

JOHN TORREY: A BOTANICAL BIOGRAPHY

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ABSTRACT

The role played by the American botanist John Torrey (1796–1873) in the development of floristics and the naming of plants, especially from the American West, is shown to be fundamental not only for present-day taxonomists in their monographic and floristics studies, and to historians in understanding the significance of discovering new and curious objects of nature in the exploration of the West but also the role Torrey directly and indirectly played in the development of such institutions as the New York Botanical Garden and the Smithsonian Institution. For the author of this 2014 paper, the name of John Torrey dates back to his earliest years of interests in botany, some 56 years ago, as even then Torrey was the kind of hero he could admire without resorting to comic books or movies.

John Torrey has long been a “founding father” of North American systematic botany. Even so it was probably a bit unusual that a high school kid from the Sierra Nevada of California should know the name and even something about the man. It was Torrey who described plants with the explorer John Charles Frémont¹, and so by fate the three of us were thrown together while I penned a paper for a history class at Sonora Union High School in the spring of 1958. Frémont brought a small howitzer with him on his third expedition to the West, and the weapon was buried in the Sweetwater Mountains of eastern California. It was what became of that howitzer, and the story around it, that was the focus of that term paper, except that Frémont had a propensity to talk about plants and geology, and so attention was drawn to an appendix — “Descriptions of some new genera and species of plants”² — and by extension to John Torrey.

Here was a description and image of *Pinus monophylla*, the singleleaf pinyon so common in the Great Basin. Exploring another Torrey paper, “Plantae Frémontianae,” published in 1853 by the Smithsonian Institution, here again were wonderful descriptions and Isaac Sprague’s³ illustrations of plants common around my boyhood home of Pinecrest in Tuolumne County: *Spraguea umbellata* (pussypaws, now *Cistanthe umbellata*), *Libocedrus decurrens* (incense cedar, now *Calocedrus decurrens*), *Chamaebatia foliolosa* (mountain misery), and most significantly, *Sarcodes sanguinea* (locally known as “snowplant,” Fig. 1)⁴. There were others illustrations, all elegantly executed, but the snowplant — well, who could not experience the same amazement Frémont must have felt when he first encounter this plant! Torrey was more refined: “A very interesting plant,” he wrote, “belonging to the small group of Monotropeae.” How could he have been so calm given its “fleshy texture and blood-red color.” What followed were the words of a professional botanist, a full and detailed description followed by a technical discussion. Interesting and most curious to a high school junior!

Decades later, working from conjectures in a 1985 paper in a botanical journal⁵ (my high school history paper still finding life!), the Forest Service, and now others, found pieces of the carriage that transported the howitzer.

As for Torrey, Frémont, and the plants, a great deal more was learned over those same decades. Today, in the LuEsther T. Mertz Library at the New York Botanical Garden, one can put all of the pieces together, for here one can see the original Charles Sprague drawings, proofs of the

illustrations, and the final published results, and from the William and Lynda Steere Herbarium one can see the original Frémont specimens, all carefully preserved. And as one learns more about when and how the Frémont collections were made — carried across the continent horseback in bundles wrapped in canvas and hides, moved by steamboat and carriage to Washington and finally to New York — one discovers incredible stories that only explorers and botanists and specimens can tell.



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Figure 1. *Sarcodes sanguinea* Torr. — A digital painting by J.L. Reveal.

Just look at collection no. 367. *Pinus monophylla* (figs. 2, 3). A single herbarium specimen with a marked over printed label: "Frémont's Expedition to California. 184[4 in ink] / 367, 1844 / *Pinus monophylla* / Torr." So little written, so much said. Turning to the 1845 Torrey and Frémont report (page 319) one reads: "This tree, which is remarkable among the true pines for its solitary leaves, is extensively diffused over the mountains of Northern California, from long. 111° to 120°, and through a considerable range of latitude." It is alluded to repeatedly, in the course of Frémont's narrative, as the "nut pine." From page 319 one goes to page 221 to read the events of January 24th 1844 to find the story behind the specimen:

A man was discovered running towards the camp as we were about to start this morning who proved to be an Indian of rather advanced age — a sort of forlorn hope, who seemed to have been worked up into the resolution of visiting the strangers who were passing through the country. He seized the hand of the first man he met as he came up, out of breath, and held on, to assure himself protection. He brought with him in a little skin bag a few pounds of the seeds of a pine tree, which to-day we saw for the first time, and which Dr. Torrey has described as a new species, under the name of *pinus monophyllus*; in popular language, it might be called the nut pine. We purchased them all from him. The nut is oily, of very agreeable flavor, and must be very nutritious, as it constitutes the principal subsistence of the tribes [the Kucadikadi, a group of northern Piute] among which we were now travelling.

On that day Frémont and his men were in the pine-covered Masonic Mountains north of Bridgeport, and the howitzer remained with them for at least for five more days. They were about to cross the Sierra Nevada in the dead of winter. For me, a 114 years later, this was grand adventure!



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Figure 2. *Pinus monophylla* Torr. & Frém.

