

"Mem. Bartram. —"

On Charles Darwin's reading of William Bartram's Travels

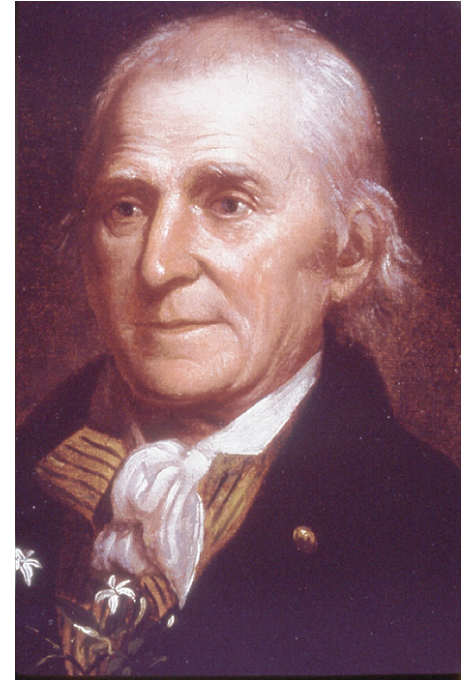
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*Portrait of a young Charles Darwin
by G. Richmond*

England (earning his the title of Botanist to the King in 1765), and as a correspondent to the Royal Society through his friend and English agent Peter Collinson. The elder Bartram was also co-founder of the American Philosophical Society with Benjamin Franklin, member of the influential Lunar Society that often met at the Lichfield home of Charles's remarkable grandfather Erasmus Darwin, who authored poetical works on botany among many other things. William achieved fame of his own among these learned men. His *Travels*, appearing in 1792 in England, had a major impact on Romantic writers of the time, including Wordsworth, Shelley, and Coleridge — writers who in turn knew the Darwins as well as the family of Charles's other distinguished grandfather, Josiah Wedgwood. A later generation of naturalists drew on William Bartram less for poetic inspiration than for his detailed and accurate natural history observations. Charles Darwin was foremost among them. Darwin became convinced of evolution, or transmutation, in the parlance of the day, just 14 years after Bartram's death. That was March of 1837, five months after returning from his voyage around the world aboard HMS *Beagle*, but he did not reveal his ideas to the world until the publication of his epochal *Origin of Species* some two decades later in 1859. The time in between was devoted to an expansive research program, resulting in several books and dozens of articles.



*Portrait of a William Bartram by
Charles Willson Peale*

The double Darwin anniversary year of 2009 — being the bicentennial of Darwin's birth and the sesquicentennial of the publication of his *Origin of Species* — presented me with an excuse to explore intersections between the great English naturalist and another of my favorite naturalists, one whose contributions were largely made in the century previous to Darwin, and a continent away. I am referring to William Bartram, of course. Bartram died when Darwin was just a lad of 14 years, but his explorations in the American southeast had become well known in the circles that included the Darwin family. His father John Bartram's fame preceded him in those circles, both as a renowned horticulturist whose talents fueled the passion for American plants in Georgian

He was all the while amassing evidence in support of his ideas, drawing from such far-ranging subjects as domestication, behavior, paleontology, hybridization, anatomy, and geographical distribution of plants and animals. He corresponded with dozens of naturalists, devised experiments, made meticulous observations, and, perhaps above all, read voraciously. Accounts of travel and exploration figure prominently in Darwin's reading. He kept a journal of the books he read, and I counted over 110 entries with "voyage," "journey," "travel," "expedition," "exploration," "tour," "narrative," "ramble," "visit," "sojourn," or "wandering" in the title between 1838 and 1860 (Vorzimmer 1975). Bartram's *Travels* is listed in April of 1839.

At the end of the C Notebook (one of Darwin's notebooks devoted to his investigations of transmutation; see Barrett et al. 1987), in a section headed "Books examined: with [reference to] Species," we find the *Travels* amid an astonishing array of books – works on instinct, animal breeding, ethical philosophy, ornithology, and more, including, of course, several other travels. Some books were read cover to cover, and others were rapidly skimmed for useful and interesting parts. Darwin would read these sections in some detail, taking notes that were then compiled thematically or pasted into a notebook or even into the margin of another book related to that topic. In this way he covered much ground, pulling together information from many sources and many research areas.

