press of Florida, Gainesville, Florida, USA.

Bolgiano, C. 1998. The Appalachian forest: a search for roots and renewal. Stackpole Books, Mechanicsburg, Pennsylvania, USA.

Borland, H. April 1975. The memorable Bartrams. American Heritage 26(3):66–72.

Burtt, E. H., Jr., and W. E. Davis, Jr. 1995. Historic and taxonomic implications of recently found artwork in arithmetic books of students of Alexander Wilson. Wilson Bulletin 107:193–213.

Chaplin, J. E. 2006. The first scientific American: Benjamin Franklin and the pursuit of genius. Basic Books, New York, New York, USA.

Coats, A. M. 1969. The plant hunters: being a history of the horticultural pioneer, their quests and their discoveries. Studio Vista, London, UK.

Corner, B. C., and C. C. Booth. 1971. Chain of friendship: selected letters of Dr. John Fothergill of London, 1735–1780. Harvard University Press, Cambridge, Massachusetts, USA.

Cruickshank, H. G., editor. 1957. John and William Bartram's America: selections from the writings of the Philadelphia naturalists. Devin-Adair, New York, New York, USA.

Cutting, R. M., compiler. 1976. John and William Bartram, William Byrd II, and St. John de Crevecoeur: a reference guide. G. K. Hall, Boston, Massachusetts, USA.

Darlington, W. 1967. Memorials of John Bartram and Humphrey Marshall. J. Ewan, editor. First edition, 1849. Hafner, New York, New York, USA.

Dobbs, A. 1750. Concerning bees, and their method of gathering wax and honey. Royal Society of London Philosophical Transactions 46:536–549.

Earnest, E. P. 1940. John and William Bartram, 1699–1777, 1739–1823: botanists and explorers. University of Pennsylvania Press, Philadelphia, Pennsylvania, USA.

Edwards, G. 1754. Concerning the pheasant of Pennsylvania, and the Otis minor [of England]. Royal Society of London Philosophical Transactions 48:499–503 + 2 plates.

Egerton, F. N. 2004*a*. John Bartram (1699–1777), botanist and explorer in America. Oxford Dictionary of National Biography 4:216–217.

Egerton, F. N. 2004*b*. Alexander Wilson (1766–1813), ornithologist. Oxford Dictionary of National Biography 59:478–479.

Egerton, F. N. 2006. A history of the ecological sciences, part 22: early European naturalists in eastern North America. ESA Bulletin 87:341–356.

Elman, R. 1977. First in the field: America's pioneering naturalists. Van Nostrand Reinhold, New York, New York, USA.

Evers, A. 1972. The Catskills from wilderness to Woodstock. Doubleday, Garden City, New York, USA.

Fagin, N. B. 1933. William Bartram: interpreter of the American landscape. Johns Hopkins University Press, Baltimore, Maryland, USA.

Grant, V. 1949. Arthur Dobbs (1750) and the discovery of pollination of flowers by insects. Bulletin of the Torrey Botanical Club 76:217–219.

Harkányi, K. 1990. The natural sciences and American scientists in the Revolutionary Era. Greenwood Press, New York, New York, USA.

Herbst, J. 1954. New green world. Hastings House, New York, New York, USA.

Mack, R. N. 2003. Plant naturalizations and invasions in the eastern United States: 1634–1860. Annals of the Missouri Botanical Garden 90:77–90.

Nelson, E. C. 1990. Aphrodite's mousetrap: a biography of Venus's flytrap with facsimiles of an original pamphlet and the manuscripts of John Ellis, F. R. S. Boethius Press, Aberystwyth, UK.
Oeland, G. March 2001. William Bartram: a naturalist's vision of frontier America. National Geographic Magazine 104–123.
Peattie, D. C. 1936. Green laurels: the lives and achievements of the great naturalists. Simon and Schuster, New York, New York, USA.
Peck, R. M. 1999. William Bartram (9 April 1739–22 July 1823). American National Biography 2:297–299.
Porter, C. M. 1989. The drawings of William Bartram (1739–1823), American naturalist. Archives of Natural History 16:289–303.
Porter, C. M. 1993. Philadelphia story: Florida gives William Bartram a second chance. Florida Historical Quarterly 71:310–323.
Réaumur, R. 1740. Mémoire pour server à l'histoire des insects. Volume 5. Académie Royale des Sciences, Paris, France.
Rice, T. 1999. Voyages of discovery: three centuries of natural history exploration. Natural History Museum, London, UK.
Silver, B. 1978. William Bartram's and other 18th-century accounts of nature. Journal of the History of Ideas 39:597–614.
Simpson, M. B., Jr. 2004. William Bartram (1739–1823), botanist and ornithologist. Oxford Dictionary of National Biography 4:217–219.
Slaughter, T. P. 1996. The natures of John and William Bartram. Knopf, New York, New York, USA.
Snapp, J. R. 1999. Arthur Dobbs (1689–1765), colonial governor of North Carolina. American National Biography 6:657–659.
Stone, W. 1913. Bird migration records of William Bartram. Auk 30:325–358 + 3 plates.
Sutton, A., and M. Sutton. 1963. Exploring with the Bartrams. Rand McNally, Chicago, Illinois, USA.
Thomas, P. D. 1999. John Bartram (23 March 1699–22 September 1777). American National Biography 2:296–297.
Welles, E. O., Jr. 1978. William Bartram's trail through nature. Pages 34–63 *in* R. L. Breeden and P. B. Silcott, editors. Into the wilderness. National Geographic Society, Washington, D. C. , USA.
Wilson, D. S. 1978. In the presence of nature. University of Massachusetts Press, Amherst, Massachusetts, USA.

Acknowledgments

For their assistance I thank Jean-Marc Drouin, Muséum National d'Histoire Naturelle, Paris, Anne-Marie Drouin-Hans, Université de Bourgogne, and Professor Emeritus Robert P. McIntosh, Department of Biology, University of Notre Dame (now in Florida).

Frank N. Egerton
Department of History
University of Wisconsin-Parkside
Kenosha WI 53141
E-mail: frank.egerton@uwp.edu