John Torrey's early years

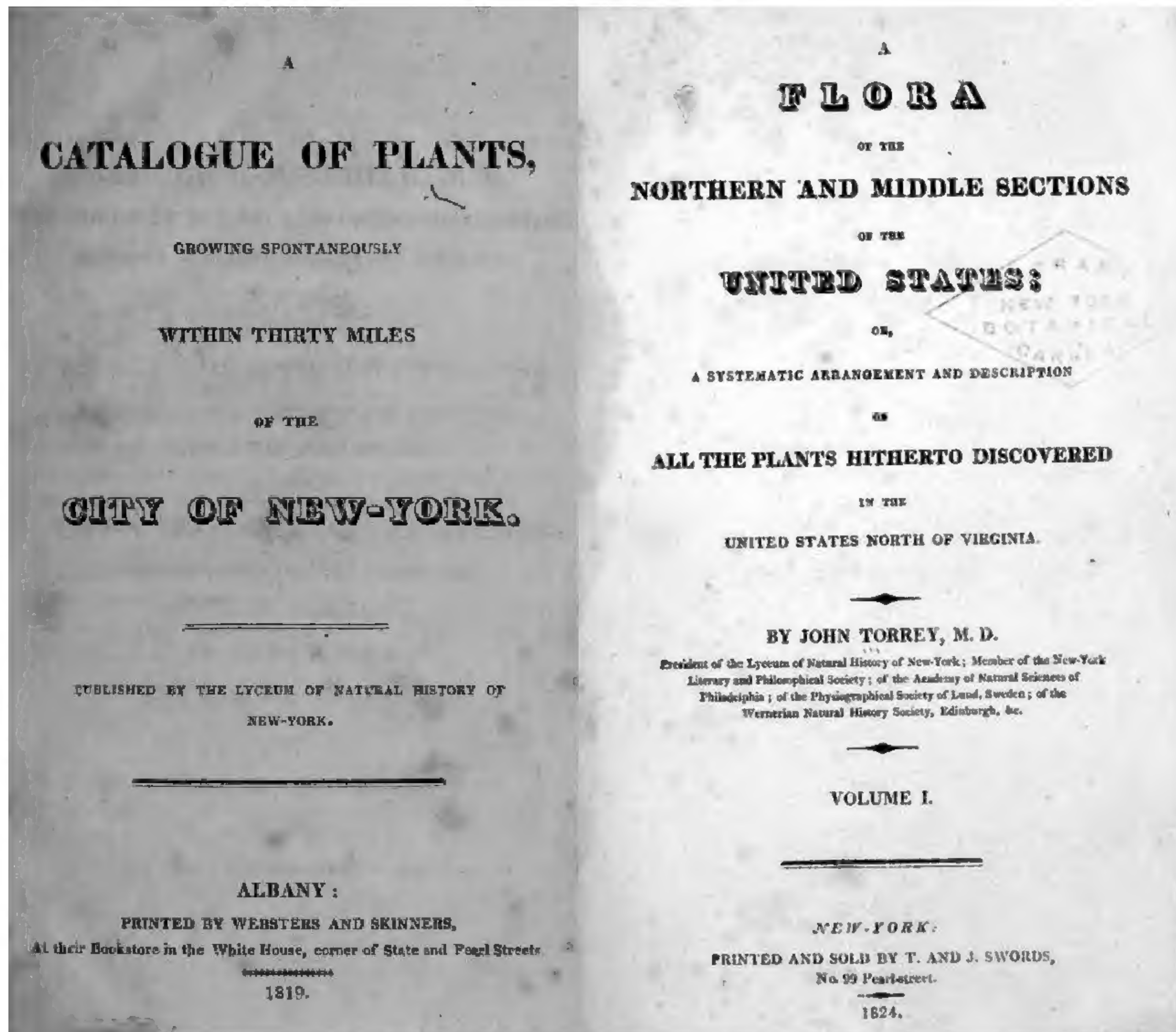
John Torrey was born on August 15, 1796, in New York City and came to botany as a secondary career⁶. He was for most of his professional career a chemist, serving in that capacity at the United States Military Academy at West Point (1824–1827), at New York College of Physicians and Surgeons (now Columbia University; 1827–1855), and at Princeton University (1830–1855). For the last twenty years of his life he was Assayer of the Mint in New York (1853–1873). He earned his medical degree at the College of Physicians and Surgeons in 1818 and briefly practiced (1818–1822) although this seems to have been rather secondary compared to his efforts with the newly established Lyceum of Natural History of New York, as he was among the institution's first curators, starting in 1817⁷.

The role young Torrey played in the development of the Lyceum proved to be critical, because as a result of his broad interests, he and the other curators were able to assemble one of the most extensive collections of natural history objects then in America. At this time, Torrey's interest in botany focused mainly on cryptogams, especially on the fungi, mosses, and bryophytes. It was during this period, with the help of others, that he acquired a fine set of watercolors of fungi as well as many specimens. Even though Torrey longed for a good microscope, he worked on sedges (mainly the genus *Carex*) and looking today at his detailed sketches of those tiny flowers and fruits on herbarium sheets in Torrey's herbarium at the New York Botanical Garden, it is amazing what he was able to discern with his simple lenses and, no doubt, a lot of patience.

Torrey's interests in natural history, while catholic, were heavily weighted toward botany, having been influenced as a youngster by Amos Eaton⁸, a noted amateur botanist and lawyer who was imprisoned in 1811 for forgery. Torrey's father, William, a sound businessman, city alderman, and fiscal agent to the state prisons, took John with him to Newgate Prison where young John became the conduit that moved plants from beyond the walls to Eaton within. At fourteen, this association had an impact for by the time Torrey became curator at the Lyceum, he was already engaged with others in writing *A Catalogue of Plants* (Fig. 4a) published in 1819⁹. In a series of notes at the end of the book, several new species were described by Torrey.

