An Oconee Bell Celebration

March 16–18, 2007
Clemson University

A Symposium in Honor of the 220th Anniversary Year of André Michaux's Discovery of *Shortia galacifolia,* the Oconee Bell, in Oconee County, South Carolina

Brad Sanders, editor

Sponsors

AMIS, The André Michaux International Society

Clemson University Museum of Natural Sciences

South Carolina Department of Parks, Recreation and Tourism

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The studies listed below are found in the appendix to this volume. They were first published in *Castanea, Journal of the Southern Appalachian Botanical Society* and are reprinted here with permission.

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Speakers at the Oconee Bell Celeberation

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Tim Drake, Ph.D. is a Clemson entomologist with a passion for historic preservation and interpretation who frequently speaks to historical groups. A longtime board member of the Historic Pendleton Foundation, he traces his ancestry and family connections back to André Michaux's friends Henry Middleton and General Andrew Pickens.

Brad Sanders is the author of *Guide to William Bartram's Travels*, published in 2002, editor of the Georgia Botanical Society's journal *Tipularia,* publisher of the *Traveller* (newsletter of the Bartram Trail Conference) and frequent speaker on William Bartram and Bartram's travels in the Southeastern United States.

Charlie Williams heads AMIS, the André Michaux International Society, was Chairman of the 2002 A Michaux Celebration sponsored by Daniel Stowe Botanical Garden and Belmont Abbey College. He is a frequent speaker on Michaux who has also written and performs a one-man play on Michaux's life and adventures.

Katherine Weeks, **Ph.D. Candidate,** is an ecologist most interested in the conservation of rare plants. Her Master's thesis, completed at Clemson in 2002, was a study of sexual reproduction in the Oconee Bell in the South Carolina Upstate.

Todd Linscott, Ph.D., Professor of Biology at Black Hawk College, Moline, Illinois began his studies of the Oconee Bell when he was on the faculty at Anderson College, Anderson, South Carolina and has continued this work after relocating to the Midwest. His research interests focus on rare plant species using molecular, morphological, and ecological data.

Lisa Wagner, Ph.D., is the Education Director of the South Carolina Botanical Garden at Clemson and a frequent speaker on native plants and sustainable gardening. A plant ecologist, naturalist and keen gardener, she promotes interest in plants to people of all ages. She is the lead author of *The Nature of Clemson: a Field Guide to the Natural History of Clemson University.*

André Michaux, Botanist-Explorer of the South Carolina Upstate *Who was this man?*

Patrick D. McMillan

Why did Charles Kuralt refer to this man as "one of the most remarkable human beings of the eighteenth century?" Charlie Williams wrote to me that he thinks Michaux's primary legacy is his example. "He is hard working, honest, and devotes himself to his family, his work, and his country." I belong to a generation often criticized for not having heroes, but I would assert that Michaux serves as a hero for all generations.

Michaux traveled and socialized in a world of aristocrats but he was not born into this class. He strove to overcome the limitations of his education; he only attended four years of formal schooling. Michaux was born into a farming family and his father sought to harden his children to the rigors of farm life. This could have provided the foundation of Michaux's indefatigable work ethic. Michaux was no stranger to the fragility and tragedy of life. He lost his father and mother as a young man and lost his wife within a year of their marriage (Deleuze 1804). He accepted the responsibilities as the eldest son and as a single father with zeal. Perhaps his realization of the fragility of life led him to live life with a sense of urgency and fill his days with a seemingly inexhaustible labor. His interest in the natural world was self-professed; he states that he "burned with longing for nature (Brasher 2004)."

Michaux was a human, and not without flaw. In the tradition of Indiana Jones, Michaux suffered from an intense fear of snakes. He owned and sold slaves. His English was good but not perfect. A taste of Michaux's command of English is seen in his letter to John Bartram, Jr. in 1791, I will give a sample here:

> *"I received the valuable seeds from China you was so kind to send me. I was very glad to make acquaintance with Mosas Bartram. His conversation is very interesant. I send you a box of some plants and little parcel of seeds by the same conveyance but I was so busy since some days that I could not send you all that I wish to send. I am in a very few days going to Georgia and I pray to not sent by my plants while I shall be abroad: But still you may inform if you receive this Plants in good order.*
>
> *I am, Sir, your assured friend, And Michaux*
>
> *On my return I will inform you excuse my haste as I fear no have time enough to send the Plants to the Vessel. My compliments respectfull to Mter Willm Bartram."*

Michaux may be thought of as a man between worlds. He was born of a farming class but lived in aristocratic circles. He was a concerned and devoted father, yet had little time to spend with his son. He was sent to America as the King's botanist but the French Revolution ravaged his homeland while he was in the New World and his allegiance shifted to the new France, one of the people. He professed Catholic faith, but exhibited no allegiance to the church, instead he incorporated the open-minded theology of deism into his composition. He was trained in the progressive, modern, natural system of classification of Jussieu, yet chose to arrange his flora according to the traditional Linnaean system.

He was an explorer. He was a botanist and scientist. He was a civil servant, who obediently upheld his commission. He was an ambassador (visited with heads of state and always made political connections), an adept politician (working to keep good relations with captains, etc), a workaholic, a demanding father. He was a man, driven and obsessed with the identification and classification of nature. He undertook botanical exploration in Cherokee Nations of the South Carolina Upstate on two journeys (1787 and 1788), and lest we forget, he discovered Oconee Bells, but didn't mention it in his journal or describe it before his untimely death and it was not included in his 1803, posthumously published *Flora*.

Michaux arrives on the scene

André Michaux was born March 7, 1746 at Satory, in the park of Versailles, France. He was born, as mentioned above, to an agricultural family. His talent and interest in plants attracted the attention of Dr. Lemonnier, who was the Professor of Botany at the King's Garden in Paris and introduced André to the Count d'Angiviller. In 1777, André studied under Bernard de Jussieu at Trianon, where he was instructed in botany and the natural system of classification. His longing for exploration and the discovery of new plants led him to be appointed to an expedition to Persia from 1782–1785. With success in Persia, he was established as a world class botanical explorer and was sent on his greatest voyage, as King's Botanist, to America in 1785, with his fifteen year old son in tow.

Michaux and his son arrived in New York on November 13, 1785, and by March 28, 1786, had established a botanical garden at Hackensack Meadows, New Jersey. His commission while in America was to collect plants, particularly woody ornamentals, and animals that would be of use on the elegant estates of France. As King's Botanist he also played the role of ambassador and met with many heads of state including George Washington who he visited in 1786 bringing a letter from Lafayette and a gift of special plants that he transported from France for Washington. Michaux was certain to meet the most important and influential politicians and scientists wherever he went. This made his traveling much easier, as he carried letters of recommendation from the most esteemed members of the community. He also was skilled in maintaining good relations with those responsible for the handling of his valuable collections including ship's captains. Michaux was a skilled politician in many ways.

Michaux and his son sailed from New York to Charleston and arrived on September 21, 1786. His rival, John Fraser, arrived in Charleston a day earlier. David Rembert, notes that Michaux and Fraser met during this September. Michaux was extremely ambitious and immediately sought to explore the New World, stating in a letter to Count d'Angivillier (September 2, 1785): "I shall have nothing to fear so much as leaving discoveries to be made by those who shall come after me." By November 12, 1786, Michaux had rented 111 acres for a botanical garden north of Charleston, near the present Charleston Airport and set out to begin his exploration of the Carolinas.

Michaux's 1787 expedition—A tale of Azaleas, Magnolias, oh yeah, and quite by chance, Oconee Bells

On April 19, 1787, André Michaux, his son François André Michaux, and John Fraser set out on a legendary journey. Michaux, knowing the discoveries of the Bartrams and having visited the Bartrams in 1786 was inspired to relocate the trail and plants that the Bartrams had found on their route to the Florida wilderness in 1765. Michaux's 1787 expedition was a journey to Florida, not to the Blue Ridge escarpment. Fate would break the company apart, prevent a journey through Creek territory and send André north to the Blue Ridge and into the range of Oconee Bells. The journey began along well established roads and trails through forests, pocosin, flatwoods, and savannas that according to Michaux were filled with the yellow flowers of pitcherplants.

Near the Savannah River, in present day Jasper County, Michaux was able to botanize. The hillsides near the river yielded a new *Azalea*, with "deep pink flowers." Savage & Savage (1986) interpret this plant as the Pinxterflower, *Rhododendron periclymenoides* (Michaux) Shinners (=*R. nudiflorum*). This species is not found south of the upper Piedmont of South Carolina and undoubtedly Michaux's *Azalea* is referable to *Rhododendron canescens* (Michaux) Sweet and probably represents the type specimen location. This was the first time Michaux would have seen the plant in flower, as he arrived in Charleston in the fall of 1786, and had not been present in the Charleston area during the flowering period. *Rhododendron canescens* is common today in the Charleston area and Michaux would no doubt have seen it many times after his first collection near the Savannah. Besides the "*Azalea*" Michaux made note of a number of other species including the fire-pink (*Silene virginica* L.), the fringe tree (*Chionanthus virginicus*), a new pawpaw (*Asimina parviflora* (Michaux) Dunal—probably the type location), a new *Kalmia* (perhaps *Kalmia hirsuta* Walter), and a new *Magnolia* which he states has flowers the same shape as those of *Magnolia tripetala* L. but "agreeably fragrant." What was this *Magnolia* that Michaux encountered? Michaux claimed that it was like *M. tripetala* but with fragrant flowers suggesting that his plant could have been *Magnolia pyramidata* Bartram, with a delicate, faint scent to the flower. *Magnolia pyramidata* is known today from very small populations in Aiken County. If this plant was *M. pyramidata*, it would not be "officially" known until the time of Pursh, though Bartram had collected it earlier.

Michaux's fear of snakes is illustrated by several en-

tries in his journal. Along the route through Georgia he boasts that in one day he killed "a very beautiful snake with yellow, black and red bands," and three moccasins, while his son killed a black snake. It's surprising that a man so reverent of nature would kill every snake he came in contact with! Across the Savannah from Two Sisters Ferry, Michaux found a species of silverbell, perhaps the small-flower silverbell, *Halesia carolina* L. (= *H. parviflora* Michaux) or the common silverbell, *H. tetraptera* Ellis. Michaux's type collection of *H. parviflora* was taken from Florida and the exact identity of the plant found in Georgia remains unknown. In this region of Georgia, Michaux also encountered a deep red-flowered *Azalea*, "the color of fire," that Savage & Savage (1986) interpreted as *Rhododendron calendulaceum* (Michaux) Torrey. This plant must surely have been *Rhododendron flammeum* (Michaux) Sargent, and this site is likely the type location. This beautiful shrub has received the name of Oconee azalea and it's high time to put one controversy to rest. Oconee azalea does not, nor has it ever been known to grow in Oconee County, South Carolina. *Rhododendron flammeum* is a species of the middle coastal plain and does not extend to the mountains. It was also encountered by Bartam, but again in middle Georgia, not Upstate South Carolina. The name Oconee, here refers to an Indian group, not Oconee County. Recent attempts to name the Oconee azalea as the official County shrub are misguided.

The Michauxs and Fraser continued towards Savannah, Georgia where Michaux notes a *Chamaerops* (palm) different from the palmetto of South Carolina. In his shipping lists from 1787 he lists such a palm with toothed petioles, no doubt the saw palmetto, so abundant in the Georgia flatwoods. The stay in Savannah lasted only a day and then our intrepid explorers made out for the Ogeechee River in search of the Ogeeche Plum, *Nyssa ogeche* Bartram, that Michaux had learned of from Bartram. Along the route Michaux would find another new *Kalmia*, no doubt *Kalmia hirsuta*. Fraser, collecting the plant at the same time, gave the specimen to Walter for description before Michaux could complete his publication. *Kalmia hirsuta* had also been noted by Bartram and referred to as *Kalmia ciliata* for the ciliate-margined leaves. A stunning water arum "with its spathe as white as the flower of a lily," was also discovered by Michaux in this region and later named *Calla sagittaefolia* Michaux (=*Peltandra sagittaefolia* (Michaux) Morong). Michaux also lists what would become *Lyonia ferruginea* in his list of plants shipped to France in 1787. This species probably was collected by both Michaux and Fraser during the trip. Fraser's plants would make it to Walter to receive description as *Andromeda ferruginea*. For some reason, Michaux chose to maintain this name without assigning his own in *Flora Boreali Americana* (1803).

On May 6, the group reached Sunbury, Georgia. André had been bitten by an insect on the leg during the journey and the constant abrasion against the saddle while riding had caused the wound to become infected. André decided to remain in Sunbury as his son François and Fraser continued on to the Altamaha River. Michaux never wasted a moment and despite the infection he used this time to work on the descriptions of new plants he found and arrange his specimens. Who knows how many of the descriptions in *Flora Boreali-Americana* were completed during this down time. A few days later, Fraser and François returned and the group decided to travel north to the Blue Ridge. This decision was contrary to the original intent of the journey, but because of the Creek wars that began in 1786 the territory they had intended to explore was far too hostile to risk continuing southward. Without the hostilities with the Creeks, we may not have known of Oconee Bells for quite some time.

Though the explorers must have been disappointed, they made significant discoveries along the route. Michaux was no doubt very pleased with the discovery of the two-winged silverbell (*Halesia diptera* J. Ellis). He commented that the existence of this plant "I have doubted until now." There is an interesting comparison between his doubt of the silverbell's existence and nineteenth century botanists' doubts about the existence of Oconee Bells. Asa Gray, would note "The late Dr. Short, who has since gone to his rest, deserved better commemoration at our hands than this empty name of a most obscure plant (Gray 1868)." He went on to say, "Indeed, our botanists, applying the old law maxim, *de non apparentibus et de non existentibus eadem est ratio*, are not unreasonably doubting if there ever was any such plant" (Gray 1868).

On May 15, fate, again took its toll on the party when the horses went missing, perhaps stolen. Michaux, always the optimist, used the loss as an excuse to separate from John Fraser. Michaux had a strong dislike of Fraser, as did many who knew him. He was often credited with an ego far exceeding his deserved merit. Always an adept politician, Michaux agreed to travel with Fraser in the hopes that having an Englishman (Scotsman) might help in garnering supplies. Michaux stated that Fraser proved to have small knowledge of natural history and took up space with common plants of little value and wasted his precious time on trifles, irritating chatter and foolish questions.

Michaux set off to Augusta, pulling a cart filled with

specimens and without the horses needed to travel comfortably. Along the route, a wheel broke off the cart and forced a temporary halt to travel. Michaux located a fine hillside here where he collected yellowlLady slipper (*Cypripedium parviflorum* Salisbury), an "exquisite" *Trillium* (perhaps *T. reliquum* Freeman or *T. maculatum* Rafinesque) and sweet shrub (Savage & Savage 1986). The identity of the *Trillium* can only be guessed but no species would be flowering near Augusta in May. The leaves of *Trillium maculatum* and *T. reliquum* would still be visible and perhaps their mottling would prompt the comment, "exquisite." In Michaux's list of plants sent back to France in 1787, he listed two species, *Trillium sessile* (which at the time would include *T. maculatum* and *T. reliquum*) and *T. cernuum*. In his *Flora*, he lists *T. cernuum* L. (including *T. rugelii* Rendle) from the mountains of North Carolina, and though this plant is known from near the fall-line in South Carolina, it apparently was not encountered here by Michaux.

Michaux arrived in Augusta on Saturday, May 26 and desiring to continue exploration he lamented that "they are so scrupulous here in America, one doesn't dare go out or even take a walk on Sunday in the large towns." One can guess that the "workaholic" Michaux was not a fan of blue laws! He set off from Augusta and somewhere near the river encountered the glorious bottlebrush buckeye. The plants that we see today at only one location at Savannah River Bluffs in Aiken County may be direct descendents of the ones Michaux found in 1787. Michaux lists the buckeye as "*Pavia floribus spicatus longissimis*" in his list of plants sent to France in 1787. Once again, Fraser must have encountered the plant, during the same trip, at or near the same location, and taken the specimen to Walter, who described the species as *Aesculus parviflora* in 1788. Michaux ignores most of Walter's names garnered from the donations of Fraser, and describes the plant under the name *Aesculus macrostachya*, listing the name *A. parviflora* in synonymy. One must wonder why Michaux chose to inappropriately assign new names to those already described by Walter. It could be assumed that Michaux, knowing the story of how they received their names, would harbor some resentment for their treatment by Walter. Michaux (1803) lists the habitat as "*ad ripas amnis Savannah, juxta urbiculam S. Augusti*." It is presumed from the translation that plants were collected near the "torrents or falls" of the Savannah, which are mapped near the present day Savannah River Bluffs Heritage Preserve. It is amazing that chance would allow the discovery of this one, very highly disjunct population, so far from the typical range on not one, but two occasions. No populations are known on the Georgia side of the river today (USDA Plants Database 2007) and the closest known to those at Savannah River Bluffs are several hundred miles distant along the Chattahoochee River in extreme southwest Georgia. The South Carolina population would not be recognized in *Guide to the Vascular Flora of the Carolinas* (Radford, Ahles and Bell 1968) and was only recently "re-discovered" along the Savannah.

Michaux found Augusta inhospitable and he left with poor provisions. While traveling up the Savannah River on the South Carolina side he entered a more gracious country filled with French settlers who were of more help. Michaux spent nights exposed to the weather and was forced on June 4 to sleep in torrential rain under his little cart. On June 5, Michaux arrived at Hopewell, the plantation of General Andrew Pickens. This is not the Hopewell on the Clemson University campus but one of Pickens' other plantations in modern day Abbeville County, which all apparently received the name of Hopewell. Michaux's journal made note of a distance of three days journey between Hopewell and Seneca that does not allow for it to be in Pickens County. He also crossed Eighteen Mile Creek on the trip from Hopewell to Fort Hill and Seneca (present Clemson Bottoms and Clemson University campus). Along the Keowee River, he found the coveted American ginseng (*Panax quinquefolius* L.) and made note of large masses of mountain laurel (*Kalmia latifolia* L.), trailing arbutus (*Epigaea repens* L.), alternate-leaf dogwood (*Cornus alternifolia* L.) and hydrangea, interpreted as *Hydrangea arborescens* L. The hydrangea is worth greater consideration. Michaux lists *H. arborescens* in his 1787 shipments. But in the *Flora* he lists it from the western mountains of Carolina, whereas his *H. nivea* is found "*versus originem amnis Savannah*," translating to: originating along the Savannah River. Today, *H. arborescens* is mostly found in the western portions of Oconee County and I know of no populations near or south of Clemson. *Hydrangea radiata* Walter (Michaux's *H. nivea*) is the common form in this region and probably what Michaux collected here. Here we have what is undoubtedly another account of Fraser's ability to take advantage of Walter's *Flora* to publish his discoveries in advance of Michaux. Again, Michaux lists *H. radiata* in synonymy of his *H. nivea*, discrediting the treatment of Fraser's specimens.