So what was in Bartram's *Travels* that caught Darwin's attention? Several of Bartram's observations appear in Darwin's notebooks, letters, and manuscripts, including a few which made it into Darwin's books. Looking first at the notebooks from the period 1838-1839, one entry makes reference to page 23 (xxiii) in the Introduction to the *Travels*. Darwin does not indicate what exactly caught his attention on this page, but most of it is dedicated to seed dispersal mechanisms – transport by wind, by adhering to fur, being carried in the stomachs of animals, etc. Another Bartram entry is found in Darwin's geological notebook, in reference to observations of petrified trees. The geologist Sir Charles Lyell, who became one of Darwin's closest friends, discussed upright petrified trees in his 1838 book *Elements of Geology*. Darwin scored the passage in his copy of Lyell's book, and wrote in the margin "Mem. Bartram – See scrap of paper pasted at end of Book A." Book A is his geology notebook. This scrap does not survive in the notebook, but could

refer to one of two reports on petrified trees in the *Travels*. On p. 435 of the *Travels* Bartram reports coming upon upright fossil cypress stumps embedded in cliffs along the Mississippi: "These stumps are sound, stand upright, and seem to be rotted off about two or three feet above the spread of their roots; their trunks, limbs, &c. lie in all directions about them." Later, traveling in coastal North Carolina on the return trip home, Bartram reported that "in the banks of a creek, five or six feet below the sandy surface, are to be seen projecting out many feet in length, trunks of trees petrified to very hard stone..." (*Travels* p. 476). Since Darwin refers in his A notebook to Lyell's observation "On Vertical trees," he probably has Bartram's observations from Mississippi in mind, which specifies *upright* stumps.

Lyell, by the way, later visited the US and consciously followed in Bartram's footsteps, visiting sites Bartram mentions across the south. In Lyell's book *A Second Visit to the United States of North America* (1849), he writes about visiting Bartram's fossil cypress site: "I had been urged by Dr. Carpenter to examine the geology of [Port Hudson bluff], which I had also wished to do, because Bartram, in his travels, in 1777, discovered there the existence of a fossil forest at the base of the tall cliff, and had commented with his usual sagacity on the magnitude of the geographical changes implied by its structure." The significance of Bartram's observations to both Lyell and Darwin pertain to the upright condition of the trees: they were petrified *in situ*, reflecting slow changes to the landscape rather than rapid, cataclysmic changes, which would have knocked the trees down. This deeply resonated with their gradualist, uniformitarian, view of earth history.



Changes in the land and its effects on species lies at the heart of another Bartram observation, this time pertaining to the celebrated *Franklinia alataamaha*. Both Darwin and Lyell commented on this, in connection with the puzzle of species rarity and the causes of extinction. Why are some species common and others rare? In his *Second Visit* Lyell quoted from Darwin's *Journal of Researches* (later published as *Voyage of the Beagle*): "If," says Darwin, "two species of the same genus, and of closely allied habits, people the same district, and we cannot say why one of them is rare and the other common, what right have we to wonder if the rare of the two should cease to exist altogether?" Lyell continued: "In illustration of this principle, I may refer to two beautiful evergreens flourishing in...Georgia, species of *Gordonia* (or *Franklinia* of Bartram), a plant allied to the camellia." Loblolly bay, Lyell wrote, "has a wide range in the southern states, whereas [*Franklinia*] is confined...to a very limited area...the same region where Bartram discovered it, seventy years ago, near Barrington Ferry, on the Altamaha."

Lyell maintains that regardless of why one species is common and another rare, rarity now does not mean rarity or even extinction in the future: "If we were told that one these two evergreens was destined in the next 2000 or 3000 years to become extinct, how could we conjecture which of them would endure the longest? ...we should require to foresee a countless number of other circumstances in the animate and inanimate world affecting the two species, before we could make a probable guess as to their comparative durability" (Lyell 1838 pp. 350-352). For his part, Darwin agreed; "I was glad," he wrote in a letter to Lyell, "to see your remarks on Extermination, & the striking instance of the tree of Bartram." Similarly, in *Natural Selection*, the forerunner manuscript to the *Origin of Species* (see Stauffer 1975), Darwin cites Bartram's "singular and unaccountable circumstance" of the tiny range of *Franklinia* in connection with a discussion of species that are rare in the broad sense, yet are abundant where they do occur. Alas, we know all too well that, far from eventually flourishing, *Franklinia* was likely extinct in nature even as Lyell and Darwin wrote these passages.

Darwin's musing on the significance of *Franklinia's* rarity did not make it into the *Origin of Species*; Darwin was compelled to edit his *Natural Selection* manuscript down considerably once naturalist Alfred Russel Wallace independently discovered the principle of natural selection and nearly scooped Darwin by writing a paper describing the process and arguing for transmutation. Their respective papers on the subject were read at the Linnean Society of London on the 1st of July 1858, and Darwin was then under pressure to get his book out quickly to assert his priority. *Natural Selection* was pared down to *On the Origin of Species* to such a degree that

Darwin always called it an "abstract."