Torrey's annotated copy of the *Catalogue* is in the rare book room of the Mertz Library. There are some corrections, but more importantly are the additions. Not only are newly found plants mentioned in this interleaved copy, it is clear that Torrey was already expanding the reach of the *Catalogue*, writing in plants found over much of New York and even New England. Without doubt, Torrey's annotations formed the basis for his later *A Flora of the Northern and Middle Sections of the United States* (Fig. 4b), published in three parts from September of 1823 until July of 1824. This work was an immediate success and introduced Torrey to others interested in plants, especially those across the Atlantic. This was promptly followed by his *Compendium of the Flora of the Northern and Middle States* published in 1826 (Fig. 5).

One holds Torrey's copy *Compendium* with reverence. The cover is worn, the pages look like they have seen rain suggesting that this book was carried when John traveled. There are faint pencil corrections, additions, comments. The preface indicates that it was written at West Point. For a modern reader the book might be frustrating as it is arranged according to the Linnaean sexual system. Still, tucked off to the side of many generic names are the natural family names championed by French botanist Antoine Laurent de Jussieu — Atriplices, Boragineae, Caryophylleae, Passiflorae — a hint of things to come¹⁰. There were no keys for one simply knew that the *Diadelphia* and *Decandria* were the homes of the pea family. Typically there were brief descriptions of genera and each species was briefly characterized. Thus, by counting the stamens and the number of carpels, one could arrive at the proper spot in the book and then glance down the page for the unique diagnostic features that characterized the plant in hand.

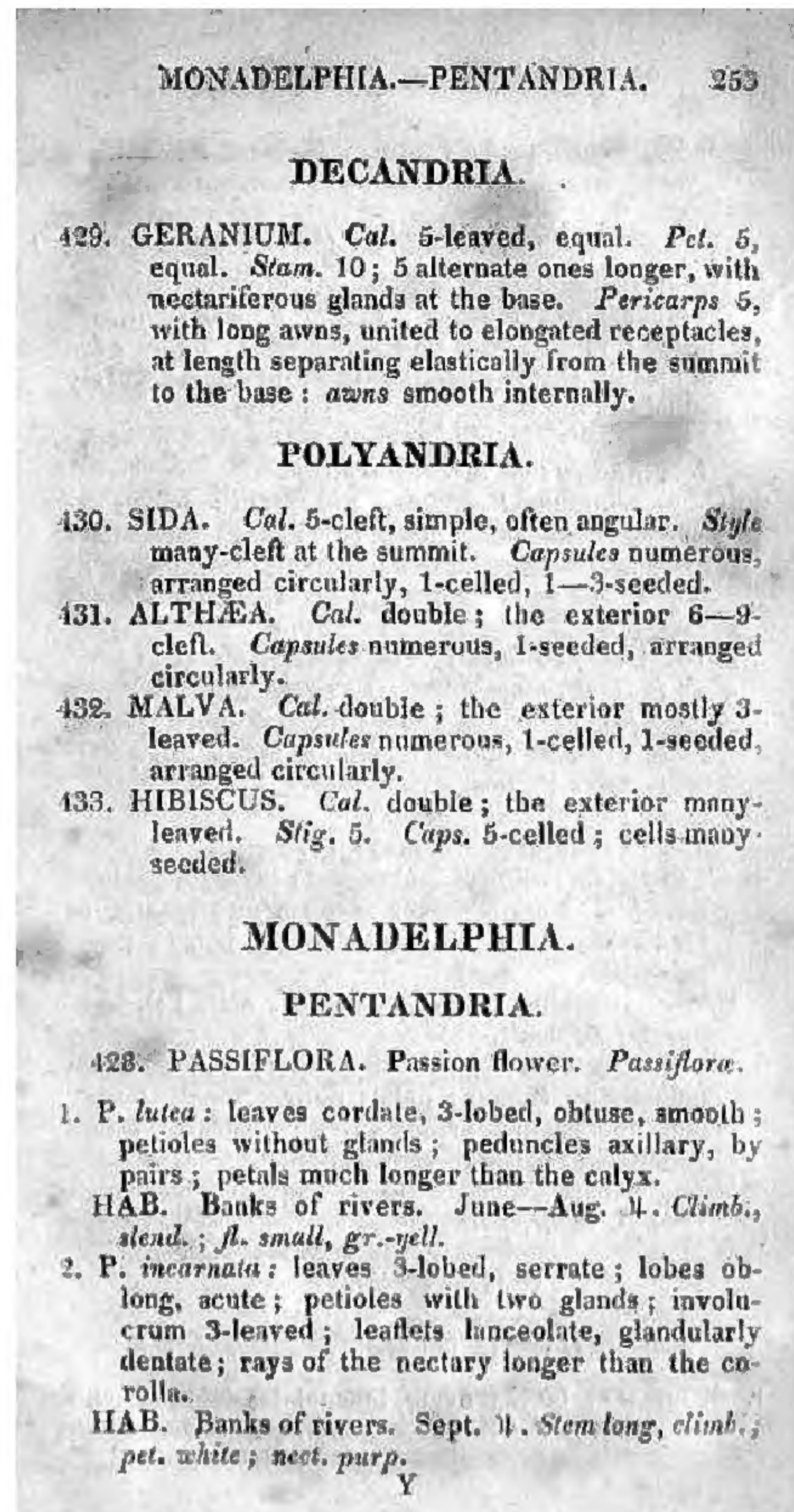
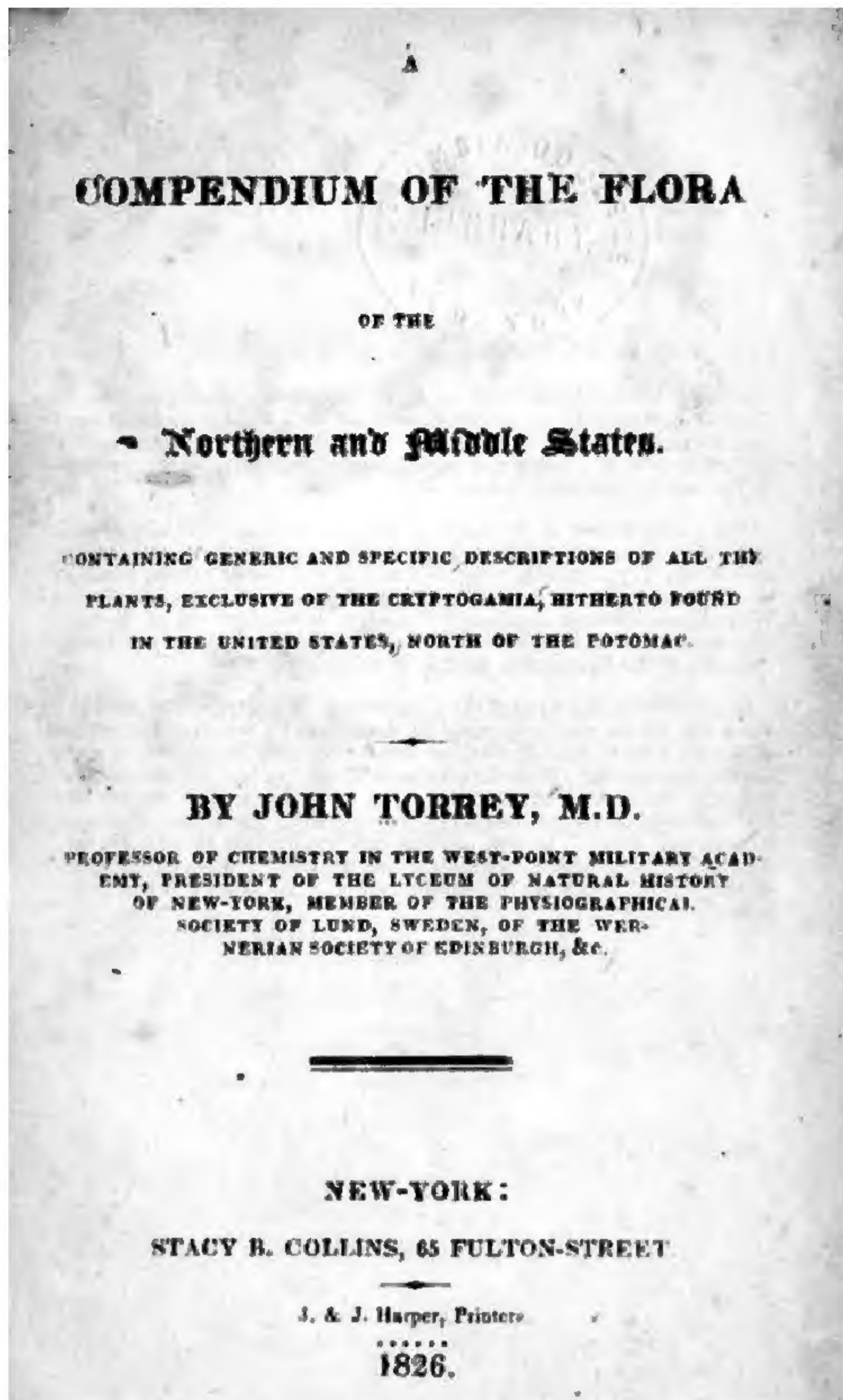