On June 8, Michaux arrived at Fort Hill, on the border of the Cherokee Nation. The Indian village was on the west bank of the river and the American settlement and fort were on the east bank with Fort Rutledge (Fort Seneca) overlooking the settlement. Here, Michaux could easily see the imposing "blue wall" rising up all along

the horizon and for the first time he would be leaving the "settled" world of European dominance for the wild lands of the Indian nations. Michaux arranged to meet a Mr. Martin and arrange local Cherokee guides for the journey into the headwaters of the Savannah and into the Tennessee headwaters. Michaux engaged in rather tense negotiations with the Cherokee to secure two men who demanded the exorbitant price of six dollars each, a blanket and a petticoat. Michaux agreed and he left with the two guides and a "companion." Savage & Savage (1986) state that Michaux left with his son, but with evidence presented to me by C. Williams, I am inclined to agree that François did not travel into the wilderness with Michaux on this journey.

Michaux set off on June 11 along the Keowee River towards the town of Keowee. There is no doubt that Michaux, in referring to the Indians as "sauvages," did not mean "savage" in the current use but rather natives. His journal is filled with comments of admiration for the Indians physical abilities to master the wilderness. Their journeys took them through what only a few years earlier would have been large Indian camps and settlements, now abandoned, due to the Cherokee Wars. Michaux depended on his guides for food and soon their food ran low and they resorted to eating nothing more than cornmeal in water. The weather was terrible and despite the dangers of slipping in torrents and being pierced by thorns, Michaux was most distraught by not finding any new or interesting plants on this first leg of their journey. The Indians had no success finding game until June 13, when they shot a bear and a turkey. On June 13, Michaux, having time to explore, came across a new shrub, the buffalo nut (*Pyrularia pubera* Michaux). He also, finally, encountered the cucumber tree (*Magnolia acuminata* L.), which he had longed to send back to France. Somewhere during this time, Michaux also first encountered the gorge rhododendron (*Rhododendron minus* Michaux), which would have been in flower, growing among the masses of great laurel (*Rhododendron maximum* L.) and mountain laurel.

During this leg of the trip Michaux encountered and collected the Dutchman's pipe (*Aristolochia macrophylla* L.) and collected a new violet (*Viola hastata* Michaux), a new shrub mountain alder (*Clethra acuminata* Michaux), and a new magnolia (*Magnolia "hastata" =M. fraseri* Walter). Magnolias were among the most sought after plants of his expeditions and the obsession with the gaudy-flowered *Magnolias* continues to this day. There have been a myriad of articles concerned with their discovery in recent years. The most convoluted story revolves around the plant that both Michaux and Fraser would collect in 1787, the "mountain magnolia," *M. fraseri*. The story begins with another traveler, William Bartram, who was the first naturalist to encounter the plant. He saw the plant on his journey from Seneca to the headwaters of the Tennessee River, but did not stop to collect it until he reached a region near the cascades of Martin Creek in northern Georgia in May of 1775 (Zahner 2006). Bartram referred to the plant as *Magnolia auriculata*. At the time of its discovery, Americans were not in the habit of describing new species in scientific publications so Bartram would not receive his just reward as the authority for this plant. The next scientific collections were made during June of 1787. Michaux visited Bartram twice during 1786 and no doubt discussed the beautiful new *Magnolia*. This *Magnolia* would become one of the primary targets of Michaux's attempt to retrace the trail of Bartram. Despite the fact that Michaux and Fraser had parted ways, both men were to encounter and collect the *Magnolia* within days or weeks of each other. Michaux listed living specimens of this plant in his shipping manifest on August 2, 1787. Michaux's plants were to await description until 1803. Meanwhile, John Fraser visited Thomas Walter during the late summer of 1787 and gave him a specimen of this *Magnolia*. Walter in 1788 published the *Magnolia* within his *Flora Caroliniana* as *Magnolia fraseri*, in honor of Fraser.

The *Magnolia* found by Bartram was named by Walter, after Michaux's archrival, John Fraser—one can only imagine how this news would have been received by Michaux! Luckily for Michaux, he was not to be outdone. As it turns out, *M. fraseri* is notoriously difficult to grow and propagate and Michaux's greatest find, *Magnolia macrophylla* Michaux (collected near Gastonia, North Carolina) is the largest-flowered, largest-leaved, showiest, and among the most amenable deciduous species of the genus.

The group eventually made it to the head of the Keowee River at the junction of the Toxaway and Whitewater Rivers and the broad, semicircular plain was a pleasant change. Perhaps it was here that Michaux would have found the most famous of his discoveries, the Oconee Bell. This remarkable plant would send legions of botanists in search of it for nearly a century after its discovery; a plant whose story has become legend and lore. Michaux, however, found that it was apparently not important enough for a note in his journal or for shipment to France. It was collected, this much we know, but quietly sat in Michaux's herbarium without notice for over forty years. Is this surprising? In light of the frenzy of activity surrounding this plant today it may seem ironic, but to the duty-bound Michaux it was apparently insignificant.

Michaux's commission was to collect woody plants and other species that would grace the luxurious estates of the French nobility. Oconee Bells did not fit this parameter. It's interesting that he saw no horticultural interest in this plant but sent back species like *Polygala senega* L., *Rhexia* and *Xyris*. Michaux saw the plant without flower and maybe if the flower had been present, his opinion would have been more favorable.

The interpretation that Michaux had collected Oconee Bells during his December 1788 excursion into the same area was first proposed by Charles S. Sargent (1886). This interpretation was followed by Savage & Savage (1986) and has been perpetuated in much of the popular literature to this day. Williams et al. (2004) shows that the December collection is incorrect and based upon misinterpretation of Michaux's journal. Michaux's journal on December 8, 1788 states:

> *"As we approached the source of the Kiwi (Keowee), the paths became more difficult... A family of Cherokee Indians lived in a little cabin at this site. We stopped there to camp and I rushed to explore. I dug up a new shrub with toothed leaves, that grew up the mountainside not far from the river."*

It's easy to imagine that Sargent and all other researchers would find it hard to believe that this toothed-leaved shrub could not be Michaux's Oconee Bells. After all, how could Michaux not have made reference to such a find in his journal? Michaux's journal on December 11, however, would clarify the identity of this shrub. I will give an excerpt here:

> *"I returned to camp with my guides at the head of the Kiwi and collected a large quantity of the shrub with saw toothed leaves which I had found on the day of my arrival. I did not find it on the other mountains. The Indians of the area told me that the leaves taste good when chewed and smelled good when crushed, which I found to be the case."*

This description led Charlie Williams to propose that the toothed-leaved shrub was, in fact, wintergreen (*Gaultheria procumbens* L.). The leaves of Oconee Bell certainly don't taste good and I concur with Mr. Williams that this plant is probably wintergreen.

In addition to the journal data, the specimens that exist from Michaux's journey, including the fragment of the type collection at the Gray Herbarium at Harvard University were in early fruit when collected. This would indicate the plants could only have been collected during the June, not the December trip. We are then left with the less-than-noble conclusion that Michaux did not find this plant worthy of mention in his journal.

On June 15, Michaux and company reached the headwaters of the Tugaloo (Chattooga) River. This portion of the journey was through continuous rain and steep mountain paths. Perhaps Oconee Bells were found during this strenuous leg before the company passed out of the Whitewater River drainage and conditions were so strenuous that Michaux failed to incorporate it into his notes. After two more days of high mountain trails the group entered the drainages of the Tennessee River and here, near Highlands, North Carolina, Michaux would find another *Azalea* with yellow flowers, the flame azalea, *Rhododendron calendulaceum*. He also encountered a "*Arbutus*" which produced reddish berries which he was told were consumed in great quantities by bears. It has been suggested, by C. S. Sargent, that this plant was likely the type collection of *Vaccinium erythrocarpum* Michaux. If so, this would mean that Michaux would have traveled to the heights of the local peaks, as this plant seldom grows in the river valleys or hills through which he was traveling. It may be that this "*Arbutus*" was *Gaylussacia ursina* (Curtis) T. & G., which is so abundant on the hillsides of the area. Michaux's *Flora* lists the habitat for *V. erythrocarpum* as high mountains of North Carolina.

Michaux returned quickly to Seneca, arriving on June 18. Michaux traveled back to Charleston by way of the home of General Pickens and few new finds were located during the return trip. Michaux's journal reflects his disappointment of the journey of 1787. He had expected to find many more new plants than he had encountered. Despite his disappointment he returned again, during the "seed" season in December of 1788. Michaux had been criticized for his plants arriving in poor condition or not surviving the European climate. Plants collected in December were dormant and thus much better adapted to making a long trip by land and sea to France.

Unbeknownst to Michaux, his greatest discovery, the Oconee Bell was made during this excursion. The importance of the discovery of Oconee Bells is not limited to the legend of its loss and rediscovery. The realization by Gray (1867, 1868) that *Shortia* has very close relatives in Japan and east Asia helped lend support for Gray's development of a theory of vicariance explained by a paleo-mesophytic flora. Gray (1868) went so far as to suggest that *Shortia uniflora* may well be conspecific with *Shortia galacifolia*. Gray, who was Darwin's champion in America, theorized that during the geologic past a land bridge connected the East Asian flora with that of the United States and evolution since that time has led to

the rise of similar and related species on each side of the Pacific. His theories would be supported by the advent of molecular technologies that are able to unlock the similarities in DNA between these species. Tulip poplar (*Liriodendron*) and sweet gum (*Liquidambar*), each with American and Eurasian species have been analyzed to determine their last connections through such methods (C.R. Parks 1994).

His journeys through the South Carolina Upstate and the headwaters of the Tennessee may not have produced as many finds as he wanted but it did dramatically shape his character and give him the courage to travel deeper into the Appalachians, to many more discoveries and to the loftiest summits east of the Mississippi.

More than any other journey Michaux's experiences in 1787 appear to have forged the fearless nature of this legendary explorer.

Despite the fact that Michaux was already a world explorer and adventurer when he arrived in America he apparently was still fearful of wilderness and the natural perils that abound there. During his 1787 journey he was confronted with the vast wild-land and dark, steep, densely forested gorges of the Indian Nations. His travels in a war-torn Persia took him through many dangers but never into unpopulated and densely forested wildlands. He was robbed, nearly killed twice, imprisoned, and suffered the loss of all his possessions (save his books and plants), but wrote rather stoically of his adventures; apparently he understood the war and terror of mankind much better than the unpredictable hazards of nature. His journals during his 1787 journey are quite different after his party departed Seneca for the wild lands. He writes that he was frightened of traversing the rushing streams; he was tormented by *Smilax* vines that slashed at his body; he was terrified he would step on snakes; fearing that he would be lost, he ran to keep up with his Indian guides, and in a crescendo of fear he exclaims that "I was seized with an intense, horrible, violent fear when we had to walk on huge trees that were so rotten that they gave way under the feet and we were half buried under the bark and surrounding vegetation." Michaux did run, he did keep up, he overcame his anxiety and this unrelenting confrontation of his fears in the wilderness of the Carolina mountains may have given him the strength and courage to carry him to the Mississippi, the wilderness of northern Canada, and into the annals of history.

After the journey into the Cherokee Nation in 1787, Michaux's journal does not contain the passages of anxiety and fear that define this trip. It was a magical moment in our lives because it led to the discovery of the Oconee Bells and for Michaux's life it proved to him that he could do it, he was an explorer of wilderness. Charlie Williams' research gives me this concluding passage taken from Michaux's journal in 1792, while he is traveling on the dangerous whitewater of the Chicoutimi River in the Quebec wilderness:

> *"These voyages are frightening for those who are not accustomed to them and I would advise the little masters of London or Paris to stay at home."*

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An Eighteenth Century Journey through the Backcountry, *Imagine the Impression It Would Have Made!*

Tim Drake

The daily concerns of post-Revolutionary life in the upper piedmont of South Carolina and Georgia were little-changed from those that the settlers of the western "backcountry" had known in the decade preceding the Revolutionary War. The most marked difference was that settlers were moving northward and westward in great numbers into what had been known as Indian lands during the era of British rule. This rapid settlement was necessitated by the large numbers of Ulster-Scot, more commonly known as "Scots-Irish" immigrants that were coming into the ports of Philadelphia, PA, and Charleston, South Carolina, from the seven counties of Ulster in Northern Ireland.

In customs, language, and religion, these immigrants were more similar to their cousins in Scotland than to their neighbors in Ireland. They were clannish, self-reliant, stubborn, proud, agrarian, somewhat literate, and thoroughly Presbyterian. The largest of several successive migrations had occurred just prior to and during the early years of the Revolution, and many of these new immigrants were seeking farmland in the newly opened western territories of South Carolina and Georgia. These people were the ones who would have been encountered most often by the Botanist André Michaux throughout his travels into the upper piedmont of South Carolina in 1787.

Western South Carolina and northern Georgia were areas that drew much attention by the mid-eighteenth century because of their abundance and diversity of natural resources. Some of the earliest settlement followed trade routes of the Creek and Cherokee, and facilitated the shipment of tremendous quantities of deer and beaver hides to Charleston and Savannah. From these ports they were shipped to the glove and hat manufacturers in England.

Another draw was the English desire for the white kaolin "Cherokee Clay" that was being demanded by the Staffordshire potteries. The Wedgwood factory was one of the most devoted seekers of this legendary clay because it made a lustrous and highly vitreous china. By the mid-1750's several expeditions had ventured deep into the Cherokee lands for this clay.

The earliest traders and trappers lived fairly harmoniously with the native people until the Cherokee Wars of the 1760's and 1770's. These uprisings were largely the result of aggressive European agricultural settlement and fluctuating political alliances of the tribes. From this point until the negotiation of the Treaties of Hopewell, beginning in 1785, there was no peace for either immigrant or native inhabitants of the upper South Carolina piedmont. Skirmishes with the Creek Nation continued in northern Georgia until the last of the treaties were signed in the early 1800's.

Largely responsible for the success of the Treaties of Hopewell was the Revolutionary War veteran and planter, General Andrew Pickens. Pickens had moved into the area now known as Clemson around the year 1784, receiving one of the first grants in the newly-opened Pendleton District. Pickens had been an Indian fighter and was known as the "Wizard Owl" by the local Cherokee. He was not particularly adored, but he was tolerated and respected by the leaders of the Cherokee and Creek nations in the upper piedmont. Through a series of treaties between the new federal government and the tribal leaders, western South Carolina, North Carolina, and Georgia were opened to white settlement by the late 1780's. Andrew Pickens considered his participation in this effort to be among his greatest accomplishments. Over time, Pickens accumulated thousands of acres of land along the Keowee (now Seneca) River and surrounding areas. His former plantation house and country seat at Hopewell still stands on property now owned by Clemson University. The house is believed to have

been built as early as 1784 or 1785, and is likely identical to the Pickens family's home (also called Hopewell) near Abbeville where André Michaux stopped during his journey through the harsh and sometimes savage backcountry, a region where gentlemen were few and accommodations were often meager.

In traveling through the newly-settled backcountry in the 1780's, Michaux would have encountered a variety of rough people that would have been unfamiliar to someone accustomed to a life of privilege. Most of the settlers spoke either English or French and were free of both refinement and material accoutrements because their primary objective was survival. They were involved daily in clearing land, building cattle and hog pens, erecting barns and cabins, growing subsistence crops, and hunting for the majority of their meat.

There were few churches and practically no schools or academies. Most public gatherings were held in open areas, private homes, barns, or brush arbors. Few marriages were sanctioned by the church, and most marriages occurred early in life, sometimes as early as the age of twelve or thirteen. Families were large and slaves were either non-existent or very few. There were a few planters, like Pickens, who owned moderately large numbers of slaves and farmed sizeable tracts of land, but this was more the exception than the rule.

There was no aristocratic or ruling class of people as could be found abundantly in the long-settled coastal regions. The outward display of wealth was disdained by the frugal Ulster Scots and French Huguenots who had settled along the upper Savannah. Even those who brought with them or accumulated some wealth early-on most often reinvested in land and slaves rather than wasting their wealth on refined domiciles or decorative objects called "vainglories" that were seen in abundance in Charleston.

The typical farmstead that Michaux would have encountered in 1787 would have appeared to the city dweller as a picture of abject poverty. The farmhouse would have been constructed of hewn logs, chinked with stones or wedges of wood and plastered over, or daubed, with red clay. The dimension of most houses did not exceed 25 by 35 feet, and most extant houses from that period are much smaller, usually not exceeding 15 by 20 feet.

The fireplace and chimney, used for cooking and warmth, would have been constructed of stone or sticks plastered on the inside with mud. A shingle or split board roof would have barely kept out the elements, allowing rain or snow to enter when it was windy, and posing a constant fire hazard due to falling chimney sparks.

Most upcountry houses of this period did not have floors of sawn boards, but of split logs (puncheons) or even bare dirt. Rammed-earth floors were commonplace, even among the growing middle class. They were made by packing river sand and lime (if available) into the red clay substrate to form a smooth hard surface similar to concrete. Most houses had only one room with a sleeping loft above for the children, usually accessed by a crude ladder. Animal skins would have covered the interior walls and floors during winter months for warmth.

Few if any windows would have contained glass. Most windows were very small and were either completely open or covered by oiled paper or animal hides. This allowed limited light to enter, so the houses were dark and smoky. Windows were covered by heavy shutters, and doors were thick and heavy for protection.

The family lived much of its existence out of doors, with only the dark or inclement hours being spent inside. Families were often multi-generational with elderly parents or grandparents inhabiting the same cramped quarters as the younger parents and their many children. There was no privacy in the eighteenth century backcountry household, but privacy within a family unit was not important for those trying to survive.

Because most tasks were performed outdoors, more prosperous farms were assemblages of many tiny buildings. These were constructed over a period of time when land clearing and planting were not being performed. Each of the buildings was typically associated with a single task, for example, smokehouse, cow barn, stable, blacksmith, woodshed, kitchen, wash house, poultry house, and privy. The range and number of dependencies depended upon the affluence and needs of the family. Some of the more prosperous farms appeared as tiny medieval villages surrounded by split rail fences, more often to keep out the wild animals than to keep the domesticated ones in.