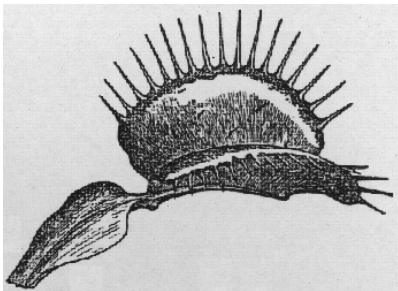
Another Bartram reference that appears in *Natural Selection* but did not make it into the *Origin* pertains to geographical botany. While researching the geographical distributions of species Darwin puzzled over why related species are found in distantly separated parts of the globe. In his time, before movement of the continental plates was known, Darwin's speculations relied on climatic oscillations that opened and closed "corridors" of suitable conditions over time, allowing species to migrate across continents and between hemispheres. Botanists had shown a correspondence between some of the plant species of northern Europe and those found on the other side of the world, as far south as Patagonia. How did northerly species, or their relatives, get so far south? Darwin's idea was that the Appalachian chain served as a corridor whereby northern species could migrate south, augmented by fluctuating sea levels and climatic shifts. An observation from Bartram was an important piece of the species migrational puzzle for Darwin.

An inserted comment in chapter 13 of the *Natural Selection* manuscript quotes Harvard botanist Asa Gray in regard to southern Appalachian botany, and adds "see Bartram for the Occone Mountains." This was probably added in July 1856, for in the middle of that month Darwin wrote to Gray on the subject: "I have been reading a paper by you on plants on mountains of Carolina," he wrote, "in which you state that most are the same with the plants of the N. States & Canada. Now what I want to know is, whether the [Appalachians] are sufficiently continuous so that the plants could travel from the north in the course of ages thus far south? I remember Bartram

makes the same remark with respect to several trees on the Occone M^{ts}.,—not that I know where these Mountains are." The paper Darwin referred to, entitled "Notes of a botanical excursion to the mountains of North Carolina, &c.; with some remarks on the botany of the higher Alleghany mountains," was published in installments between 1842 and 1844 in the *London Journal of Botany*.

Gray opened his paper commenting on Bartram's "well known and very interesting volume of Travels," and made special reference to Bartram's reports of "the remarkable intermixture of the vegetation of the north and south" that occurs in the southern Appalachians (Gray 1842, p. 1). Darwin had homed in on a particularly relevant passage along these lines from the *Travels*. Bartram relates his "ascent of the Occone Mountain" [thought to be modern Stratton Mountain in South Carolina] in chapter 3: "My next flight was up a very high peak, to the top of the Occone mountain, where I rested; and turning about found that I was now in a very elevated situation, from whence I enjoyed a view inexpressibly magnificent and comprehensive..." Bartram then descended "over rocky hills and levels, shaded by incomparable forests, the soil exceedingly rich...where grew many trees and plants common in Pennsylvania, New-York and even Canada..." This was the critical observation of interest to Darwin, showing that northerly species are found far south at high elevations. Unfortunately, this Bartram reference was not mentioned in Darwin's discussion of global plant migration in the *Origin*.

While neither Bartram's rare *Franklinia* nor his account of northern plants flourishing in the high mountains of the south ended up in the *Origin of Species*, another Bartram observation did make the cut. It is found in chapter 4, where Darwin introduces his concept of sexual selection, "a struggle between the males for possession of the females." The result of this process, he argues, "is not death to the unsuccessful competitor, but few or no offspring. How low in the scale of nature this law of battle descends, I know not; male alligators have been described as fighting, bellowing, and whirling round, like Indians in a war-dance, for the possession of the females." Described by whom? The source of the alligator example is Bartram, you have no doubt guessed – and while this is not revealed in the *Origin*, Bartram is credited in Darwin's 1871 book *The Descent of Man*, chapter 12, which discusses sexual selection in reptiles. The evocative passage on alligator courtship is found on p. 130 of the *Travels*: "At other times, when swollen to an extent ready to burst, his head and tail lifted up, he spins or twirls round on the surface of the water. He acts his part like an Indian chief when rehearsing his feats of war..."



Source: (<http://darwin-online.org.uk>)

There is one final Bartram-Darwin connection to consider, this one a return to botanical matters. Venus's Fly-trap, *Dionaea muscipula*, was called by Darwin "one of the most wonderful [plants] in the world." His interest in this coastal North and South Carolina endemic pertained

to precisely the attributes that Bartram marveled over in the *Travels*: "Can we after viewing this object, hesitate a moment to confess, that vegetable beings are endued with some sensible faculties or attributes, similar to those that dignify animal nature; they are organical, living and self-moving bodies, for we see here, in this plant, motion and volition." Bartram pointed out, too, that it was his father John Bartram that first brought this marvelous plant to the attention of European naturalists in the 1760s. When a specimen made its way to Linnaeus in Uppsala, he marveled that "certainly nothing more interesting was seen...I must confess I never met with so wonderful a phenomenon!"