Source: BHL

Figure 4. (a) Title page of *Catalogue* (1819) and (b) the 1824 *Flora*.

His duties as curator meant that Torrey's interests were destined to go beyond the cryptogam world. Long before Frémont, Torrey was involved in examining vascular plants gathered by western expeditions. In an 1823 paper in the *Annals of the Lyceum of Natural History of New York*, Torrey wrote "Descriptions of some new or rare plants from the Rocky Mountains, collected in July, 1820, by Dr. Edwin James"¹¹. Here one finds many of the novel plants found on what is now unfortunately called Pikes Peak rather than the much more suitable James Peak as it was then known¹².

In a series of articles published from December of 1826 until June of 1827, Torrey augmented that paper with a much longer and more detailed account in the *Annals*, discussing some 481 different plants. Over that five-year period Torrey's knowledge of plants grew tremendously. While James himself named some of his new finds, notably the limber pine (*Pinus flexilis*), a bluebell (*Mertensia ciliolata*; Fig. 6) and the columbine (*Aquilegia coerulea*; Fig. 34) in late December of 1822, it remained for Torrey to deal with the bulk of new species, notably *Krameria lanceolata* (trailing krameria) of the Great Plains, *Acer glabrum* (Rocky Mountain maple) of the lower elevations in the Rockies, and *Prosopis glandulosa* (honey mesquite), a major desert shrub of the Southwest illustrated by Torrey himself¹³.