Life was difficult and unpredictable. Hard labor was expected from men, women, and children. Laboring in the fields started as soon as a child could hold a hoe or push a plow. Other farm chores such as carrying water, gathering eggs, feeding animals, pulling weeds, picking insects from crops, gathering wood, and whittling shoe pegs started earlier. Crop success or failure depended on environmental conditions, and times of abundance and starvation were cyclic. Foods stored from one season to the next were salted, dried, rendered, ground, or buried. Indian corn, or maize, was very important. Along with salted pork and any fresh fish and game that could be obtained from the area, it was the mainstay of the diet. Many people suffered from pellagra, scurvy, and other nutrient deficiencies.

There were few professionally trained physicians in the Carolina backcountry in the 1780's. Most who claimed to practice medicine were either self-taught, or had apprenticed briefly under a physician elsewhere. Even minor injuries could turn into life threatening ailments. Infections and disease killed many people very early in life. One of the leading causes of death among women was childbirth. Most children were delivered either by family members or by midwives. In most instances, any complication usually ended with death of the mother, the child, or both. Pneumonia was an almost certain death sentence. Life expectancy was short and funerals were commonplace in every settlement. Sometimes smallpox, influenza, and other epidemics would kill large numbers of settlers, and in the years before knowledge of bacteria and viruses, a great deal of fear and superstition were generated by such events.

In the 1780's most people in the Carolina and Georgia piedmont were connected in some way to the Presbyterian faith. Having origins in Scotland and Northern Ireland, many were grandchildren of the followers of John Knox. There were not many established churches in the backcountry, and in some places taverns greatly outnumbered churches. Most early ministers of the Gospel were circuit-riders and went by horseback from community to community preaching along the way. Ministers were usually fed and housed by settlers in the various communities. In addition to Presbyterian settlements, there were also concentrations of Baptists and Methodists, many times all being served by the same minister on different days.

Early churches had many problems in maintaining attendance among their congregations. There were many instances in which congregants were expelled from churches for various offenses such as swearing, adultery, fornication, drunkenness, violence, stealing, and non-attendance.

It was a usual occurrence for slaves to be admitted to Protestant churches as members. Within the church, they sometimes held equal status to their white owners, and had an equal vote in church affairs. Equality as Christian brothers and sisters was expressed only inside the church. Once outside the church doors, they were again divided into master and slave.

French Protestants or Huguenots settled in the area along the Savannah River known then as New Bordeaux. This area is very close to the present-day town of Abbeville. They ventured up from the coast as early as the 1750's, and they were well-established by 1787 when Michaux traveled through the area. Their church services resembled the Anglican services of the English, but were delivered in French rather than English.

The traveler of the eighteenth century preferred to travel by water if possible. He would have encountered no roads that would be recognized as a road today. The roads of the backcountry were merely winding paths that followed the general topography of the land and went on for more than a hundred miles through thick forests. There were no bridges over the rivers, and often camps were made for days after hard rains as travelers waited to pass safely over. Most roads followed ancient Indian trails. Some became so rutted and eroded from the heavy wagons coming through from Virginia and Pennsylvania that they were practically impassible. A journey on horseback was the fastest way to go in areas where rivers and streams were not navigable.

Inns were scarcely found, and when encountered they were usually dirty and crowded. The fare in taverns and inns was often of a very poor quality. Women rarely traveled very far from home, and men on a journey were expected to sleep several to a bed in most hostelries. This was not a comforting situation because many people had lice and fleas. For this reason, someone such as Michaux who was traveling through the newly-settled territory would have likely depended upon the hospitality of the "better" families along the way.

Such families welcomed an educated traveler who could bring news from the coast as well as a vast knowledge of agriculture and botany. Many of the more educated people had a great interest in plants, both native and imported. Some had meager pleasure gardens where scotchbroom, lilacs, daffodils, herbs, privet, roses, and boxwood were grown. Practically everything grown in an eighteenth century garden in this region had a practical use as a medicine, seasoning for food, preservative, or dye.

One of the families that André Michaux encountered on his journey was that of General Andrew Pickens. Upon venturing to Pickens' plantation known as Hopewell, Michaux would have found a well-ordered farm, not dissimilar to one that would have been seen in the piedmont of Virginia. The manor house would have been a fine structure for the locale, and probably almost identical to the still-extant Hopewell on Keowee structure near Clemson. The existing Hopewell house, in the 1780's, was situated on a prominent hill above a fertile river valley and surrounded by hundreds of acres of cleared agricultural land. The house itself was constructed sturdily of large hewn logs, covered over with boards. It sat high on a stone foundation, and its base-

ment contained a fine winter kitchen with stone fireplace and floor. Originally, it contained at least two large rooms on the first main level and two rooms on the second floor. Although nothing like the opulent Georgian mansions of the coastal cities with which Michaux was familiar, Hopewell was a fine house by upcountry standards. The house would have been surrounded by various outbuildings, and very evident would have been the constant comings and goings of the family slaves, for Pickens was one of the wealthiest men in the Abbeville and Pendleton Districts.

Pickens himself was a retired soldier and planter in his early fifties, an advanced age at that time. He was a descendant of French Huguenot and Ulster-Scot settlers who had moved into Pennsylvania well before the American Revolution, and then migrated into the newly-settled Waxhaws settlement of South Carolina, near present-day Lancaster. From there, he moved into the Abbeville District of South Carolina along with other closely-related families, the Calhoun family being one. His wife was the former Rebecca Calhoun and was descended from another family that would later become prominent in the Abbeville and Pendleton Districts. Her uncle, Patrick Calhoun, was one of the earliest surveyors of the backcountry and the father of John Caldwell Calhoun, just a child of five years in 1787. John C. Calhoun would later become South Carolina's foremost antebellum statesman and champion of States' Rights. He served as Vice President of the United States for two terms and as U.S. Senator until his death from tuberculosis in 1850. Andrew Pickens was descended from the French Huguenot Bonneau family, as was his wife's aunt Floride Bonneau Colhoun, the wife of John Ewing Colhoun. From this it can be assumed with some degree of certainty that the culture and customs of Michaux's native France were not completely foreign to the Pickens and Colhoun/Calhoun families.

Andrew Pickens traveled extensively for his time, and was fairly well self-educated. He possessed a good library, musical instruments, fine English and French china, table silver, fine linens, and a good stock of liquors and wines. He was very well prepared to entertain a traveler of André Michaux's status. It is likely that Michaux enjoyed his visit with General and Mrs. Pickens and possibly met their kindred family, the Calhouns. Without a doubt, in these surroundings he received a brief and welcomed respite from his taxing search for rare native plant species.

As time has passed and generations of descendants of those earliest settlers have come and gone, the lands and forests known to Pickens and Michaux have either disappeared or changed drastically. Unfortunately, many species that were likely present in 1787 are no longer here. No one will ever know because the era of the great cotton plantations left us with almost no tract of land unplanted. The era of the Great Depression left almost no tract of land un-eroded, and our modern suburban sprawl has left few tracts of land undeveloped.

We shall never know the beauty of this place that the ancients saw, or the adventure of this place that the colonizers experienced. We do, however, know that some beauty still remains, and that we are charged with the preservation of those natural and cultural resources that impart beauty to our present surroundings. Let us not be remembered as the generation who let the last rare native plant and animal species slip into memory, but let us be the ones who preserve the areas that are rare and unspoiled. In our own backyards we may possess something extraordinary. It was in the "back yard" of Andrew Pickens, in the beautiful ancestral valley of the Cherokee nation, that André Michaux first observed the beautiful *Shortia galacifolia*, or as we locals have known it for so long, the Oconee Bell.

Bartram and Michaux: Early Botanical Explorers in the South Carolina Upstate

Their Expedition Routes and Plant Discoveries

Brad Sanders

Figure 1: View of Philadelphia from Historic Bartram Garden

André Michaux left New Jersey on June 3, 1786 bound for Pennsylvania. He soon arrived in Philadelphia where he visited Benjamin Franklin. It is unthinkable that in 1786 a visiting Frenchman, traveling on official scientific business in North America would not pay a visit to Franklin, who was much beloved by the French. Sometime between June 5 and June 11 Michaux crossed the Schuylkill River to see the famous Bartram Garden. There he visited with William Bartram, who was laboring to finish his *Travels*. The *Travels*, which was to bring world-wide attention to William, was not to be published until 1791, but the Frenchman was well acquainted with the work of William's father, for John Bartram was well known in the botanical circles of Europe.

We don't know much about this first meeting for Michaux's journal of that period was lost at sea, but André would certainly have plied William for information about travel in the South and he would have been guided around the Bartram garden as William pointed out interesting plants collected on his travels in the South as well as plants collected all across America by his father. Michaux observed Franklinia for the first time, although it does not bloom in Philadelphia in June.

Figure 2: The Bartram Home

Just before their first voyage to Charleston in 1786, André and François Michaux returned to Philadelphia to visit Bartram and Franklin again on September 2. No doubt this trip was to get letters of introduction from both men and, in particular, travel details from William. One of the things one will learn from a study of William Bartram's life and character is that he was a man of few pretentions and no jealousy. He freely gave advice and information to people that a lesser person would consider a professional rival.

After his first successful expedition into the Piedmont and mountains of South Carolina Michaux sailed for Philadelphia where he visited William Bartram on July 30, 1787. We can imagine how animated the conversation might have been as the two botanists compared notes and exchanged stories of traveling in the Cherokee Country.

Figure 3: Portrait of William Bartram

André and François returned to Philadelphia on July 21, 1789 and remained for a week. Michaux left his horses with the Bartrams, ensuring that he could have at least two visits with William. Rain delayed the return trip south and the Michauxs were forced to spend two days with William at the Bartram Garden before heading to South Carolina again. During this visit Michaux presented a new plant to Bartram, *Jeffersonia dyphylla*, collected in the Virginian mountains. Benjamin Smith Barton received the plant from Bartram and named it in honor of Thomas Jefferson.

Figure 4: Twinleaf, *Jeffersonia diphylla* (L.)
Photograph by Tom Barnes, University of Kentucky

After trips to the north and west we find Michaux in Philadelphia again in April 1792. He again visited John, Jr. and William Bartram. We find Michaux in Philadelphia in April, 1792, in December of that year, and January, 1793. Each time he no doubt visited the Bartram Garden. Michaux visited William in early February, 1793, and received a list of plants that William wished him to collect in the South. Michaux was again in Phildelphia at the end of the year and wrote that William Bartram kept his horse. Michaux remained in Philadelphia through January and visited Bartram at least once

more.

Figure 5: Portrait of François Michaux

The friendship continued beyond the death of André Michaux in 1802 for his son, François, continued a correspondence with William Bartram.

March 12, 1810

I am sincerely obliged to our common friend, Mr. [Alesander] Wilson, to have give me in his last letter, news of you and family. The marks of friendship that you have invariably bestow on my father and me will be constantly present to my memory:

The seeds came in hand in good order. The only thing I cannot but observe is that you really put too much of each kind for the small sum of money that I have sent; consequently I am under a double obligation toward your brother John, and your nephews.

By this same occasion, I send somme Literary Journals for the Philosophical Society. In the same packet, I include a small parcel of seeds of two sorts of pine, Pinus maritima, et P. laricio. This last is a very interesting species, growing in the mountains of Corsica. As it grows very well at Paris, I suppose he will support well your climate. You claim those seeds of Mr. J. Vaughan.

Since my return not a day is passing away without working steady to my American Sylva. Drawers, engravers, type and copper printers, are busy about it; and the French edition, or at least the first number, is to appear the first of May; and by the same time, I shall send over the engravings to be added to the American edition, in case Mr. S. Bradford will be disposed to republish. I am very anxious to know how he will meet in America; and in particular, your opinion respecting it. Also of Mr. Hamilton and Dr. Muhlenberg.

Our great emperor is about to marry. The only good that will do, at present, is to prevent a great effusion of blood, by preserving the life of many thousand; considering that event will afford a Continental peace, for some time.

With respect, and an unalterable attachment, I remain your most obedient friend.

F. André Michaux

Upon his arrival in Philadelphia in June, 1802, François visited numerous influential people, including William Bartram, whose reputation had by that time been enhanced by the wide-spread distribution of his *Travels*.

Now we will look at several plants that were first collected by William Bartram and André Michaux.

Figure 6: *Magnolia fraseri* Walter

Bartram: May 19, 1775, found on the south slopes of Rabun Bald. "This exalted peak I named mount magnolia, from a new and beautiful species of that celebrated family of flowering trees, which here, at the cascades of Falling Creek (Martin Creek Falls), grows in a high degree of perfection: I had indeed, noticed this curious tree several times before, particularly on the high ridges betwixt Sinica and Keowe, and on ascending the first mountain after leaving Keowe, when I observed it in flower, but here it flourishes and commands our attention.

This tree, (*Magnolia auriculata*) or perhaps rather shrub, rises eighteen to thirty feet in height; there are usually many stems from a root or source, which lean a little, or slightly diverge from each other, in this respect imitating the Magnolia tripetala..."

Michaux: "On December 8, 1788, as we were approaching the source of the Kiwi the paths became more difficult. Our journey was... and two miles before arriving there I recognized the *Magnolia montana* which... was named *M. cordata* or *auriculata* by Bartram."

Michaux found it near the Keowee dam. Bartram's *Magnolia auriculata* is now called *Magnolia fraseri*, named by Thomas Walter for his friend John Fraser.

Figure 7: *Rhododendron calendulaceum* Michaux

Bartram: May 15, 1773, Anderson and Oconee counties. "the Flaming azaleas abound, and illuminate the hill sides; and a new and singularly beautiful species of *Aesculus pavia*, situated above them, towards the summits of these low hills."

Several times during his journey through Cherokee Country Bartram mentions *Aalea flammea* and *Azalea flammula* without giving a description.

Michaux: June 16, 1787, between Dillard and Mountain city. "I found a lot of that shrub with pear-shaped fruit and an azalea with yellow blossoms.

Figure 8: *Rhododendron minus* Michaux

Bartram: May 19, 1775 near Station Mountain: "This species of Rhododendron grows six or seven feet high; many nearly erect stems arise together from the root, forming a group or coppice. The leaves are three or four

inches in length, of an oblong figure, broadest toward the extremity, and terminating with an obtuse point; their upper surface of a deep green and polished; but the nether surface of a rusty iron colour, which seems to be effected by innumerable minute reddish vesicles, beneath, a fine short downy pubescence; the numerous flexile branches terminate with a loose spiked raceme, or cluster of large deep rose coloured flowers, each flower being affixed in the diffused cluster of oblong peduncle, which, with the whole plant, possesses an agreeble perfume."

Michaux: December 4, 1788, site of Seneca Town. "At dawn I went to look at the banks of the river and I recognized the yellow root, rhododendron new species, mounain laurel, hydrangea (*Hyrangea glauca*), hemlock spruce (*Pinus abies*), box-elder (*Acer negundo*), fruitful… pawpaw (*Annona triloba*), silverbell (*Halesia tetraptera*), alternate-leaved dogwood, sweet-shrub (*Calycanthus*):

Figure 9: *Stewartia ovata* (Cavanilles) Weatherby

Bartram: May 19, 1775, near Tamassee. "Having crossed the vales, I began to ascend again the more loft ridges of hills, then continues about eight miles over more gentle pyramidal hills, narrow vales and lawns, the soil exceedingly fertile, producing lofty forests and odoriferous groves of Calycanthus, near the banks of roivers, with *Halesia*, *Philadelphus inodorus*, *Rhododendron ferrugineum*, Azalea, *Stewartia montana*, fol. ovatis acuminatis serratis, flor. niveo, staminum corona fulgida, pericarp. pomum exsuccum, apice acuminato dehiscens…"

Bartram's footnote says: This is a new species of *Stewartia*, unknown to the European botanists, and not mentioned in any catalogues.

Figure 10: *Heracleum maximum* Bartram
Photograph by Stephen Lea

Bartram: May 21, 1775, Rabun County along the Little Tennessee River. "I observed growing in great abundance in these mountain meadows, *Sanguisorba canadensis* and *Heracleum maximum*, the latter exhibiting a fine show, being rendered conspicuous even at a great distance, by its great height and spread, vast pinnatifid leaves and expansive umbels of snow-white flowers..."

Michaux: Cow parsnip, *H. lanatum*. Michaux must certainly have found cow parsnip in the meadows during his first trip into the Blue Ridge Mountains. Cow parsnip was once attributed to Michaux but has now been given Bartram's original name, *Heracleum maximum*.

Figure 11: *Clethra acuminata* Michaux

Michaux: June 15, 1787, headwaters of the Chatooga River near Highlands. "In several creeks I recognized a new kind of very large Clethra with a stem of four inches circumference, a violet with hastate leaves, of which I luckily could gather some seeds."

Figure 12: *Panax quinquefolius* Linnaeus
Photograph by Dan J. Pittillo

Ginseng is one of John Bartram's great discoveries. Ginseng was not known to the English of North America until John Bartram discovered it in May 1738 on the banks of the Susquehanna River. However, it must be said that the French of Quebec had known of North American ginseng since 1718 when it was discovered by Joseph François Lafitau.

Bartram: June, 1773. William Bartram saw Ginseng in Oconee County, South Carolina, where he observed it grew plentifully on the northern exposure of the hills. However, in his Report to John Fothergill Bartram first mentioned seeing ginseng after leaving Wrightsborough in the Georgia Piedmont, where it is an extremely rare plant today.

Michaux: June 8, 1787: Michaux saw ginseng near Seneca Town. Both André and François Michaux promoted the establishment of a ginseng trade with China.

Figure 13: *Pyrularia oleifera* Michaux
(*P. pubera*) Buffalo nut

Michaux: June 13, 1787, Whitewater River. A woody plant discovered on the same day as *Shortia*, Michaux was more excited about buffalo nut. "I found a shrubby "dioique" tree with a pear-shaped fruit, an upper calyx with five very short leaves; it had not yet formed, but it was developed enough to recognize a stone inside. I am calling this shrub "dioique" because I saw several of them past the flowering stage where only the grape remained. The female trees had their fruit in the number of 4 or 5 on the same cluster."

Figure 14: *Shortia galacifolia*

Figure 15: Expeditions of William Bartram and André Michaux in Oconee County.

William Bartram

May 15, 1775: Bartram left Loughabber, just north of Abbeville. He saw flame azalea while traveling through Anderson County. He traveled forty-five miles through a wilderness and arrived at Seneca in the evening.