It is interesting that Darwin used the word "wonderful" to describe this species as well. He was keenly interested in what he viewed as animal-like properties of carnivorous plants like Venus's Fly-trap, as well as climbing and twining plants. He conducted innumerable experiments with them and published lengthy books on their biology. The results of his extensive study of Venus's Fly-trap are presented in chapter 13 of his book *Insectivorous Plants* (1875), among them his discovery of the trigger mechanism that causes the lobes of the leaves to rapidly close upon unsuspecting insects, whereupon they are digested. In that respect Charles improved upon the speculations of his grandfather Erasmus, who in his 1789 poem *Loves of the Plants* suggested that the traps protect the flowers from insects. Erasmus would undoubtedly have been enthralled with his grandson's conclusions regarding Venus's Fly-trap and related plants like sundews, which very much centered on the "sensible faculties or attributes, similar to those that dignify animal nature" that so intrigued Bartram. "We perhaps see the prefigurement of the formation of nerves in animals in the transmission of the motor

impulse" in such species, Darwin wrote in *Insectivorous Plants*, underscoring for him the continuity of animal and vegetable life so central to his theory of common evolutionary descent.

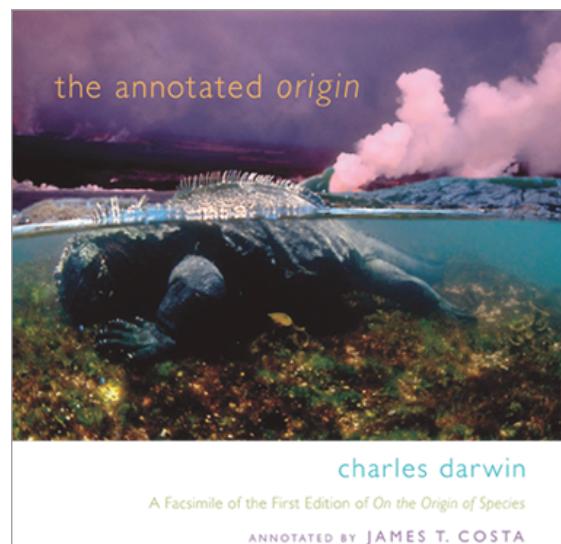
In his introduction to the *Travels* Bartram wrote that "the attention of a traveller, should be particularly turned, in the first place, to the various works of Nature, to mark the distinctions of the climates he may explore, and to offer such useful observations on the different productions as may occur..." Speaking of himself in the third person, Bartram continued: "From the advantages the journalist [Bartram himself] enjoyed under his father John Bartram, botanist to the king of Great-Britain, and fellow of the Royal Society, it is hoped that his labours will present new as well as useful information to the botanist and zoologist." Useful information indeed; Bartram would be most pleased that his *Travels* were read by the greatest naturalists of the following century – Darwin, Lyell, Gray, and others – and perhaps also that his keen observations played a role, with those of other naturalist-travelers, in the greatest scientific discovery of the modern age, the process of biological evolution. Or would he? While a deeply religious man, I like to imagine that Bartram would have been as accepting of Darwin's ideas as his botanical heir Asa Gray, himself devout yet a devoted evolutionist, agreeing with Darwin that "there is grandeur in this view of life." Perhaps not, but as a child of the Enlightenment surely Bartram would at least have embraced the view of William Whewell, in a passage selected by Darwin as an epigraph to the *Origin*: "But with regard to the material world, we can at least go so far as this – we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general laws."

Acknowledgments

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Jim Costa's Darwin and Bartram article represents an intersection of his long-standing interest in these two great naturalists. Jim first noticed Darwin's reading of Bartram while researching his book *The Annotated Origin*, published by Harvard University Press. Jim's annotated edition of the *Origin of Species* uses running commentaries to help readers better understand the historical context, structure, and content of Darwin's masterwork.

The book has been receiving critical acclaim since its publication last spring: *Publisher's Weekly* called it "a fine tribute in the great scientist's bicentennial year," and *Education Digest* found that Jim's annotations make Darwin's text "not only approachable, but positively inviting," even calling it "a particular gift to laypeople, especially to biology teachers." *BioScience Magazine* enthused that "*The Annotated Origin* should be on the shelf of every practitioner of the life sciences," lauding Jim for rendering "a valuable service to the profession by making the single most influential work in the history of biology both accessible and relevant to modern readers."

To learn more about Jim's annotated *Origin* and read additional reviews, check it out on the Harvard University Press website at <www.hup.harvard.edu/catalog/DARANN.html>