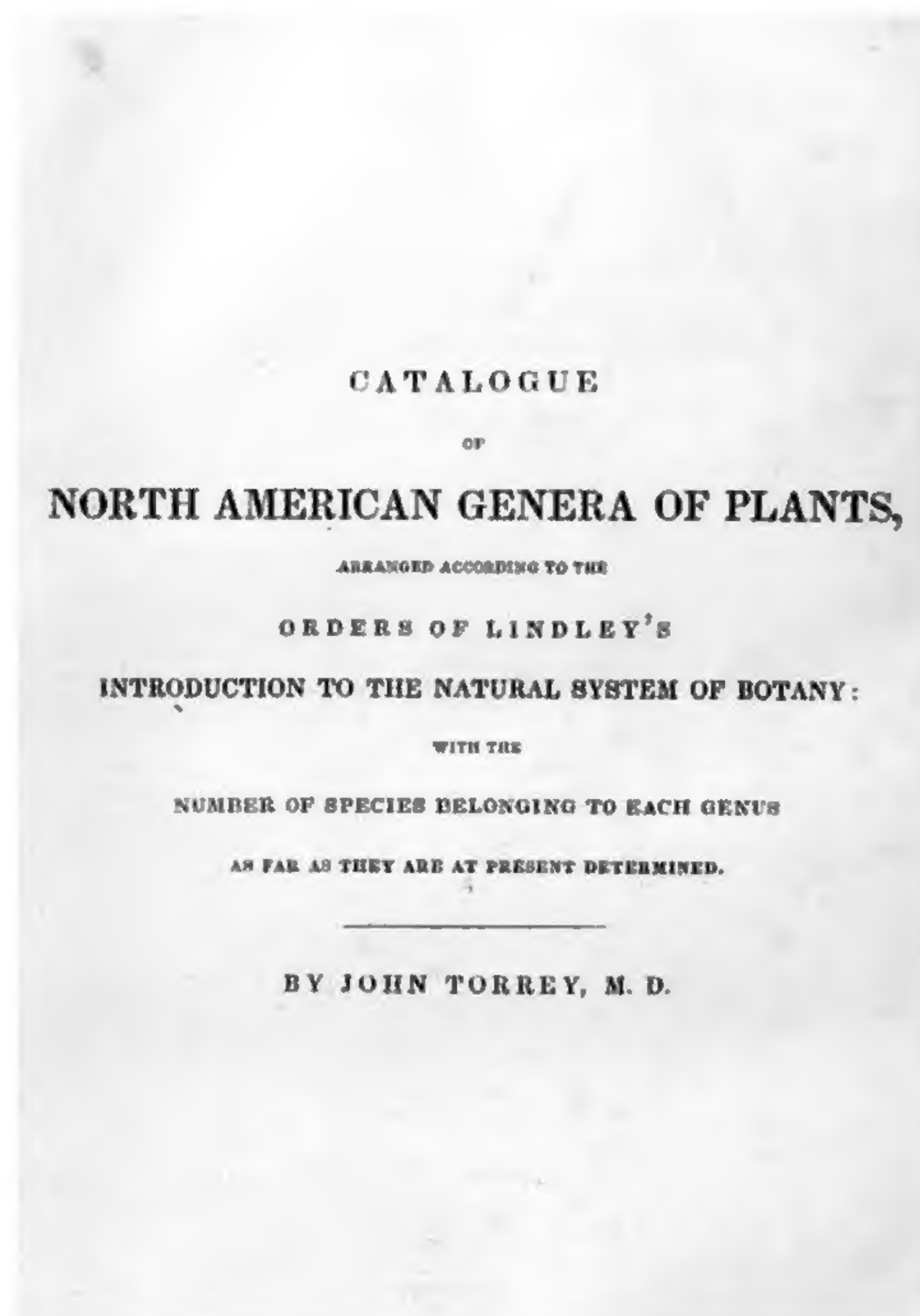
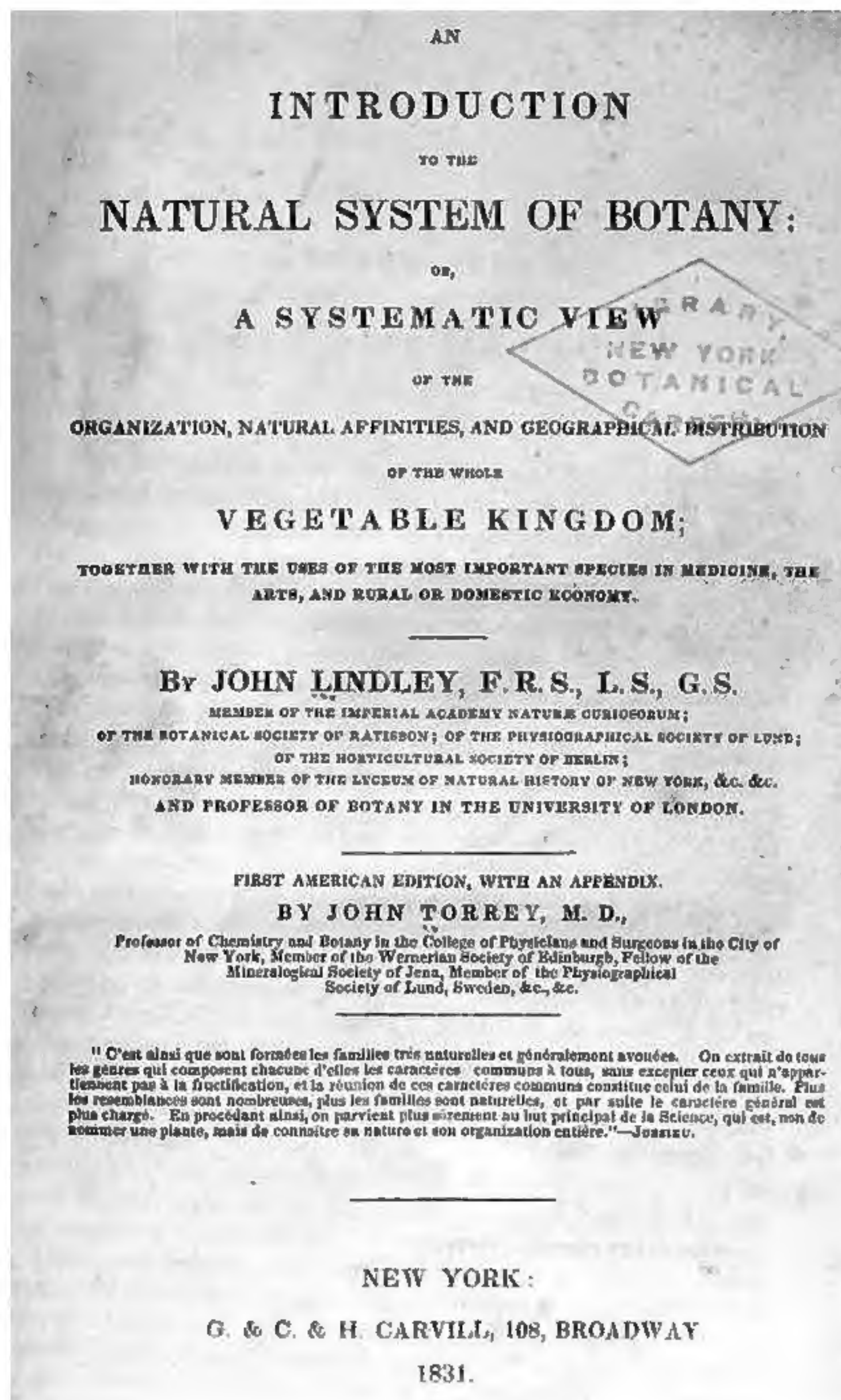
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Figure 5. Title page and a representative page of the *Compendium*.