May 16: Bartram left Seneca, traveled sixteen miles and arrived at Fort Prince George Keowee in the evening.

May 19: Bartram left Fort Prince George and traveled westward. He saw ginseng growing plentifully on the northern exposure of hills. He found *Sewartia montana*, *Rhododendron minus*, traveled through Salem, near Tamassee, Oconee Station, and over Station Mountain. He noted that many plants he saw were common to Pennsylvania.

Bartram crossed the Chatooga River at Earl's Ford, meandered along Warwoman Creek and skirted Warwoman Dell by crossing the lower part of Rabun Bald at Courthouse Gap. He discovered "*Magnolia auriculata,*" Fraser Magnolia, at Martin Creek Falls and at Pinnacle Knob. He found *Heracleum maximum* near Clayton.

May 22, he arrived at Cowee.

May 24, Bartram departed Cowee for the Overhill Towns.

About May 27, Bartram arrived back at Cowee.

May 29–30, he return to Keowee.

Early June, he remained at Seneca.

Mid-June, he explored around Fort James in Georgia.

André Michaux

May 30, 1787 Michuax departed Augusta. He made twelve miles that day. François accompanied him.

June 1, Michaux traveled nine miles to Scotts Ferry, then traveled 5 miles farther.

June 2, traveled twelve miles

June 3, traveled ten miles and passed through New Bordeaux

June 4, traveled sixteen miles

June 5, Michaux reached the home of Andrew Pickens near Abbeville.

June 6, traveled seventeen miles, passed the home of Capt. Middle (Vedle) seven miles from Pickens. He lodged with Thomas Lee near Rocky River.

June 7, Michaux traveled fifteen miles and spent the night at Deep Creek.

June 8, he traveled fifteen miles to Seneca (Fort Rutledge). On the way he recognized *Kalmia latifolia*, *Panax quinquefolius*, *Epigaea repens*. Michaux collected *Hydrangea arborescens*, *Cornus alternifolia*.

June 9, Michaux visited Martin the Frenchman.

Jun 10, he met with his Cherokee guides

June11, traveled twelve miles and crossed Little River

June 12, traveled north for fifteen miles, through the sites of Keowee, Sugar Town, and Toxaway.

June 13, traveled nine miles, crossed the Keowee (Whitewater) at the fork with the Toxaway. Found *Pyrularia oleifera*, saw *Magnolia acuminata* for the first time.

June 14, traveled ten miles, proceeded up Whitewater River, saw *Magnolia fraseri* for the first time.

June 15, traveled twelve miles and arrived at the hills of the Tugaloo River He recognized a new clethra (*Clethra acuminata*). He camped near Little Scaly Mountain,

June 16, traveled eighteen miles and reached the Little Tennessee River between Dillard and Mountain City. He found *R. calendulaceum.*

June 17, traveled fifteen miles. He passed through Warwoman Dell and down Warwoman Creek.

June 18, traveled twenty-seven miles, through level ground in Oconee County, through Tamassee and arrived at Seneca in the evening. He recognized the cucumber tree, *Magnolia acuminata*, on the banks of Cane Creek. The return to Seneca from Tamassee was most likely not along the Keowee River, which would be much more than twenty-seven miles, but by some unknown route more directly across Cane Creek.

June 19, Michaux rested and prepared for his return to Charleston.

June 20, Michaux left Seneca.

The "Lost *Shortia*," a Botanical Mystery

Charlie Williams, AMIS Chairman

The story of "the lost *Shortia*" is the best story in nineteenth century American botany. We have gathered here today only a single hour's journey from the very spot where it all began two hundred and thirty years ago. Many of you are familiar with parts of this story; that is why you are here. It was felt that we needed to retell this story at our conference in order to correct any misinterpretations and bring the latest developments to the attention of an interested public. This happy task has fallen to me, so let us begin at the beginning, before there was a "*Shortia*" and before it became *"lost."*

On June 8, 1787 the Frenchman André Michaux arrived here. At the age of forty-one he was in the second year of what was probably the most productive decade of his career. Michaux brought the latest and best European training in botany to the study of the plants of North America. He was familiar with many of the American plants that had previously been imported and grown in Europe and could therefore recognize new American species when he encountered them. He was also an experienced botanical traveler, a veteran of an expedition to the Middle Eastern countries who understood that plant exploration could sometimes be a difficult and dangerous business. He knew that physical stamina and simple courage were as essential to a successful botanical explorer as ability and training. Moreover, he possessed all these necessary qualities.

Today we are in a suburban setting on the campus of Clemson University, but in 1787 the Cherokee village of Seneca was across the river. Michaux went for a walk along the bank of this river he called the "Kiwi", and as was his custom, looked for plants. Lake Hartwell now covers the riverbank where his feet must have left impressions in the soft mud. Much of the land he saw that is not beneath the waters of the lake is now developed. The university, the towns that have grown up in the area, agriculture, and our transportation and electric power corridors have replaced most of the forest, but wild areas are still preserved nearby in a collection of lands known as the Clemson Forest. Some of the plants Michaux noticed on his first walk are not so easy to find now. Nonetheless, the ginseng, wild hydrangea, Indian pink, yellow root, alternate-leafed dogwood and many other plants observed by Michaux still survive in places in the Clemson Forest along this lake and in the nearby uplands.

About the only building left standing in this area from the period of Michaux's visit is Andrew Pickens' fine plantation home Hopewell. It survives partly because this house stood high on a bluff overlooking the river. Now the property of the university, Hopewell is an historic site, but it has not been restored to the glory of the days when Andrew Pickens entertained the chiefs of the Cherokee and Choctaw tribes, the governor of Georgia, the future governor of Tennessee, and a host of other dignitaries. We are not certain whether Michaux ever spent an evening in this "Hopewell on the Kiwi" or not, but he would have seen the house and known about it. On his 1787 journey Michaux met Andrew Pickens and was his guest at another Pickens plantation located near present Abbeville about forty-five miles from here.

Michaux had come here to explore the wilderness for plants new to science. He was purposely following the same general route American botanist William Bartram had taken to explore this region in the 1770's. Once he arrived where we are today, Michaux didn't waste any time. As soon as he could arrange for local Cherokee guides, he set off on his wilderness exploration. If measured by the yardstick of his later American explorations, this journey was brief. He traveled beyond the area of European settlement only one week; however, I will suggest to you that in some ways this was the most important journey Michaux would make in America. What he would do in this one week would eventually change him from just another European plant collector in America to a legend in the annals of botany. I suggest that had Michaux not observed and collected the little plant we now know as *Shortia galacifolia* during this short jour-

ney, the name of André Michaux would most likely be known to only a few botanists.

It is more than a little ironic that a man who came to America to study our woody plants, especially the trees that might be most useful in shipbuilding, is principally remembered for an evergreen ground cover. He thoroughly studied our oaks and authored the first book about this plant family in America. He cataloged and described the many plants in the herbarium that he had gathered with such extraordinary personal effort during his travels through the eastern half of the continent. Then, from his herbarium, notes and memory, André Michaux drafted the first book describing all the plants he had found growing in North America. The book came to be published as the *Flora Boreali-Americana* in 1803. Nonetheless, his son François-André tells us that his father's draft was too detailed for publication and so another anonymous botanist was engaged to revise, and shorten André Michaux's manuscript to create the book we have today. Michaux's draft of the *Flora* has not been found, so we cannot be certain how much his anonymous co-author, whom we now believe to be L. C. M. Richard, contributed to the work. Nonetheless if you search Michaux's published *Flora,* you will find no mention of this evergreen ground cover. When he collected it, the plant was past flowering, so without the flowers, even though he knew this was a new species, Michaux could not describe it. The Linnean system he used to describe plants relied on the counting of flower parts. So, the specimen was filed away in a folder in his herbarium in Paris marked "unknown plants."

There the specimen remained for four decades until the young American botanist Asa Gray arrived at the Paris herbarium in 1839 to study Michaux's North American plant collections. Gray found Michaux's specimen and the discovery of this little plant truly changed his life. Writing about it almost fifty years later, Gray's friend and colleague Charles S. Sargent reported that Michaux's specimen of this little ground cover with the habit of *Pyrola* and the foliage of *Galax*, was, among all the plants studied, described and classified by Gray over his long and productive career, the plant that most excited Asa Gray's interest. Recounting the story of Gray and his quest for *Shortia* in the one hundredth anniversary year of Gray's publication of the name, Charles F. Jenkins reported that Gray was absolutely bewitched by *Shortia* in the sense that this little plant charmed, enchanted and captivated him.

Gray, demonstrating the confidence that served him so well throughout his career, boldly suggested to the staff of the Paris herbarium that he be allowed to name this new North American species and to take a small fragment of the specimen back to America with him. His hosts in France granted both requests and today the Gray Herbarium at Harvard retains this fragment of Michaux's historic specimen.

Gray chose to name the plant for Charles W. Short. Although they had never met, Short was a prominent American botanist. Since Michaux's note on his herbarium specimen indicated that he had collected the plant in the "high mountains of Carolina," Gray hoped that Short, who lived in Kentucky, would promptly make a search for his namesake plant and find the flowers. In this Gray was disappointed, but he resolved to make his own journey south to the high mountains of Carolina Michaux had visited and find the plant himself.

Gray was on the threshold of a long and productive career that would make him the leading American botanist of the Nineteenth Century. In 1841 and again 1843 Gray, by then Professor of Natural History at Harvard, made journeys to the southern mountains in search of *Shortia.* Learning from Michaux's journals that the Frenchman had visited the very highest peaks in North Carolina, the Black Mountains, Grandfather Mountain and Roan Mountain, that is where Gray searched unsuccessfully. Today, we know that *Shortia* does not grow on mountaintops, but Gray didn't. He didn't even know what time of year the plant flowered. In retrospect, Gray's confidence that he could find *Shortia* with such slender information is amazing.

After 1843, Gray's work kept him too busy for more expeditions. He became the unofficial, but widely recognized coordinator of American botany. He corresponded with prominent European botanists and received a constant stream of plant specimens from other botanists and from government exploring expeditions. His prominence in American botany enabled him to encourage others to take up the search for *Shortia*, but none of them found the plant either.

Years passed, fruitless searches continued and some began to doubt the existence of *Shortia.* Dr. Short passed away without ever having seen his namesake plant. Gray noted in his obituary of Short that Michaux was still the only botanist to have ever seen the elusive *Shortia.* Then, the existence of *Shortia* was confirmed from Japan. Gray received a specimen of a plant from the mountains of Japan with name *Schizocodon soldanelloides* that appeared to be virtually identical his *Shortia galacifolia*. This specimen also lacked flower parts, but Gray now had fresh proof of *Shortia's* existence. Moreover, Gray had become a leading authority on plant geography. He had systematically studied the close affinities between the floras of eastern Asia and of eastern North America and had developed a theory to explain this phenomenon. The dis-

covery of a close relative of *Shortia* in Asia fit perfectly into Gray's theory of a widespread ancient flora covering the northern hemisphere before the advancing glaciers separated and divided it.

More years passed. Gray became the president of the American Association for the Advancement of Science and retired from active teaching, but *Shortia* continued to elude all the botanists he sent south to search for it. Then, in 1878 his colleague Joseph W. Congden of Rhode Island sent Gray a plant collected in McDowell County, North Carolina by seventeen-year old George Hyams. His father Mordecai Hyams, a knowledgeable plant collector, had been unable to identify this plant his son had collected and therefore sent a specimen to Congden. Young Hyams had collected *Shortia* on a hillside near the Catawba River in McDowell County, North Carolina in May 1877.

So, at last Shortia had been rediscovered. Gray had never lost faith; his announcement printed in the *American Journal of Science and the Arts* in December 1878 is factual and restrained. In 1879 Gray and some of his friends came south to McDowell County, North Carolina in order to see the plant, but he arrived too late to see *Shortia* in bloom. Asa Gray never did see *Shortia* flower in its native habitat. Moreover, Hyams' *Shortia* population was growing at approximately 1,000 feet elevation. It was at the foot of the mountains and additional populations were not found higher in the nearby mountains. Although Michaux had visited this area during his journeys, Gray came to believe that Michaux had really discovered the plant elsewhere in his travels.

Gray continued to speculate about *Shortia.* In 1886 he wrote a letter to his friend and companion on the 1879 journey, Charles S. Sargent who was at that moment on a botanical expedition in Sapphire, North Carolina. Sargent, an expert on trees, was searching the mountains and valleys along the North Carolina-South Carolina border for a "lost" Michaux tree, *Magnolia cordata.* This yellow-flowered deciduous magnolia had not been seen in the wild in the nineteenth century, although several gardens featured trees collected in Michaux's era.

In his letter Gray asked Sargent to look for *Shortia* while he searched for the magnolia on his present journey. After many years of being convinced that *Shortia* was a plant of the high mountains, Gray had now revised his interpretation about where and when Michaux had found *Shortia.* Gray now suggested to Sargent that Michaux must have found the plant on his initial journey to the southern mountains in 1787 when he had visited the same area that Sargent was now exploring. In what might be regarded a cosmic coincidence, Sargent received Gray's letter the very same day that he rediscovered *Shortia.* So, at last, in the twilight of his life, Gray could rest in the knowledge that *Shortia galacifolia* had been found in the same locale where Michaux had discovered it.

The story, however, does not end with Gray's quest or with Gray's death in 1888. Sargent, after studying the landscape and comparing it to the descriptions he found in Michaux's journal, concluded that entries in Michaux's journal for December 8 and December 11, 1788 described Michaux's discovery of the plant we know as *Shortia* and provided very specific directions for finding the plant. Sargent published his conclusions in 1886, 1888 and again in 1889 when he annotated the transcription of the original French of André Michaux's journals being published by the American Philosophical Society. The "lost *Shortia* story was in fact enhanced by Sargent's interpretation, because it indicated that Michaux regarded *Shortia* as an important enough discovery to provide absolutely the most thorough directions for finding *Shortia* that he gave for any plant he mentioned in his journal.

It is worth mentioning here that the American Philosophical Society had held Michaux's manuscript journals for more than sixty years and had not published them. It was at Charles S. Sargent's request that the journals were finally transcribed and published in their original French. As we have seen, *Shortia* played a key role in Sargent's interest in Michaux. We can speculate that without Sargent's involvement in the rediscovery of *Shortia* Michaux's journals might be known to only a handful of scholars. In the years since this the publication of this French transcription in 1889, portions of the French transcription have been translated into English and published with annotations. This has made some of Michaux's notes accessible and useful to many people who would never have sought out the manuscript. We can say that interest in *Shortia* opened the door to the study of Michaux.

Sargent's interpretation of when and where Michaux found *Shortia* is the conclusion of the *Shortia* story in the nineteenth century. The great mystery was solved, but it was not the end of the story. Again, the link is Asa Gray. He was perhaps one of the few people who noticed that Michaux's December 1888 description referred to a plant with aromatic leaves. Gray's insightful comment about this, which is appended as a note to Sargent's 1886 publication, seems to have been overlooked. Gray remarked that the plant Michaux described in December 1788 with aromatic leaves must have been *Gaultheria procumbens*, "teaberry" or "wintergreen." There the matter remained for more than half a century; the locale of *Shortia* remained remote and difficult. A few

enterprising local nurserymen visited the area to collect live plants and soon *Shortia* plants found their way into many gardens. Sargent's interpretation, that Michaux had collected his famous *Shortia* specimen in December 1788, appeared in every publication on the subject.

Only after the plant's patterns of growth and flowering became better known did anyone question Sargent's interpretation. In the 1950's botanist P. A. Davies of the University of Louisville began publishing a series of studies of *Shortia*. Davies did not directly question Sargent's conclusion that Michaux had collected *Shortia* in December 1788. Instead, Davies used his knowledge of the growth habits of *Shortia* to propose that the type specimen that Asa Gray studied in Paris was collected by Michaux in June 1787. This was Michaux's initial journey to the southern mountains and the only time he was along the Keowee River early in the year. Michaux's specimen had fruiting capsules, but Davies observed that these structures withered and disappeared long before December. Davies also noted small differences between the McDowell County, North Carolina plants and those found in South Carolina. He was thus able to confirm Gray and Sargent's conclusion that the plant in Michaux's herbarium had come from South Carolina and rule out the possibility that Michaux had collected the famous specimen in McDowell County, North Carolina.

In the 1980's Clemson botanists Robert Zahner and Steven Jones followed the path blazed by Davies. They carefully studied the route of Michaux's 1787 journey and proposed that Michaux first entered the range of *Shortia* and would have collected his type specimen on June 13, 1787. Today this location is under water near the site of Jocassee Dam. Because of the creation of the lake it is no longer possible to retrace Michaux's journey through the Jocassee Valley, but our story does not end here.

Following the 2002 André Michaux International Symposium the organizers formed an new organization called AMIS, the André Michaux International Society, to continue the study of Michaux. In 2004 a small group of Americans from AMIS visited France for a celebration honoring André Michaux in the town of Rambouillet. After the 2002 symposium a member of the Michaux family in France, the botanist's great-great-great nephew, journalist Régis Pluchet, had come forward and introduced himself to the Americans who were interested in André Michaux. Before the Rambouillet celebration began, my wife Lydia and I joined Monsieur Pluchet for a visit to Michaux's herbarium at the National Museum of Natural History in Paris. There, among other folders, we examined the famous folder of unknown plants hoping to find and photograph the specimen of *Shortia* studied by Asa Gray, but we confirmed instead that this celebrated specimen was missing.

We also learned new and potentially important information during our visit to the museum. After Michaux had returned to France, he gave his colleague Anton-Laurent de Jussieu about five hundred duplicate plant specimens that he had collected in America and these specimens were in de Jussieu's herbarium, also housed in the museum. We passed this information to fellow AMIS Eliane Norman, who was in Rambouillet for the Michaux celebration and possessed both the French language and taxonomic skills to examine the de Jussieu herbarium.

Immediately following the celebration in Rambouillet, Eliane Norman visited the herbarium in Paris. There she began to systematically locate and examine the Michaux plants in the de Jussieu herbarium. She soon found a specimen only recently identified as *Shortia galacifolia.* For over 200 years the dried plant on this sheet had been identified as a *Pyrola.* The re-examination of the specimen and determination of its identity had been made by French botanist, Gerard Aymonin, only one day after we visited the herbarium with Monsieur Pluchet. In the herbarium the day of our visit, Dr. Aymonin learned of our quest for *Shortia* and with his extensive knowledge of the herbarium, promptly located and correctly annotated the specimen in the de Jussieu herbarium.