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Figure 6. *Mertensia ciliata* (James ex Torr.) G. Don

Torrey's paper on the James collection departed from the Linnaean system and embraced that of Jussieu's being the first author in North America to adopt natural families. Soon thereafter, in 1830¹⁴, England's John Lindley published a new botany text book on the natural system, and immediately Torrey asked Lindley's permission to publish an American edition (Fig. 7). In the 1831 American edition, Torrey added a "Catalogue of North American genera of plants." To ensure the wide dissemination of the natural system, Torrey reprinted his *Catalogue* with its own pagination. By 1831, Torrey listed his title as "Professor of Chemistry and Botany in the College of Physicians in the City of New York."



Source: BHL

Figure 7. Title page of Lindley's American edition and the title page of Torrey's Catalogue.

The name of Asa Gray (Fig. 8) is attached forever to that of John Torrey¹⁵. By 1831 the two men had already formed a close and lasting bond. In 1824, Torrey married Miss Eliza Robinson Shaw of New York City and the couple was living comfortably at West Point. Professionally, Torrey was deep into chemistry, with botany on the side. His long-time correspondent, Lewis David von Schweinitz¹⁶, had finished a monograph of the genus *Carex* that Torrey carefully edited for the *Annals*, becoming in essence a co-author. By this time, Torrey and von Schweinitz were talking about authoring a cryptogam flora of the United States and the latter's trip to Europe was largely designed to obtain books, specimens, and familiarity with American species already named by European botanists. Unfortunately, there was a dispute with Chester Dewey¹⁷, professor of natural history at Williams College, over who had the right to publish on *Carex*. The letters in the archives at the New York Botanical Garden tell the story, an invaluable resource to both historians and botanists, about early botanical struggles for scientific priority in the United States. Dewey published a few new

species just before von Schweinitz, much to Torrey's distress, and the letters show both groups were trying to claim ownership of the genus. Torrey and von Schweinitz danced around this problem for years, with Dewey publishing a name here and there as parts of his "Caricography" series. Whether or not one can be so kind as Asa Gray was in his 1873 obituary of Torrey¹⁸ and say that "Torrey generously turned over the Carices to the late Professor Dewey" is a matter of debate, as Gray was not entirely an aloof bystander in this matter. In 1836 Torrey published his own "Monograph of North American Cyperaceae" with Rhynchosporae revised "entirely" by Asa Gray whose own monograph of *Rhynchospora* was published at the same time in the *Annals*.

Ah, the letters are amazing!



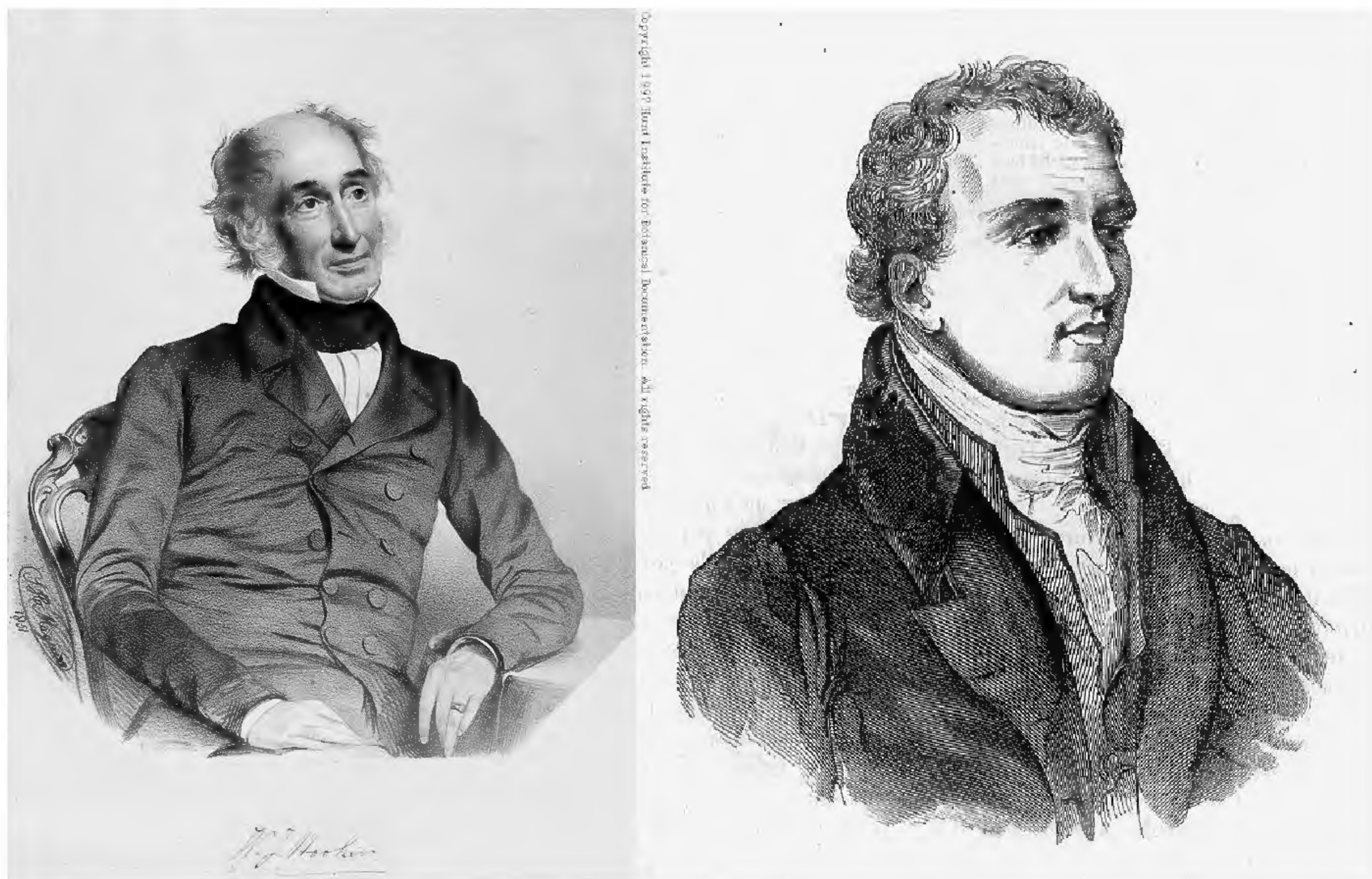
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Figure 8. Asa Gray.

John Torrey's first letter from Asa Gray arrived in September of 1830¹⁹. Working both at the College of Physicians and Surgeons in New York and at Princeton University in nearby New Jersey, Torrey's botanical efforts were stretched thin in an effort to survive the rigors of teaching and providing for his family. He needed help and Gray became a possible candidate.

Asa Gray received his medical degree in 1831 at the age of twenty, nearly a full year before he legally was able to practice. His early years were a jumble of semi-failed attempts at being a physician and teaching high school, mainly in Utica, New York. Frustrated by his efforts as a doctor, and ecstatic about botany, it was inevitable that Torrey's suggestion that the young man should become an expedition surgeon/naturalist meant that the two would meet. When Torrey decided to go to Europe, mainly in search of a decent microscope, he asked Gray to collect plants and to organize his personal herbarium. This Gray did in the summer of 1833. By the fall of 1834, Gray was living in Torrey's home, free at last to write botanical papers much to the dismay of his parents and their rapidly disappear dreams of a doctor-son.

Gray's duties were relatively simple: Help Torrey with his "botanical & chemical labours" and Gray was permitted to "devote part of his time to his own concerns"²⁰. With Gray at hand, talk shifted from a cryptogam flora to simply a flora of the United States, and even that would morph into the ultimate title, *A Flora of North America*.

The idea of a flora was discussed by Torrey with William Jackson Hooker²¹ (Fig. 9) in Scotland, who was then engaged in publishing *Flora Boreali-Americana* — basically a flora of that portion of North America controlled by Great Britain. Not only did Torrey obtain parts of the *Flora* already published but also critical specimens as well, especially those found by David Douglas (Fig. 9) in the Oregon Country²². In Paris, Torrey was able to obtain a copy of André Michaux's 1803 *Flora Boreali-Americana*²³ and again a promise of specimens. On his three-month visit Torrey met the likes of George Bentham²⁴ (Fig. 10), Robert Brown²⁵, John Lindley (Fig. 10), and a host of others. Most importantly, Torrey studied Michaux's American collections, clearly with the goal of writing a flora of the North America.



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Figure 9. William Jackson Hooker (left) and David Douglas (right).



© Hunt Institute for Botanical Documentation (left)

Figure 10. George Bentham (left), John Lindley, Constantine Samuel Rafinesque (right).