Examining the specimen closely, Eliane translated the notes on the herbarium sheet. The notes on the sheet are in Anton-Laurent de Jussieu's handwriting and identified this as a specimen collected by André Michaux in 1787 in the high mountains of Carolina and given to de Jussieu in 1797. In addition, the herbarium accession label indicated that the specimen had been donated to the Museum in 1857. Gray visited in 1839, found only one specimen in Michaux's herbarium and therefore concluded that Michaux had only collected the one specimen. Since this second specimen was not donated to the Museum until eighteen years after Gray's visit, he did not see it and never learned about it. What had actually transpired was that Michaux had collected and pressed at least two plants for his herbarium. Our second specimen, clearly collected at the same time as the first one studied by Gray, confirms for us that Michaux did indeed collect *Shortia* in 1787. Since we know from the studies of Michaux's journal that he entered the range of Shortia on June 13, 1787, this becomes the most likely date of collection.

Thus, the date of Michaux's collection of *Shortia* is resolved, but not the identity of the plant he described on December 8 and 11, 1788. Michaux's directions for finding this mystery plant are the most elaborate directions to find any plant mentioned in his journal. What

might this plant have been? Sargent concluded that it was *Shortia.* This is possible, certainly, but several points in Michaux's description really do not fit *Shortia*.

First of all would a French botanist really use the word for shrub, *arbuste* in French, to describe *Shortia*? In addition, Michaux clearly says in his journal that the Indians told him that the mystery plant's leaves were aromatic when crushed and tasted good when chewed and that he himself had found this to be true. *Shortia's* leaves are not aromatic when crushed and do not have a pleasant taste. Michaux specifically said he found the mystery plant in only one location although he had searched for it all around. That alone suggests the mystery plant was not *Shortia*. Sargent's guide in 1886, Frank Boynton, who like Michaux visited this forest before it was extensively logged, reported finding acres and acres of *Shortia* in the Jocassee Valley and along the little streams entering the Whitewater River. These are places we know Michaux visited two different times in different seasons. How could he have missed so many large populations of the plant along his path?

If the plant was not *Shortia* what might it have been? We remember that Asa Gray had immediately suggested that the plant Michaux described in December 1788 was *Gaultheria procumbens,* "teaberry." Why would Sargent not think of *Gaultheria* as a possibility as Gray had?

Perhaps one reason is that Sargent had reached the range of *Shortia* by descending the mountains from North Carolina, not as Michaux had by coming up the rivers from South Carolina. Sargent concluded that Michaux had collected his specimen and written this 1788 journal entry to describe the junction of the Toxaway and Horsepasture Rivers. Sargent visited that river junction and found *Shortia* growing where he believed Michaux had found it.

One crucial issue, therefore, is did Sargent actually find the spot where Michaux collected *Shortia*? The best answer we can give to that question is no, he did not. The later researchers who followed Michaux's route up rather than down these rivers, including Davies and Zahner and Jones, all concluded that Michaux actually collected *Shortia* about ten miles downstream from Sargent's site and at the junction of the Whitewater and Toxaway Rivers. Unfortunately this whole area is now beneath the waters of Lake Jocassee so we can never check for *Gaultheria* there.

An examination of the herbaria at Clemson, USC and UNC reveals that no one had reported *Gaultheria* from the South Carolina Upstate prior to the publication of the *Manual of the Vascular Flora of the Carolinas* in 1968. In the last forty years a few populations of *Gaultheria* have been found, including one now beneath the waters of Jocassee, but it remains a rare plant in South Carolina although fairly common to the north on into Canada. Is it possible that the sharp-eyed Michaux found a single population there in 1787, 180 years before anyone else? If so, the question then becomes how such a well-trained European botanist could fail to recognize this species? *Gaultheria* was named for a French doctor in Canada, had been known in France for decades, and was even then growing at Rambouillet where Michaux's shipments were being sent.

Fortunately we have another clue that suggests Michaux found, but did not recognize *Gaultheria,* and this clue was not available to Sargent. Michaux kept very detailed lists of the plants that he shipped to France and these lists have survived in the French archives. Sargent had only Michaux's journal. If we examine the documents accompanying Michaux's two shipments for January 1789 we find one entry for "*50 Gualtheria ? procumbens*." The question mark and the misspelling are both found in the original document. Michaux is a very good speller of Latin plant names. This spelling error is very unusual and could suggest he was unfamiliar with the plant; moreover, the question mark is not likely to indicate that he wanted his spelling checked. He had reference books and could do that himself. Michaux inserts a question mark after a plant name only a handful of times throughout all his many shipping lists. Together with the fact that Michaux reported collecting a large quantity of the mystery plant in December 1788, the aromatic leaves, and other inconsistencies in his description, there is reason to believe that Michaux collected *Gaultheria procumbens* in December 1788, but did not immediately recognize the species as one that had been previously described.

So, this is the evidence that the 1788 plant description is in fact not *Shortia,* but *Gaultheria*. It is not conclusive evidence. There is no Michaux-collected specimen of *Gaultheria* with helpful geographic information, but I find this evidence persuasive. Sargent's story is so romantic, that I am reluctant to give it up, but I know Sargent was an exacting scientist. If he had all the evidence we have today, I think he would change his interpretation.

The key question now is much larger and more complex than the mystery story I have just related. With the accelerating changes now occurring in climate, forest composition and destruction of crucial habitat, could future generations lose *Shortia galacifolia* as a wild species? Our scientific researchers will address aspects of this far more difficult and important question in the next sessions.

Sexual Reproduction in the Rare Oconee Bells

Implications for Conservation

Katherine Weeks

Abstract

Shortia galacifolia has a narrow geographic distribution restricted to the escarpments of the Blue Ridge Mountains. Although there have been studies on the distribution, seed germination and pollination of this species, very little is known about its reproductive biology. Understanding the reproductive biology of rare plants is important to their conservation. To develop information needed to support effective conservation management, I investigated *Shortia's* dependence on pollinators, breeding system and timing of inbreeding depression. My work provides specific information about self-compatibility, autogamy, rate of selfing, and the possibility that pollination might limit seed production. I also investigated when, in the early life stages, that inbreeding depression is expressed.

I conducted a replicated field experiment with several pollination treatments: open-pollinated, selfed, and crossed within and between two nearby populations in Devil's Fork State Park. One population was located along a stream, and represented the "stereotypical" *S. galacifolia* habitat (Site 1). The second population (Site 2) was found about 500 meters away in "atypical" *S. galacifolia* habitat adjacent to Park roads. Additional experiments included caging flowers to exclude pollinators and adding pollen to open-pollinated flowers to determine if seed production is pollen limited. Germination and seedling growth tests were conducted in controlled growth conditions that approximated field temperatures and light regimes. Response variables measured included fruit set, seed mass, germination percentage, germination rate, number of seedlings to develop true leaves, seedling survival at seven months, aboveground biomass, and rosette diameter. Data were analyzed using a variety of statistical tests.

S. galacifolia flowers are self-compatible and autogamous although spontaneous self-fertilization occurs very infrequently. Insect pollinators are nearly necessary for fruit and seed set. The two populations tested had intermediate selfing rates ($S \approx 0.38$ at Site 1 and $S \approx 0$ .48 at Site 2). Despite predictions that self-compatible and autogamous species are not likely to be pollen limited, this was not the case for *S. galacifolia* as the total seed mass of open-pollinated flowers treated with additional pollen was greater than those that were not. This difference was less evident at Site 1 ($p=0.0491$ at Site 2; $p=0.0673$ at Site 1) suggesting that pollen quantity or quality was less limiting here than in Site 2. Effects of inbreeding depression were quantified using ten fruits (capsules) each from selfed, outcrossed within population, and outcrossed between population treatments. Response variables from three developmental stages, seeds, growth (over seven months), and survivorship, were used. The coefficients of inbreeding depression (δ) were greater in the seed and survivorship stages than in the growth stage with $\delta_{(\text{seed mass})} \approx 0.3$ and 0.2 at Site 1 at Site 2 respectively, and $\delta_{(\text{survivorship})} \approx 0.2$ at both sites. The mean performance of selfed and outcrossed progeny were not different for the following growth measures: rosette size, aboveground biomass at seven months, and number of seedlings to develop true leaves. Inbreeding depression in the growth stage may have become more evident over time or in field conditions where competition would play a role. There was evidence of some outbreeding depression at Site 1. The progeny from Site 1 outperformed those from Site 2 with respect to germination percent, germination rate, day first leaves appeared, and the number of seedlings to develop true leaves.

These results can be directly applied to the conservation management of *S. galacifolia*. The observed inter-population differences suggest the need to conserve multiple populations, at least until the degree of inter-population diversity can be investigated further. Results

further suggest that artificial gene flow may be needed to counter inbreeding depression especially in small populations, but used with caution to prevent out-breeding depression. Finally, protecting the insect pollinators may be vitally important to this species' conservation as this study underscores the importance of pollinators for fruit set while suggesting the need for additional research on pollinator identity and abundance.

Genetic Studies of the Imperiled Oconee Bell to Enhance Its Conservation

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Background

Shortia (*Diapensiaceae*) is genus of six to twelve species with one in the Southeastern United States and the others are found in Eastern Asia. *Shortia* plants are mat-forming perennials with evergreen, alternate, round, and toothed leaves. The teeth are generally sharper and more prominent on immature leaves. Flowers are solitary or in a short raceme. The flowers are 5-merous with a funnel-shaped white corolla with toothed or fringed lobes. The stamens are attached near the mouth of the corolla tube and alternate with short staminodes. The fruit is a capsule with a persistent style. Seeds are numerous, small, oblong or ovoid (Hatley, 1977).

Much has been inferred from the natural habitats of *Shortia* to assess the origins of the different species. The North American *S. galacifolia* T. &. G (Oconee Bell) occurs in similar habitats to many of the Asian species, namely broad-leaved deciduous or mixed forests in low mountains. Common plant associates are found between the American and Japanese species. Most species are characteristic of moist yet well-drained habitats in areas of high rainfall. The habit and habitat of *S. galacifolia* (forming mats of foliage on steep ravine sides and on stream banks) is very similar to that of the Japanese *S. soldanelloides*. However, there is a greater diversity of habitats in Japan and this is reflected in a wider range of morphological variation in its species of *Shortia*. Because of the similar habitat and elevation patterns among the different species, some have speculated that *Shortia* is a very old genus and that speciation occurred after the breakup of the continents (Duncan et al., 1950).

The Oconee Bell is endemic to a very narrow mountainous region of Georgia and the Carolinas (five counties total). This species is a small herbaceous evergreen plant found almost exclusively along stream banks and in well-shaded, moist areas. This species is classified at the state and federal level as a "plant of concern" because of its global and state-wide rarity or factor(s) making it vulnerable to extinction (Walter and Gillett, 1998). Two varieties are sometimes recognized in the Oconee Bell. Plants with shorter styles (6–10 mm) are recognized as *S. galacifolia* var. *brevistyla*, and those with longer styles (12–18 mm) are *var. galacifolia* (Davies 1952). These two varieties are found in distinct watersheds separated by approximately sixty miles of mountainous terrain. Other than the style difference, these varieties are morphologically very similar and Hatley (1977) did not support their varietal status.

The largest historical concentration of *S. galacifolia* and its possible center of distribution were considered to be the confluence of the Horsepasture and Toxaway rivers, with the greatest abundance in the Jocassee Valley of South Carolina. With increased development and utilization of natural resources, many previously identified locations of *S. galacifolia* have been inundated by the Keowee and Jocassee reservoirs. With just the loss of the Jocassee Valley it was estimated in the mid-1970's that 60% of the *S. galacifolia* populations had been lost (Dunn and Jones, 1979). Since this last published survey work (only covering Oconee and Pickens counties, South Carolina) on *S. galacifolia*, the areas around these new lakes have become highly developed further threatening the remaining populations.

Genetic Studies on Shortia:

No population genetic work has been completed on the Oconee Bell that could be used to improve conservation or management strategies. We wish to determine the ge-

netic diversity of this species to obtain baseline data for future research and conservation efforts. These data will be essential in preserving the variation observed in this species. These genetic markers and population genetic theory can provide information on life history traits and offer insights into the current and future condition of the Oconee Bell. Genetic markers provide a window into the variation present in a species, especially variation that is often masked by morphological similarity. Additionally, these data can be used to test if the two varieties of *S. galacifolia* are genetically distinct.

An initial genetic diversity assessment using RAPD (Random Amplified Polymorphic DNA) markers found seven primers with variation among population samples. Populations were from the southern range of the species (around Devil's Fork State Park, South Carolina) with approximately one mile separating each population (Linscott, 2003). These initial data revealed high levels of diversity for a species that spreads vegetatively (=clonal). One possible explanation for the maintenance of high levels of genetic diversity could be if individuals with different ploidy levels (number of chromosomes) exist within each population, as has been shown in other members of *Diapensiaceae* (Burton and Husband, 1999). Future work will determine if populations contain individuals of different ploidy. Other genetic analyses will use AFLP (Amplified Fragment Length Polymorphism) banding patterns to assess genetic diversity because they can detect more variation and are not as problematic as RAPDs.

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Planting Michaux's Garden: Carolina Plants to Grow in Your Garden

Lisa K. Wagner[1]

André Michaux was especially active in the Carolinas and named nearly 300 plants native to the two states (see www.michaux.org for complete lists prepared by Dr. David Rembert Jr. and excerpted by Lynn Smith and Tom Jones of the South Carolina Association of Naturalists (SCAN). In addition, he introduced many plants from other parts of the world through his plant nursery in Charleston, South Carolina, including camellia (*Camellia japonica*), tea olive (*Osmanthus fragrans*), crape myrtle (*Lagerstroemia indica*) and gingko (*Ginkgo biloba*).

I'm focusing here, however, on a few of the Carolina natives discovered by Michaux that are particularly garden-worthy, although this is not an inclusive list, by any means. Some are widely available, others are available only through specialty nurseries, and some need to be grown by seed. I haven't included Oconee Bells (*Shortia galacifolia)* because of its rare status, and limited availability through nursery-grown plants, although it grows well in suitable garden habitats. *Shortia galacifolia* is under consideration for delisting from Appendix II of CITES (Convention on International Trade in Endangered Species), during the fourteenth CITES Conference of the Parties in The Hague (Netherlands), on June 3–15, 2007. CITES helps protect rare and endangered species from the impacts of collection of plants in their native habitats by regulating traffic in these species.

I've included USDA hardiness zones and brief cultural notes for each species, indicating whether plants and/or seeds are available. Much more cultural information is provided in the references listed for the most commonly grown species. For all of these species (and as a good general gardening practice), careful attention to site conditions (soil, light, and moisture, and their seasonal changes) is an important part of being successful with a given species in your garden.

1. Director of Education, South Carolina Botanical Garden.

Wildflowers

Hexastylis arifolia (arrow-leaved wild ginger), Zone 5–9
Easy to grow, moist shade; available as plants.

Liatris squarrosa (scaly blazing star), Zone 3–9
Easy to grow in average soil, sun, widespread species; plants or seeds.

Viola hastata (halberd-leaved yellow violet), Zones 5–9
Easy to grow in woodland gardens; seed or divisions.

Vernonia noveboracensis (new york ironweed), Zones 4–8
Easy to grow and widely available, sun; plants or seed.

Delphinium tricorne (dwarf larkspur), Zones 4–9
Attractive in damp areas in sun to light shade on woodland edges, slow-growing; seeds or plants.

Lobelia puberula (downy lobelia), Zone 7–9
Good butterfly plant with short soft hairs on stems, average soil; seeds or plants.

Trillium grandiflorum (large-flowered trillium), Zone 2–8
Very attractive in shady woodland gardens, needs rich soil high in organic matter; confirm plants that you buy are nursery-propagated.

Pachysandra procumbens (alleghany spurge,) Zones 4–9
Very attractive; moderately difficult to grow from seed or cuttings.

Ferns

Thelypteris hexagonoptera (broad beech fern), Zones 5–9
Easy to grow in partially shaded woodland gardens; rhizomes or plants.

Polystichum ascrostichoides (christmas fern), Zones 4–9
Easy to grow evergreen fern in shaded woodland gardens; rhizomes or plants.

Athyrium asplenioides (southern lady fern), Zones 3–8
Grow in rich moist shade to partial shade; forms attractive patches; rhizomes or plants.

Trees, shrubs and vines

Clethra acuminata (mountain pepperbush, cinnamon pepperbush), Zones 5–8
Attractive peeling cinnamon-colored bark, good shrub for mixed borders, sun to light shade in moist soils; plants or seeds.

Halesia parviflora (little silverbell), Zones 6–9
Smallest of the silverbells, good in moist to moderately dry soil; plants.

Magnolia macrophylla (big leaf magnolia, umbrella tree) Zones 5B–8
Lovely specimen tree with the largest leaves in North America, fairly adaptable to sun and shade; plants and seed.

Myrica cerifera (southern wax myrtle) Zones 7–9
Easy to grow, full sun, adaptable and tough; plants.

Pinckneya pubens (fever tree, poinsettia tree) Zone 8, 9 (protected Zone 7)
Beautiful, but restricted to moist to wet shady sites, best in morning sun; plants or seeds.

Quercus falcata (southern red oak) Zones 6–9
Good wildlife tree, widespread in upland areas; seeds or young containerized plants.

Rhododendron minus (carolina rhododendron) Zones 5–8
Widespread on moist slopes, moist, rich acidic soil, variable depending on sub-species; plants or seeds.

Rhododendron catawbiense (catawba rhododendron, Mountain Rosebay) Zone 5–8
Adaptable, widely used shrub for cool, moist sites, striking flowers; plants.

Rhododendron calendulaceum (flame azalea) Zones 4–8
Beautiful in flower; flower color variable from pale yellow to deep orange-red; plants.

See Michaux's discoveries page at Michaux.org for photos and descriptions of some of the showiest species (http://www.michaux.org/photos.htm#discovery).

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Appendix

Three studies of where and when André Michaux collected the type specimen of *Shortia galacifolia*

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Castanea, Journal of the Southern Appalachian Botanical Society

Type Location of *Shortia Galacifolia*

P. A. Davies

During his brief sojourn at the Jardin des Plantes, Paris, in 1839, Asa Gray examined each of André Michaux's North American specimens. As he reached the end of the collection he came upon a folder marked "plantae ignotae." In the folder was an unnamed incomplete specimen that Michaux had labeled "Hautes montagnes de Carolinie, *An pyrola spec*? *An genus novum*?" Gray (1842) by right of discovery named the plant *Shortia galacifolia* in honor of his friend and botanical colleague, Charles W. Short in Kentucky.

Because Michaux failed to place on the herbarium label clear and concise data concerning the location and date of discovery of the original specimen of *Shortia*, various opinions on the subject have arisen. Some botanists and layman believe that he collected it on one of his five botanizing excursions to the high mountains (Black, Grandfather, Roan, Yellow and Linville) north and east of Ashville, North Carolina. This was the opinion held for so long by Asa Gray and his associates, and their efforts were spent hunting for it in this area. Also the first rediscovery by George M. Hyams was made in McDowell County. Others contend that it was found on one of the two trips Michaux made earlier to the sources of the Keowee River. They interpreted Michaux's "*arbuste*" for *Shortia*, and for which he recorded concise collecting data in his Journal. In this region it is found more abundant.

Except for the recent discoveries by Crandall (1956) in Amherst County, Virginia, cumulative data show that *Shortia* is confined to two restricted areas, separated by more than sixty miles of mountainous terrain (Davies 1952, 1955). Floral differences are present in the plants from these two areas. The larger area containing the original species *Shortia galacifolia* is on the Keowee River and its tributaries in Oconee and Pickens Counties, South Carolina, Transylvania County, North Carolina and near Reed Creek in Rabun County, Georgia, while the smaller one containing the variety *brevistyla* is restricted to the drainage areas of small streams that flow from the southern part of the Bald Mountain chain and terminate in the Catawba River in McDowell County, North Carolina.

The question of first importance is, from which of these regions did Michaux collect the original specimen? Michaux's type specimen in; the Jardin des Plantes is incomplete, lacking petals, stamens and staminoidia, but containing two long peduncles each with a dehisced capsule, style, stigma and subtending calyx. Drawing of the specimen with an extra capsule and style enlarged, made by M. Joseph Decaisne in 1839, is fixed to a herbarium sheet in the Gray Herbarium. Also, in an envelope attached to the same herbarium sheet is a peduncle with capsule, style, stigma, and sepals from the type specimen. An important characteristic which separates the species from the variety is the length of the style. In order to determine the source of Michaux's specimen an index was developed between the length of the mature ovaries and their styles. More than 200 flowers were used. For plants from the sources of the Keowee River the index was 1:2.37 and from the Catawba River was 1:1.28. Using the index on the capsule and style of Decaisne's drawing and the part of the original specimen in the Gray Herbarium, it was clearly shown that the type specimen came from a source of the Keowee River.

André Michaux was at the source of the Keowee River on two successive years. On the first he departed from the village Seneca, crossed Little River on June 11, 1787, and reached it on June 14. It required more than three days of difficult travelling to make the distance. During the second journey he departed from village Seneca on

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December 6, 1788, and two days later was at the source of the river.

With definite proof that Michaux collected the type specimen on a source of the Keowee River, the next important question to be answered is on which of his trips was it found and in what place.

There are two references in the literature on the type location of *Shortia* for the sources of the Keowee River. Charles S. Sargent (1886) while seeking Michaux's *Magnolia cordata* at the head waters of this river rediscovered *Shortia* near the confluence of Horsepasture and Toxaway Rivers. He was convinced that this was the locale where the Frenchman collected the original specimen. In a recent article, "*Shortia galacifolia* in its type location," A. E. Prince (1947) expresses an opinion that it was near the junction of the Whitewater and Toxaway Rivers, a few miles south of where Sargent believed it was found, that Michaux collected the original specimen.

Shortia flowers during March and the first part of April. The majority of the capsules mature and dehisce during the latter part of April and throughout the month of May. The author has found a few late capsules with seeds the first week of June. Before mid-summer the peduncles and capsules have disappeared. Michaux's specimen contained two peduncles each with a well-developed dehisced capsule. If the first of June is considered as the time when all but a very few of the capsules have dehisced and December 8 is considered as Michaux's collecting date in 1788, then six months would have intervened between the ripening of the capsule and this collecting date. As the fruiting structures and the remaining floral parts dry with dissemination of the seeds, one would expect the parts to be badly weathered if they had remained on the plant for six months. But Decaisne's illustration and the part specimen in the Gray Herbarium show little that could be considered weathering, so he must have gathered his specimen June 14 on his first trip to the sources of the Keowee River.

A source or beginning of a river was frequently considered the place where two large streams came together, i. e., on modern maps, the source of the Savannah is the Seneca and Tugaloo Rivers; for the Seneca, the Keowee and Twelve Mile Creek; and for the Keowee, the Whitewater and Toxaway Rivers. At the time Michaux was on the Keowee the maps available to him show the entire river above its junction with the Tugaloo as the Keowee. A map of northwestern South Carolina dated May 1777 depicting the area ceded by the Cherokee Indians shows distinctly the fork or source of the river, and the two streams forming the source are now named the Horsepasture and Toxaway.

The most distant point he reached along the Keowee in 1787 before turning west to the Tugaloo River (now the Chatooga, the north fork of the Tugaloo) to follow the path taken by William Bartram eleven years earlier to the Tennessee River was the confluence of two rivers, for he wrote in his Journal on June 14: "We finally arrived at a place where the Kiwi [Keowee] begins. This place resembles a bay, being a plain more than a mile surrounded by high mountains." Without doubt the "place where the Kiwi begins" is the junction of the Horsepasture and Toxaway Rivers. The bay was the more or less treeless area beginning on the Horsepasture River and extending eastward along the lower part of Laurel Fork Creek.

Asa Gray found but a single specimen of *Shortia* in Michaux's collection so it is logical to conclude that the Frenchman gathered only one. This can be accounted for on the supposition that either he was unable to find but a single plant with fruiting structures still attached or he failed to recognize it as something new so did not think it necessary with his limited collecting facilities to gather more than one. Anxious to reach the high mountains to the west, he spent only a short time at the sources of the Keowee. He recorded in his Journal, "We stayed there more than two hours to rest our horses and to eat strawberries which were there in abundance." In this brief time and at that season of the year he found the one remaining plant with a capsule in the patch he discovered. Only after he returned to Charleston and consulted the manuals did he decide that not only was it a new species but also a new genus, for he wrote on the label, "*An genus novum*?" He was unwilling to name or describe it until he could obtain plants in flower.

On his second trip to the sources of the Keowee River, Michaux (1788) collected on two separate occasions "*un nouvel arbuste*" and recorded specific directions for finding the small shrub:

> *"On Dec. 8, 1788, in proportion as we approached the source of the Kiwi, [Keowee] the roads became more difficult. Our march was towards… and two miles before arriving there I recognized the* Magnolia montana*, which was named* M. cordata*, or* auriculata *by Bartram. There was in this place a small cabin inhabited by a family of savage Cherokees. We stopped to camp here and I ran off to do some research. I collected a new shrub with denticulated leaves, climbing on the mountain a short distance from the river." [And again on December 11.] "It froze considerably and the air was clear and brisk. I came back to camp with my guides at, the head of the Kiwi and I collected a large quantity of the shrub*

with notched leaves that I found the day I arrived. I did not meet it on any of the other mountains."

"Directions for finding this shrub."

"The head of the Kiwi is the junction of two torrents of considerable size which flows by cascades from the high mountains. This junction takes place in a small plain where formerly there was a city, or, rather a village, of Cherokees. Descending from this junction of these two torrents, with the river on the left and the mountains which face north on the right, one finds at about 30 to 50 toises [16.4 ft.: 1 toise] from this confluence a path cut by the savage hunters. It leads to a stream where one can recognize traces of a village of the savages by means of the peach, trees which remain in the middle of the brush. Following this path one arrives immediately on the mountains and one finds this shrub which covers the ground with the Epigea repens."

To rediscover and study Michaux's *Magnolia cordata* in its native habitat and to seek the *arbuste*, Charles S. Sargent in 1886 resolved to visit Michaux's old camp grounds at the confluence of the two torrents that gave birth to the Keowee River. He decided that the junction of the Horsepasture and Toxaway Rivers was the source of the Keowee and proceeded with his guide, Frank E. Boynton, to this place. On what basis Sargent made his decision is not known. Days of strenuous mountain climbing in clear and invigorating autumnal air failed to yield a single trace of either the magnolia or the new shrub. What they did find was the first station of *Shortia* for the Keowee and its tributaries. After some reflection Sargent (1886) decided that the *arbuste* and *Shortia* must be one and the same.

There is some positive evidence to indicate that the *arbuste* is *Shortia* while other pieces of information suggest to the contrary. Supporting evidence is that both are evergreen low growing ground covers with denticulate leaves. Michaux could have mistaken *Shortia* for a shrub for the older stems are hard and rather tough. Sargent believed that the geographical and descriptive evidence was conclusive enough to warrant the consideration that they are "one; and the same." The writer has not found a single reference in the literature which lists or describes from this region a small shrub that fits Michaux's description. Also he has carefully examined the areas about the confluences of the larger tributaries in the watershed of the Keowee River without finding a little ground-covering shrub with denticulate leaves. However, he has located *Shortia* at or near several of them.

The strongest evidence against *Shortia* being an *arbuste* is that it is an herbaceous perennial. Michaux was a keen observer and would not have made such a mistake. He entered in his Journal, "The savages of this place [source of the Keowee] told me that the leaves had a good taste when chewed and that the odor of them was very agreeable when they were crumpled." Asa Gray added a note to the end of Sargent's (1886) publication commenting on the last statement, "Michaux must have had reference to *Gaultheria procumbens* and not *Shortia*, for the foliage is slightly mucilaginous and odorless." The writer has chewed both young and old leaves without experiencing either an agreeable or disagreeable taste and the leaves when crumpled are neither pleasing nor unpleasant.

Unless we accept *Shortia* for the *arbuste* we have no clue to the location where Michaux collected it in 1788 for he visited many places at the headwaters of the river. Because of his careful directions for finding the *arbuste* we know that the place he gathered his specimens was near the junction of the two large streams. A comparison of these directions for finding the shrub with data obtained from a thorough study of the areas about the different stream junctions show only the Toxaway-Whitewater and Toxaway-Horsepasture have a close agreement.

A strong claim is made by Sargent (1886) that it is the junction of the Horsepasture and Toxaway Rivers that Michaux described as "Tete de Kiwi," and the place where both he and the Frenchman found *Shortia*, for he writes, "A little plain less than a hundred acres in extent, now converted into a corn field and dotted with the homes of a few poor families, marks the junction of the Toxaway and the Horsepasture. The mountains which are "*exposees au sud*," that is, which faces the left bank of the Keowee below the junction of its two mountain branches, are still covered with *M. auriculata*. From the opposite shore at the foot of the mountains which face the north, fifty paces below the junction, the Cherokee hunting trail, as smooth and hard today under the tireless steps of the moon-shiners as it was ninety-eight years ago when Michaux saw it, leaves the river, crosses, the little brook and stretches up to the mountains; and here with *Epigea repens* may be found Michaux's little "*arbuste*" with its "*feuilles denticulees*," the *Shortia* of Torrey and Gray."

It was unfortunate that Sargent did not explore the river farther south, for he would have noticed a close resemblence in the topography between the Whitewater-Toxaway and the Toxaway-Horsepasture junctions. Had he visited the former rather than the latter he would have undoubtedly declared the area of the Whitewater-Toxaway confluence as the type location. This is exactly what was done by A. E. Prince.

On March 18, 1944, Prince observed and collected *Shortia* along of the Whitewater River in Jocassee Valley. Of this occasion he relates (1947) "…the author had the opportunity to visit the area where this relative rare plant was originally collected. Additional trips on two succeeding years were made into the area looking for *Shortia* which was found in a few other more or less isolated places. Another trip on May 21, 1946 to the exact fork of the Keowee River [junction of Whitewater and Toxaway] was more profitable." The "exact fork" must have had reference to Michaux's statement where he found the *abuste* which is interpreted to be *Shortia*, "The head of the Kiwi [Keowee] is the junction of two torrents of considerable size which flows by cascades from the high mountains."

Resumé of the data indicates that the type specimen which André Michaux collected at the source of the Keowee River and which Asa Gray found in this botanical savants collection and named *Shortia galacifolia* was discovered at the confluence of the Toxaway and Horsepasture Rivers on June 14, 1787, or on his first trip to the sources of the Keowee. The *arbuste* which he collected twice in the same place on his second excursion to the source of the river and for which he recorded definite directions for finding, was also gathered at the junction of the Toxaway and Horsepasture rivers. If the *arbuste* is *Shortia* as Sargent believed and which the author agrees, then Michaux again collected *Shortia* in 1788 from or near the patch where he gathered the type specimen the previous year.

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Resolving the Type Location for *Shortia Galacifolia* T. & G.

Robert Zahner and Steven M. Jones

Abstract

Previous opinions, principally those of Charles S. Sargent in 1886 and P.A. Davies in 1956, are reviewed concerning the type location and the date of collection by André Michaux of the type specimen of *Shortia galacifolia* T. & G. A 1976 rendering of Michaux's journal by Margaret Mills Seaborn permits a new interpretation for both the type location and the date of collection for the *Shortia* type specimen. Phenological observations prove the type specimen was collected in June, 1787 during Michaux's first journey to Oconee County, South Carolina, when he continued on into Jackson and Macon Counties, North Carolina, and Rabun County, GA. A detailed study of journal entries strongly indicates that Michaux's party traveled through the heart of the natural range of *Shortia* on June 13. He was out of the natural range on June 12 and on June 14. Further interpretation resolves that the type location lies within a six-mile stretch along the west bank of the upper Keowee River above present Jocassee Dam and along the northeast bank of the Whitewater River in Jocassee Valley, Oconee County, South Carolina.

Discussion

Based on the December 8 and December 11, 1788 entries in the journal of André Michaux, Sargent (1886) placed the type location for *Shortia galacifolia* T. & G. at the confluence of the Toxaway and Horsepasture rivers in Oconee County, South Carolina. Translated from the French (Sargent 1889, Jenkins 1942, Davies 1956), these entries are: "The roads became more difficult as we approached the headwaters of the Kiwi on the 8th of December, 1788. … We stopped there to camp and I ran off to make some investigations. I collected a new shrub with denticulated leaves creeping on the mountain at a short distance from the river. … This place which is called the source of the Kiwi is incorrectly so indicated. It is the junction of two other rivers or large torrents which unite at this place and which is known only as the forks of the Kiwi;" and on December 11, 1788, "…I came back to camp with my guides at the head of the Kiwi and collected a large quantity of the shrub with the denticulated leaves that I found the day I arrived. …"

Both Sargent (1886, 1888, 1889) and Davies (1956), as well as many other botanists who have studied these well-known journal entries, agree that this "shrub"[1] is *Shortia*. Michaux obviously collected a quantity of this plant, probably digging up clumps with roots for transplanting, as the purpose of his trip to the Keowee River in the winter of 1788 was to obtain woody perennials for transplanting to his garden in Charleston (Sargent 1886). If this plant was truly *Shortia*, it did not survive in Michaux's garden, nor did it appear in France among the collection of living plants shipped to Rambouillet for planting in the gardens there (Sargent 1889). It is odd that none of the "large quantity" of this plant collected by Michaux on December 11, 1788 has survived, for certainly he would have retained a few clumps in his flourishing Charleston garden, and more recent transplants of *Shortia* survive and grow well throughout eastern North America (Davies 1959, and Dunn and Jones 1979b).

Michaux did collect and preserve a single specimen of *Shortia*, discovered in the herbarium of the Paris museum by Asa Gray in 1839. Jenkins (1942) reviewed the now well-known *Shortia* story and reproduced the drawing by Decaisne of the single type specimen described and named by Gray. Jenkins cites a key entry in Gray's journal for April 8, 1839: "…I have discovered a

1. Michaux uses the term "*arbuste*" (Sargent 1889); *Shortia* itself is a stoloniferous herb.

Reprinted from *Castanea* 48:163–173. 1983.

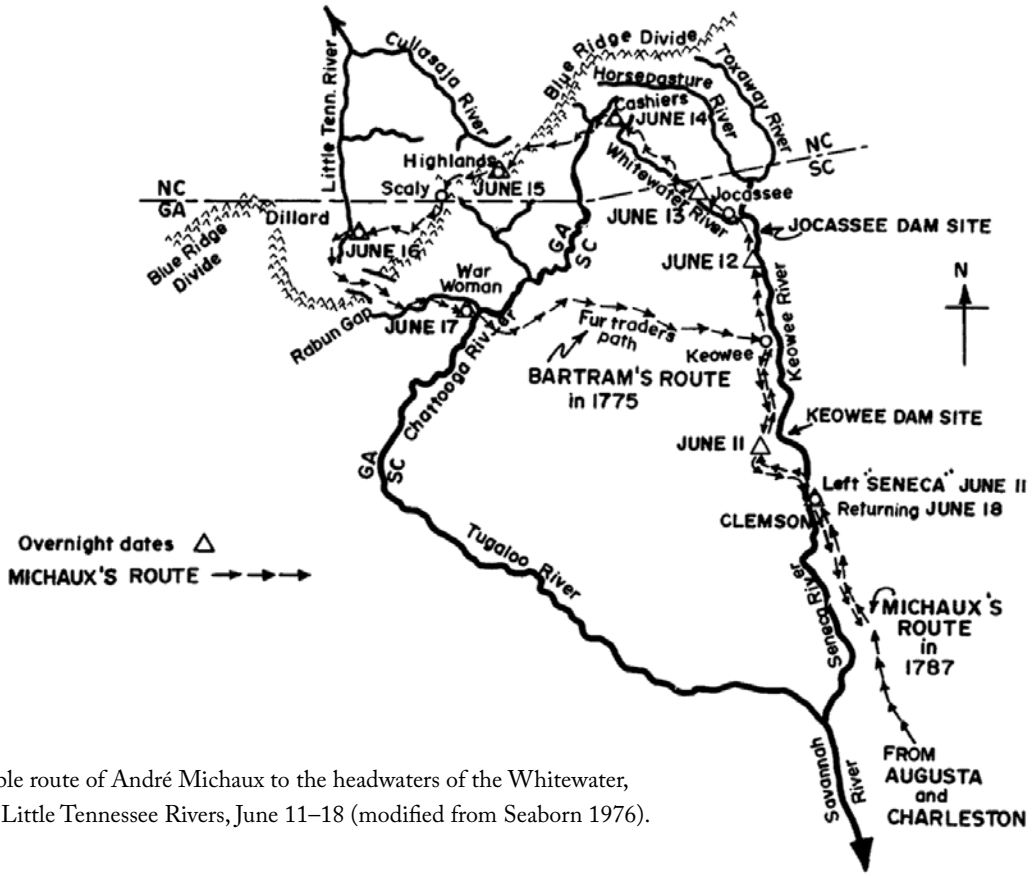

Figure 1. Probable route of André Michaux to the headwaters of the Whitewater, Chattooga, and Little Tennessee Rivers, June 11–18 (modified from Seaborn 1976).

new genus in Michaux's herbarium… we have the fruit, with the persistent calyx and style, but no flowers." In Michaux's handwriting in the herbarium folder are the words "Hautes montagnes de Caroline," but neither collection date nor more exact information concerning the type location is given. Is this single type specimen a survivor of the "large quantity of the shrub with the denticulated leaves" collected by Michaux on December 9 and December 11, 1788, as presumed by Sargent and many other botanists? Davies (1956) concludes not, and we agree with Davies.

Before the type location for *Shortia* can be ascertained with any degree of certainty, the date of collection of the type specimen must be established. Davies (1956) presents convincing evidence that the single type specimen was collected by Michaux on an earlier journey to Oconee County in June, 1787. The presence and condition of capsules on the type specimen precludes its collection in December; however, the specimen's phenological stage coincides perfectly with a June collection date. One of us (SMJ) has studied intensively the phenological development of *Shortia*'s flowering and fruiting habits at all seasons for several years at many field stations in Oconee and Pickens Counties, South Carolina. *Shortia* blooms from mid-March to mid-April in its natural range, the fruits mature from late April to early June and seed dispersal begins by early May and is normally complete by mid-June (Jones and Dunn 1979). These observations agree with those of Vivian (1967). Like Davies (1956), we conclude that the type specimen could not have been collected in the winter months. No vestiges of flowering stalks with calyx and capsules remain by late summer, and certainly all traces have disappeared by December.

Gray's 1839 Journal entry cited above, the drawing by Decaisne, and the packet attached to a herbarium sheet in the Gray Herbarium containing a peduncle with capsule, style, stigma, and sepals from the original Michaux specimen (Davies 1956) all attest to the fact that the type specimen was collected by Michaux during his first visit to the Keowee River in June, 1787. There is, however, no entry in Michaux's journal that indicates he saw such a plant on his 1787 journey.[2]

Having established to our satisfaction that the type

2. Michaux's simple notation in the herbarium folder, "Hautes montagnes de Caroline" without further elaboration, is further evidence that the type specimen was collected in 1787

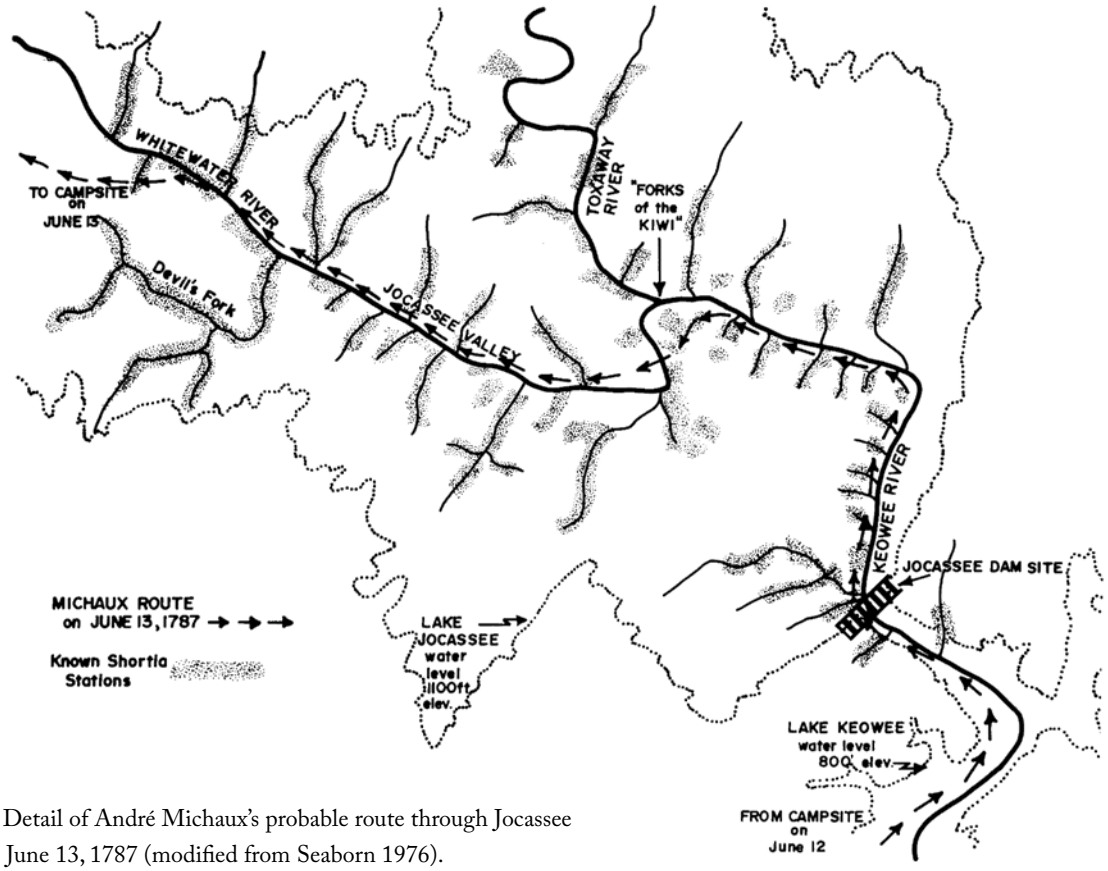

Figure 2. Detail of André Michaux's probable route through Jocassee Valley on June 13, 1787 (modified from Seaborn 1976).

specimen was collected on the earlier of Michaux's two journeys to Oconee County, we now turn to Michaux's journal to retrace his route precisely for clues where he most likely first encountered *Shortia* plants. Recently, Seaborn (1976) has reconstructed from information in Michaux's journal the exact routes of the botanist's travels in Oconee County in 1787 and in 1788. One of us (RZ) has traced these two journeys in the field and agrees substantially with Seaborn's interpretations (Figure 1). Based on the details of Michaux's route and assuming that he did, indeed, collect the type specimen of *Shortia* in June, 1787, then both the type location and the exact date of collection must be reestablished. We propose that André Michaux collected the type specimen of *Shortia* on June 13, 1787, near the west bank of the main stream of the Keowee River at some point near the present Duke Power Company's Jocassee Dam. This location is some ten miles downstream of that established by Sargent (1886, 1888), who assumed the type specimen was collected in December, 1788 at the confluence of the Toxaway and Horsepasture Rivers.

From Michaux's journal entries for the period June 11 through June 14, 1787, we have a number of precise reference points to establish that he passed through the heart of the natural range of *Shortia* on June 13 (Figure 2). He could not have failed to espy this unusual plant and to collect a specimen. That he did not note this as an entry in his journal is not unusual, as Michaux was on a botanizing expedition, collecting many plants each day, rarely noting in his journal individual collections. From known landmarks noted in his journal, we now conclude that Michaux did not go upstream along the present Toxaway River and that he probably was unaware of the existence of the Toxaway River on his 1787 journey. The path he followed apparently led from the present Keowee River into Jocassee Valley, crossing to the present Whitewater River some distance south of and not within sight of the confluence of the Toxaway and Whitewater Rivers.

It is well to trace our latest interpretation of this route, based largely on the work of Seaborn (1976) and verified in the field in 1982 (Figure 1). In 1976 Margaret Mills

when Michaux actually did collect many plants from the "high mountains of Carolina" and probably did not note the exact date or location for each specimen. In 1788 he did not reach the high mountains, and he certainly recorded detailed information concerning time and place for the collection of the "*arbuste*" he gathered in quantity.

Seaborn, of Walhalla, South Carolina, translated for the first time for English readers those portions of André' Michaux's Journal dated June 5, 1787 through June 30, 1787. This includes the period of Michaux's first journey through Oconee County, South Carolina. The following translated excerpts from Michaux's Journal are herein reprinted from Seaborn (1976) with permission from the author.

On June 10, 1787, at present-day Clemson, then known as "Seneca," Michaux writes:

> *"The Indians came with a chief and several others of the nation. After I had made them fully understand that I wanted to visit the headsprings of the Kiwi river and the Tugelo river which together form the Savannah river; those which form the Tanase river which runs into the Ohio; and that I wanted to go as far as Tanase each of them demanded a blanket and a petticoat, the price of six dollars each for the twelve days the journey was to take. …"*

Contemporary maps of the late Eighteenth Century (Bancroft 1853, Bierer 1972) show clearly that the "Kiwi" river of Michaux's journal today includes (proceeding upstream from its junction with the present Tugaloo River to form the Savannah River) the Seneca River, the Keowee River, and the Whitewater River to its source near Cashiers, in Jackson County, North Carolina. Michaux's "Tugelo" river (again proceeding upstream) is the present Tugaloo River and the Chattooga River to its source between Cashiers and Highlands in Jackson County, North Carolina. The "Tanase" river of Michaux's journal is the present Little Tennessee River flowing north from Rabun Gap, Georgia, through Macon County, North Carolina. It is clear that Michaux wanted to explore the Blue Ridge Divide in the vicinity of the present-day Highlands Plateau, North Carolina. These "high mountains of Carolina" are plainly visible from Clemson. Michaux originally intended to go as far west as the state of Tennessee. (Inclement weather made him change his mind about continuing to Tennessee, and he returned to Clemson on June 18.)

On June 11 Michaux writes:

> *"I left with a young man who had lived with the Indians for five months and went to the arranged meeting place, and at noon we set out with the Indians whom I had furnished with gunpowder and bullets. They guided me alternately through hills and torrents which are called creeks. This very same day we passed through very steep places and we crossed a small river called Little River. Its current is very swift and I was frightened when I saw that we had to walk on rocks which were a foot, sometimes two, under water. The current was so swift that anyone but an Indian would have been carried away. These rocks were sloping and covered with a slimy moss. I feared the fall of one of our horses, but there was no other way and the Indians are not willing to listen to one's remarks in those circumstances. The deep creeks and the riverbanks were covered with rosebay rhododendron. Our day's journey was twelve miles…"*

Michaux and the "young man" (not his son François) were on horseback, and the two Cherokee guides were on foot. Michaux's estimates of miles traveled were quite accurate as verified by on-the-ground checks of distances between known locations. Thus, on June 11 the party camped on high ground along the main Cherokee path between old Esseneca Town (present Clemson) and the abandoned Keowee Town, about two miles southwest of the present Duke Power Company's Lake Keowee Dam.

On June 12 Michaux's entry reads:

> *"… At noon we took a short halt to rest the horses and to drink from a brook, where the water was the purest and best one could drink in America. Following the example of my two Indians I soaked the corn meal in this water and that was our dinner. The bad food and the bad paths didn't bother me as much as the displeasure of not having found any interesting plant since May 8th and I frequently pondered the annoyance of such a journey without results. That day we traveled fifteen miles through hills full of rocks, where we had to pass through deep brooks, through places which were marshy spots and full of terribly thorny smilax that wrapped around the face, the body or the legs all the time. Along the river I saw very fertile plains. In three different places the Indians showed me locations of three abandoned villages whose names they told me."*

The well-traveled Cherokee path, the route taken by William Bartram twelve years before (Harper 1958), turned west at Keowee Town, and Michaux's Indian guides led him north on poor trails up the west bank of the Keowee River, past the abandoned Cherokee towns of Keowee, Kulsage (or Sugar Town), and Toxaway, to camp overnight on June 12 at a point on the west bank of the river several miles downstream from the present Duke Power Company's Lake Jocassee Dam. This route is today inundated by the water of Lake Keowee. At some point north of the abandoned Cherokee town of Toxaway (lo-

cated at McKinneys Creek), this route enters the main portion of the natural range of *Shortia* (Dunn and Jones 1979a). Michaux's party evidently camped just south of the known *Shortia* stations along the west bank of the Keowee River. Michaux probably did not collect *Shortia* on June 12, as indicated by his statement of displeasure at not finding any interesting plant since May 8th.

On June 13 Michaux writes:

> *"… Shortly before crossing the Kiwi river which we had always followed on our right against the current, one of the Indians killed a wild turkey and at 10 o'clock I found a shrubby "dioique" tree with a pear-shaped fruit, an upper calyx with five very short leaves; it had not yet formed, but it was developed enough to recognize a stone inside. I am calling this shrub "dioique" because I saw several of them past the flowering stage where only the grape remained. The female trees had their fruit in the number of 4 or 5 on the same cluster. I saw several cucumber trees (*Magnolia acuminata*), which was the first time that I saw this tree in America.*
>
> *"The Indians killed a deer and while they skinned it I went to see the creeks where I had noticed mountain laurel and rosebay rhododendron in abundance.*
>
> *"That day we traveled nine miles and we were too famished to go on since we had made such a good catch."*

Prior to flooding by Lakes Keowee and Jocassee, *Shortia* grew in abundance in large colonies on the lower slopes and hillsides of many small tributaries flowing into the Keowee River from the west, beginning several miles downstream from the confluence of the Whitewater and Toxaway River (Figure 2). These colonies were continuous through Jocassee Valley (Boynton 1889, Prince 1947, Davies 1955, Dunn and Jones 1979a). Michaux must have passed through several stations of this plant on the morning of June 13 as he followed the trail upriver to Jocassee Valley. His failure to note *Shortia* in his journal on this date may have been due to his excitement over discovering the other two plants, the "dioique" tree (*Pyrularia pubera*) and the magnolia tree. Elsewhere, Michaux makes it clear that the primary objective of this trip was the discovery of new species of trees and shrubs to transport eventually to the gardens of Europe (Sargent 1886). His return to this same location in the dormant season of 1788 was for the purpose of digging and "tubbing" (Michaux's term) these new trees. In any case, in contrast to the discouraging journal entry of the day before concerning his disappointment at not finding any new plants, his elation over the two new trees possibly overshadowed his mentioning of *Shortia*. Yet Michaux certainly would have collected at least a specimen of so unusual a plant and added it to the many other plants in his saddlebags that he picked up along the trail. Davies (1956) suggested the supposition that he collected only one specimen in mid-June, 1787, because either he was unable to find but a single plant with fruiting structures still attached, or he failed to recognize it as something new so did not think it necessary to gather more than one specimen with his limited traveling facilities.

We should now examine the remainder of Michaux's 1787 journey to the headwaters of the "Kiwi," the "Tugelo," and the "Tanese" rivers to establish that it was actually the Whitewater River he ascended to its source, and not the Toxaway River as interpreted first by Sargent (1886) and later concurred by Davies (1956). The June 13 crossing of the "Kiwi" River before "10 o'clock" was actually the present Whitewater River at Jocassee (Seaborn 1976), where the Whitewater River makes an abrupt northerly bend to join from the south the present Toxaway River flowing from the north, to form the present Keowee River (Figure 2). As evident from eighteenth Century military maps (Bancroft 1853, Bierer 1972), the Cherokee Indians knew the present Whitewater River as the upper reaches of the "Keowee" River, while the present Toxaway River was unnamed on these maps. Today, the Keowee River begins at the confluence of these two rivers, but in 1787 the "Keowee" River began in high mountains to the northeast of Chattooga Ridge, at an elevation over 3400 feet, far above the natural range of *Shortia*.

There are no known stations of *Shortia* on the Whitewater River above the water level of present Lake Jocassee, elevation 1100 feet (Boynton 1889, Dunn and Jones 1979a). Michaux may have been out of the natural range of *Shortia* by the evening of June 13, as his party continued on up the present Whitewater River watershed. Michaux's party had only one extremely arduous day with the horses as they climbed up Chattooga Ridge on primitive foot trails, as described in his journal on June 14:

> *"… We had to pass over rocks, straddle huge trees fallen over thick bushes where we could hardly see to go because of the density of the thicket, the close high hills and the darkness which gloomy weather produced in that location, and the fogs which made it appear as if deep night surrounded us. The trouble and the confusion were increased by the noise of the waterfalls of this river over rocks and several creeks which we had to ford up to our*

*knees. The speed with which the two Indians crossed the creeks, sometimes in the water, sometimes over trees which were an obstacle to our passage, because the young man and I had horses to lead, forced us to abandon our horses so that one of us could run after them and know what had become of them, because in these surroundings there were no other paths but those beaten by bears and sometimes by Indians. On top of the continual worry of walking over snakes I sensed an increase of a horrible fear when we had to pass over huge trees which were so rotten that they gave way under the feet and we were half buried under the bark and the leaves surrounding them. Having finally arrived at a place where the river was no more than a foot-and-a-half deep over a rock slope we crossed it and I recognized white pine (*Pinus strobus*) on the banks, fir or spruce, a new magnolia that I call* Magnolia *(*hastata*). A Dutchman's-pipe (*Aristolochia scandens*). We finally arrived at the place where the Kiwi river begins its bed. This area resembles an amphitheater in a plain of more than a mile surrounded by higher mountains (water flows swiftly down them) and with a very regular contour. We stayed there more than two hours to rest our horses and to eat some strawberries which were there in abundance. Our day's journey was ten miles and the rain forced us to camp under a shed of tree bark…"*

The place where the "Kiwi River begins its bed" is undoubtedly the "plain of more than a mile" surrounded by present Chimney Top, Terrapin, and Sassafras Mountains just south of present Cashiers, North Carolina. There were several possible routes from Jocassee Valley up Chattooga Ridge to Cashiers Valley that agree with Michaux's description, and the distance traveled is correct. Had Michaux's route been up the Toxaway River to its confluence with the Horsepasture River, as surmised by Davies (1956), the distance is much too far to the east of the "Tugelo" River where Michaux reports he arrived the next day. Further, there is no question that Michaux reached the headsprings of his "Kiwi" river, for he states they crossed "where the river was no more than a foot and a half deep," and later arrived where the river "begins its bed." These observations in no way fit the interpretation of Sargent and Davies who assumed that Michaux's "Kiwi" river began at the confluence of the Toxaway and Horsepasture Rivers, because at that point the present Toxaway River below this juncture is a broad and deep major river (i.e., before its inundation by Lake Jocassee). In any case, Michaux was undoubtedly beyond the natural range of *Shortia* for most of, and probably all of, June 14.

Excerpts from Michaux's journal entries for the following four days are:

"On June 15th the Indians led us through mountains that were high but less dangerous for the horses and in spite of continuous rain we arrived on the hills of the Tugelo River… Our journey took about 12 miles, maybe more, and at four o'clock we camped amidst mountains that were so high they obscured the daylight."

"On June 16th we traveled over several mountains whose torrents (or creeks) flow into the Tenase river and found in these areas nothing but the umbrella tree and a new Vaccinium *(or* Arbutus*) that the bears are very fond of, which the Indians brought to my attention through the droppings of their digestion. In spite of the rain that had continued for three days I decided to go to the Tenassee river avoiding all the branches that form this river, and we traveled about eighteen miles that day. We camped near the river…"*

"On Sunday the 17th we decided to go to some of the Indian villages to buy some flour, because we were tired of eating only meat without bread. When we had luckily found the path of the fur traders we decided to return and we passed through mountains that were not at all steep, always covered with this Arbutus of bears. We journeyed 15 miles…"

"On the 18th we traveled twenty-seven miles through a rather level landscape except for some creeks that the earlier rains had swelled … and in the evening we arrived at Seneca, very tired…"

From the headsprings of the "Kiwi" (Whitewater) River, Michaux's party arrived on the watershed of the "Tugelo" (Chattooga) River the next day and on the watershed of the "Tanese" (Little Tennessee) River the day following, spending the night of June 16 at the Little Tennessee River. They found the 'fur traders path" (i.e., the main Cherokee Trail that Bartram had taken through Rabun Gap twelve years earlier, Harper 1958) on the morning of June 17, and decided to return to Seneca instead of continuing on to Tennessee. Michaux's descriptions and distances traveled coincide perfectly for horseback travel on good trails from Cashiers Valley up through Wildcat Gap in the Cowee Mountains, and onto the Highlands Plateau of June 15, then along the Blue Ridge Divide through present Scaly, North Carolina, then southwest through Webster Gap north of Rabun Bald Mountain, and down to the Little Tennessee River at present Dillard, Georgia, on June 16. Here he picked up the main

Cherokee Trail and returned to present Clemson, South Carolina, in two days (42 miles).

There is no other route that would permit such a journey in the time reported by Michaux, even if his distances were incorrect. The key point in time and place is the finding of the fur traders' route on the "Tanese" River on the morning of June 17 after visiting "some of the Indian villages" which in the late 18th century were numerous in the Little Tennessee River Valley between Rabun Gap and present Dillard, Georgia (Harper 1958, Smith 1979). This point establishes the fact that Michaux's party crossed the Blue Ridge Divide between "the place where the Kiwi river begins its bed," or Cashiers Valley, and Dillard, Georgia. Michaux could not have gone up the Toxaway River on June 14 and then back track to Keowee Town on June 15 to follow Bartram's route west through Rabun Gap as interpreted by Davies (1956). There was not time, the distances are too great, and Michaux's descriptions simply do not apply to any such route.

Based on the recent interpretation of Michaux's exact route (Seaborn 1976), our conclusion is, therefore, that Michaux collected the single type specimen of *Shortia* on June 13, 1787 at a point not far upstream from present Jocassee Dam (Figure 2). Before inundation by Lake Jocassee, the range of *Shortia* was continuous upstream from the present dam site for at least six miles along the Keowee River and Jocassee Valley. Michaux must have traveled through the heart of *Shortia*'s type location for most of the day on June 13. He could have collected the famous specimen at any point along this route.

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The Type Locality of *Shortia galacifolia* T. & G. Visited Once Again

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Abstract

In the spring of 1839, Asa Gray found a specimen bearing small scalloped leaves, without flowers, but with a scape with a calyx and capsule, in the Michaux collection at the Muséum d'Histoire Naturelle, Paris, which Michaux had labeled "*An Pyrola* spec? *an genus novum*? *Hautes montagnes de la Caroline*." This plant was subsequently named *Shortia galacifolia* T. & G. Charles Sprague Sargent, after travel in the Carolinas and reading Michaux's journal, concluded that the type was collected in December 1788 at the forks of the Kiwi [Keowee] River, Oconee County, South Carolina. Other botanists disagreed and maintained that the type was collected in June 1787 in the area of present day Jocassee Dam, also in Oconee County, South Carolina, as there would be no remaining capsule in December. The specimen that Gray studied in Paris has disappeared. We have recently found an isotype of this species in the de Jussieu collection at the Paris herbarium. This one is labeled by de Jussieu: "*Pyrola or related genus. In a specimen in the Michaux herbarium, we have seen a capsule which appears to be 3-valved, each valve had a partition in the middle. Given by Mr. Michaux in 1797, collected by him in 1787*" (transl.). This specimen substantiates the correct date of collection and type locality for this taxon.

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Discussion

Asa Gray, while on a year's trip to Europe, visited the Museum d'Histoire Naturelle in Paris in March and April 1839 and studied the Michaux collection, which was the basis of Michaux's *Flora Boreali Americana* (1803), the first flora of North America. At the end of the collection, among other unidentified specimens, Gray focused on one labeled "*An Pyrola spec*. ? *An genus novum? Hautes montagnes de la Caroline*." Quoting from the unbound collection of paper signatures that make up Gray's journal for 1838–39, Jenkins (1942) shares Gray's important entry for April 8, 1839. Of the unknown specimen, Gray wrote: "*We have the fruit, with the persistent calyx and style, but no flowers, and a guess that I made about its affinities has been amply borne out on examination by Decaisne* (curator at the Museum d'Histoire Naturelle, P) *and myself. It is allied to Galax but is 'un très distinct' genus, having axillary one-flowered scapes… I claim the right of a discovery to affix the name. So I say, as this is a good North American genus and comes from near Kentucky, it shall be christened Shortia galacifolia to which we will stand as godfathers. So Shortia galacifolia it shall be. I beg you to inform Dr. Short, and to say that we will lay upon him no greater penalty than the necessary thing—that he make a pilgrimage to the mountains of Carolina this coming summer and procure the flowers*." Decaisne gave Gray a fragment of the holotype, namely a leaf and a scape with the remains of a calyx enclosing a fruit (Figure 1) as well as a sketch of the whole plant. These are now at the Gray Herbarium of Harvard University.

From the very moment of the discovery of this new taxon, it was Gray's earnest wish to find this species in its natural habitat. Initially, Gray believed that *Shortia* would be found at a site in the very highest mountains Michaux visited. The interesting story of Gray's quest has been told several times (Jenkins 1942, Savage and

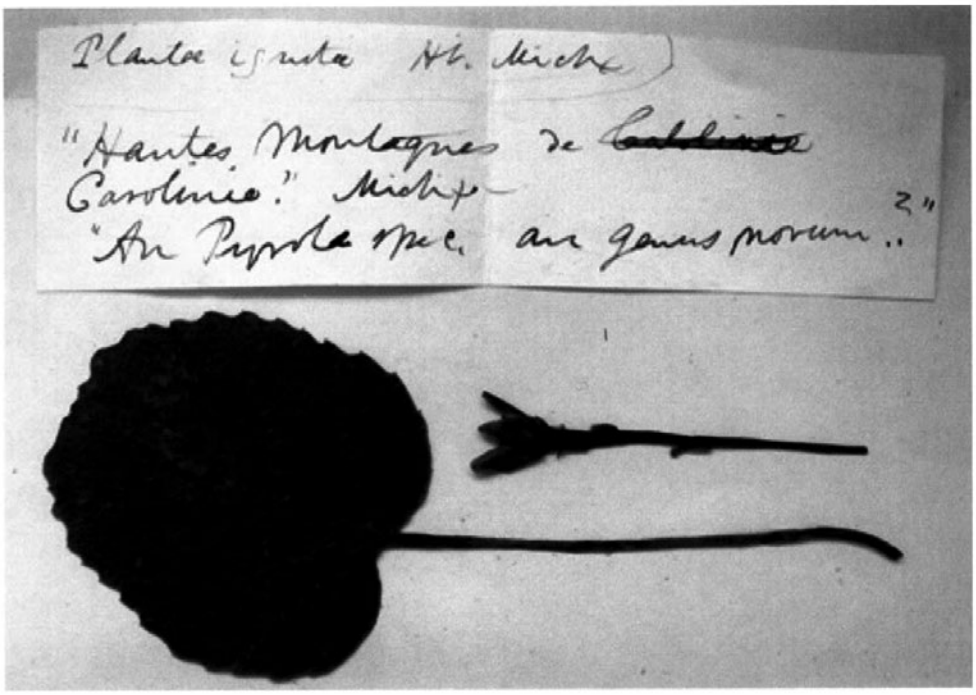

Figure 1. Fragment of holotype of *Shortia galacifolia* at GH.

Savage 1986). *Shortia* was only rediscovered in 1877 by George M. Hyams, the teenage son of an herbalist from Statesville, North Carolina. He found it not in the high mountains, but on the banks of the Catawba River near Marion, McDowell County, North Carolina.

The question that remained unanswered by Hyams' discovery was when and where Michaux discovered *Shortia*, or what was the type locality for this intriguing taxon. In 1886, Charles Sprague Sargent, an associate of Gray's and first director of the Arnold Arboretum., was in the southern Appalachians looking for another Michaux plant, *Magnolia cordata*, when he received a letter from Gray. In this letter dated September 17, 1886, Gray entreated Sargent, to find "*the original habitat of Shortia, which we believe Michaux found near where M. cordata came from in that first expedition*" (Jenkins 1942). Having searched, and inspired others to search, the highest mountains in North Carolina without success for many years, Gray now surmised Michaux had not found *Shortia* in the highest mountains of North Carolina during one of his later expeditions, but in the less lofty mountains along the North Carolina-South Carolina border that he visited on his first expedition. In the autumn of 1886, Sargent was searching for *Magnolia cordata* in the mountains along the North Carolina—South Carolina border that Michaux had explored in 1787–88. As Gray hoped he would, Sargent found an abundance of *Shortia* in this remote area (Jenkins 1942).

Examining Michaux's journal, Sargent became convinced that Michaux's type collection was made on December 8, 1788 at a location Michaux described as the "forks of the Kiwi" [Keowee] River, in Oconee County, South Carolina. Sargent believed the "forks of the Kiwi" to be the junction of the Toxaway and Horsepasture Rivers and he had indeed found a *Shortia* population there in 1886 (Sargent 1886). Michaux noted in his Journal for December 8, 1788 (Sargent 1889): "*Je recueillis un nouvel arbuste à f. dentelees rampant sur la montagne a peu de distance de la riv*." (I collected a new little shrub with toothed leaves prostrate over the mountainside not far from the river). On, December 10 Michaux wrote regarding this plant: "*Je recueillis une grande quantite de cet arbuste à f. dentelees trouve le jour que j'arrivay. Je ne le rencontray sur aucunes des autres montagnes. Les sauvages du lieu me dirent que les feuilles avaient bon gout étant machées et que l'odeur en était agréable en les froissant, ce que je trouvais effectivement*." (I collected a large number of the plant with toothed leaves that I found the day of my arrival. I did not find it on any other mountain. The local Indians told me that the leaves tasted good when

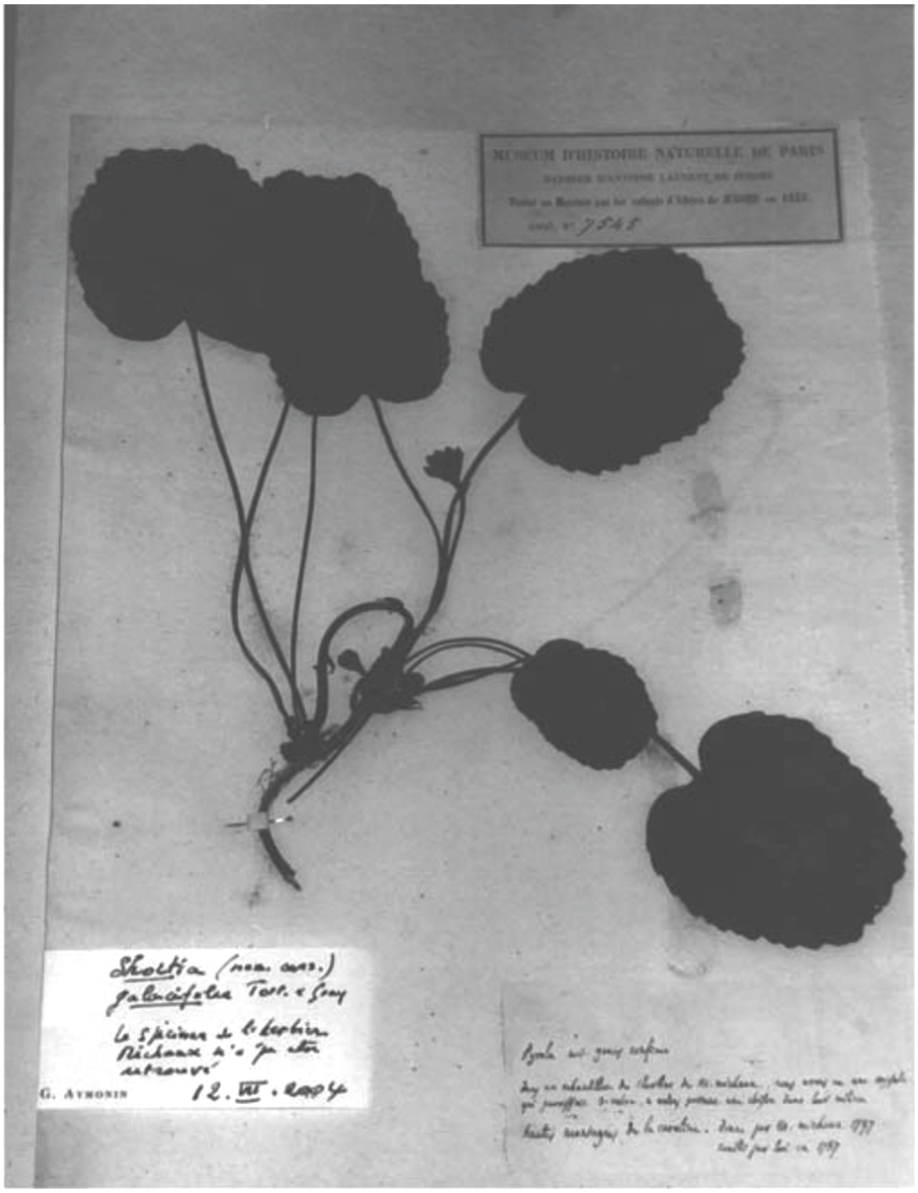

Figure 2. Isotype of *Shortia galacifolia* in the de Jussieu collection, P. de Jussieu's note is enlarged.

chewed and that the smell was pleasant if the leaves were bruised, which I found to be true).

Some authors (Prince 1947, Savage and Savage 1986) agreed with Sargent's conclusion that Michaux collected *Shortia* in December 1788. However Hyams' discovery of *Shortia* in a North Carolina locale visited by Michaux made a North Carolina type location also possible. Davies (1956) studied *Shortia* populations in both McDowell County, North Carolina, where Hyams had rediscovered the species in 1877, and in South Carolina, where Sargent had found it in 1886. Finding floral differences in the two populations, he concluded that Michaux's collection came from South Carolina. Davies (1956) also pointed out that the presence of capsules on the type specimen ruled out the possibility that it had been collected in December. This led him to propose that Michaux had collected *Shortia* in June 1787 on his initial journey to the southern mountains and that the French botanist had made no special entry for this plant in his journal.

Zahner and Jones (1983), with the help of Seaborn's meticulous study (1976), retraced Michaux's travels for June 1787. They determined that Michaux ascended the Whitewater, and not the Toxaway River as Sargent believed. Zahner and Jones (1983) concluded that Michaux collected *Shortia* on June 13, 1787 near the Jocassee Dam, approximately ten miles downstream from the location proposed by Sargent. They noted that before the formation of Lake Jocassee, there existed many populations of *Shortia* extending several miles upstream from the present site of Jocassee Dam and that these colonies were almost continuous in the Jocassee Valley.

The Michaux collection in Paris was photographed (IDC 6211, 1968), but the type specimen of *Shortia* that Asa Gray had observed in 1839 was missing and several searches of the collection itself were also unsuccessful (Aymonin, pers. obs.). However, a recent search under *Pyrola* of the de Jussieu collection, also in Paris, by one of us (G. A.), revealed another Michaux specimen of S. *galacifolia*. This one has the following information in Antoine Laurent de Jussieu's handwriting (Figure 2): "*Pyrola ou genus conforme. Dans un échantillon de l'herbier de M. Michaux, nous avons vu une capsule qui paraissait 3-valves, chaque valve portait une cloison dans leur milieu. Hautes montagnes de la Caroline. Donné par M. Michaux 1797, cueilli par lui en 1787*." (*Pyrola* or related genus. In a specimen in the Michaux herbarium, we have seen a capsule which appears to be 3-valved, each valve had a partition in the middle. High mountains of the Carolinas. Given by Mr. Michaux in 1797, collected by him in 1787). This specimen is interpreted as an isotype and we hereby designate this specimen such (Isotype: P; Michaux, 1787, as *Pyrola*; de Jussieu collection). It can be seen in IDC 6206, Fiche 552/16 (1995). De Jussieu's collection could not have been studied by Asa Gray, as it was only donated to the Museum in 1857. The discovery of this specimen substantiates the findings of Davies (1956) and Zahner and Jones (1983). It also affirms Gray's hunch that Michaux found *Shortia* during his first trip to the Carolina mountains (Jenkins 1942).

What was the plant that Michaux collected on December 8, 1788 if it is not *Shortia*? In an addendum to Sargent's article (1886), Asa Gray pointed out that the plant which the Indians said is aromatic and tasted good must have been *Gaultheria procumbens*, since the leaves of *Shortia* are somewhat mucilaginous but odorless. There is no doubt that Gray was correct. Michaux sent a shipment of plants and seeds to France in January 1789, some of which were from his recent collecting trip to the mountains. *Gaultheria procumbens* (tea berry) appeared on Michaux's list for that shipment (Rey 1954). *Gaultheria procumbens*, although very widespread in eastern North America, is rare in South Carolina and is found only in the northwestern corner of the state including the Jocassee area (SCDNR 2003). There is a Michaux collection of *G. procumbens*, IDC 6211, Fiche 56/1 (1968) which has the following information: "*from Canada to the Carolina in the mountains, from Lac Champlain to Lac St. Jean and 10 km further*." Thus it would seem that when Michaux encountered *G. procumbens* in South Carolina, it was new to him but he soon realized that Linnaeus had described it years earlier.

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