Looking at the books Torrey gathered in Europe in the Mertz Library one finds a treasure trove of comments, notes, and thoughts. By studying the marginalia one can see the formation of ideas that would find their way into his *Flora*. Knowledge of Torrey's proposed flora meant that individual collectors began to send him more and more specimens, their curation and arrangement into the herbarium being left largely to Gray. Two long-time friends, Constantine Samuel Rafinesque²⁹ (Fig. 10) and Charles Wilkins Short³⁰, continued with their contributions to Torrey and now plants also came from the South, sent by a multitude of new collectors – Moses Ashley Curtis²⁶, Hardy Bryan Croom²⁷, and John Leonard Riddell²⁸ (Fig. 11) to mention only a few.



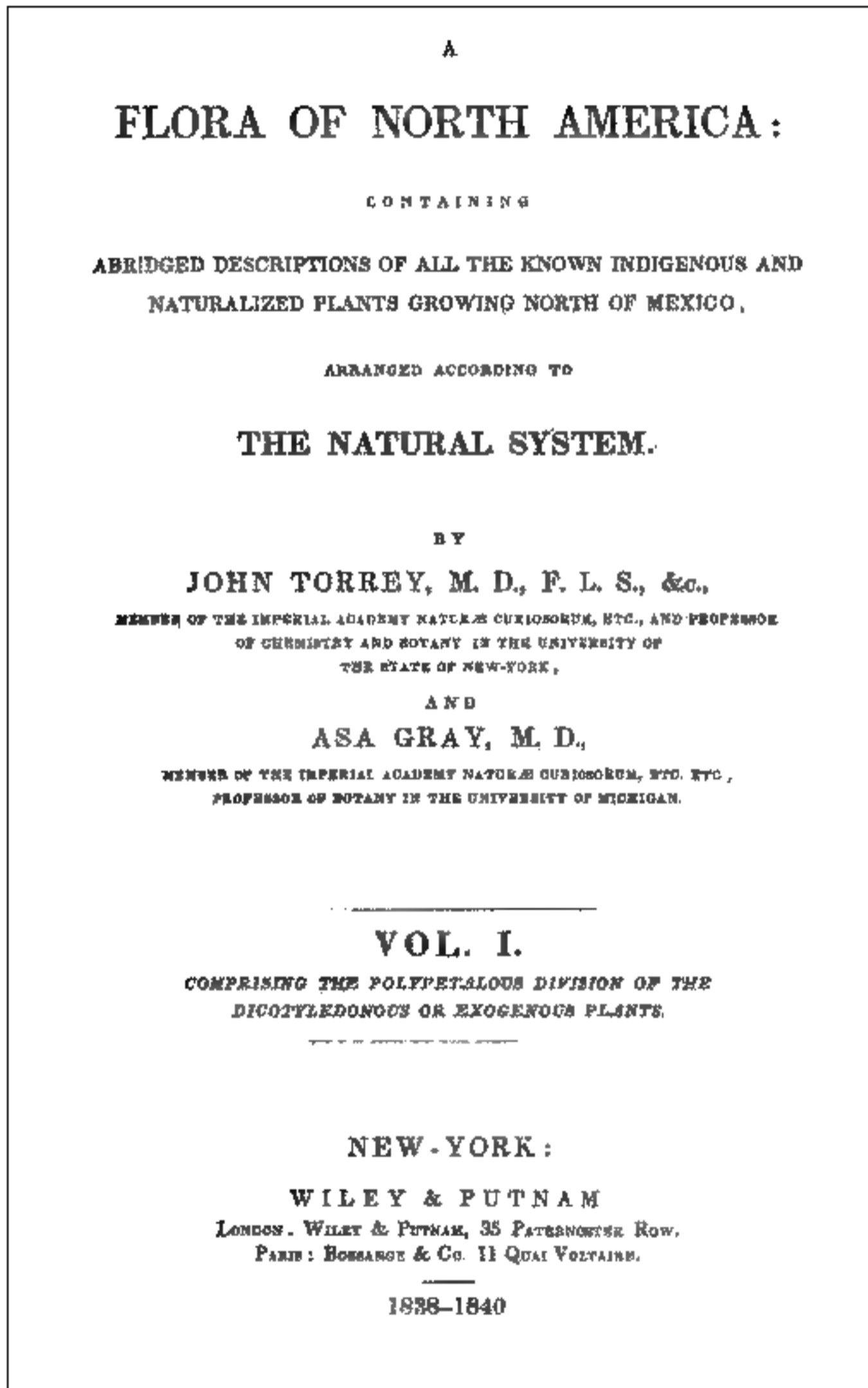
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Figure 11. Moses Ashley Curtis (left), John Leonard Riddell, Hardy Bryan Croom (right).

Rafinesque and Torrey knew each other from the early days of the Lyceum. Rafinesque even tried to get Torrey to join him at the University of Transylvania in 1819. By the 1830s, with the prolific Rafinesque busily publishing hundreds of new scientific names, much to the dismay of Torrey, their association was at an end professionally. Even so, Torrey's letter to and from Rafinesque are filled with pleasant exchanges, suggesting that while they might differ as botanists, they were still friends. Short, always a major collector, continued to be so for decades. The letters between Torrey and Short are diverse and filled with both scientific and personal matters. Above all, as their

correspondence matured and both men aged, their interest and frustrations revolved around Torrey's *Flora* (Fig. 12)



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Figure 12. Title page of Torrey and Gray's *Flora of North America*

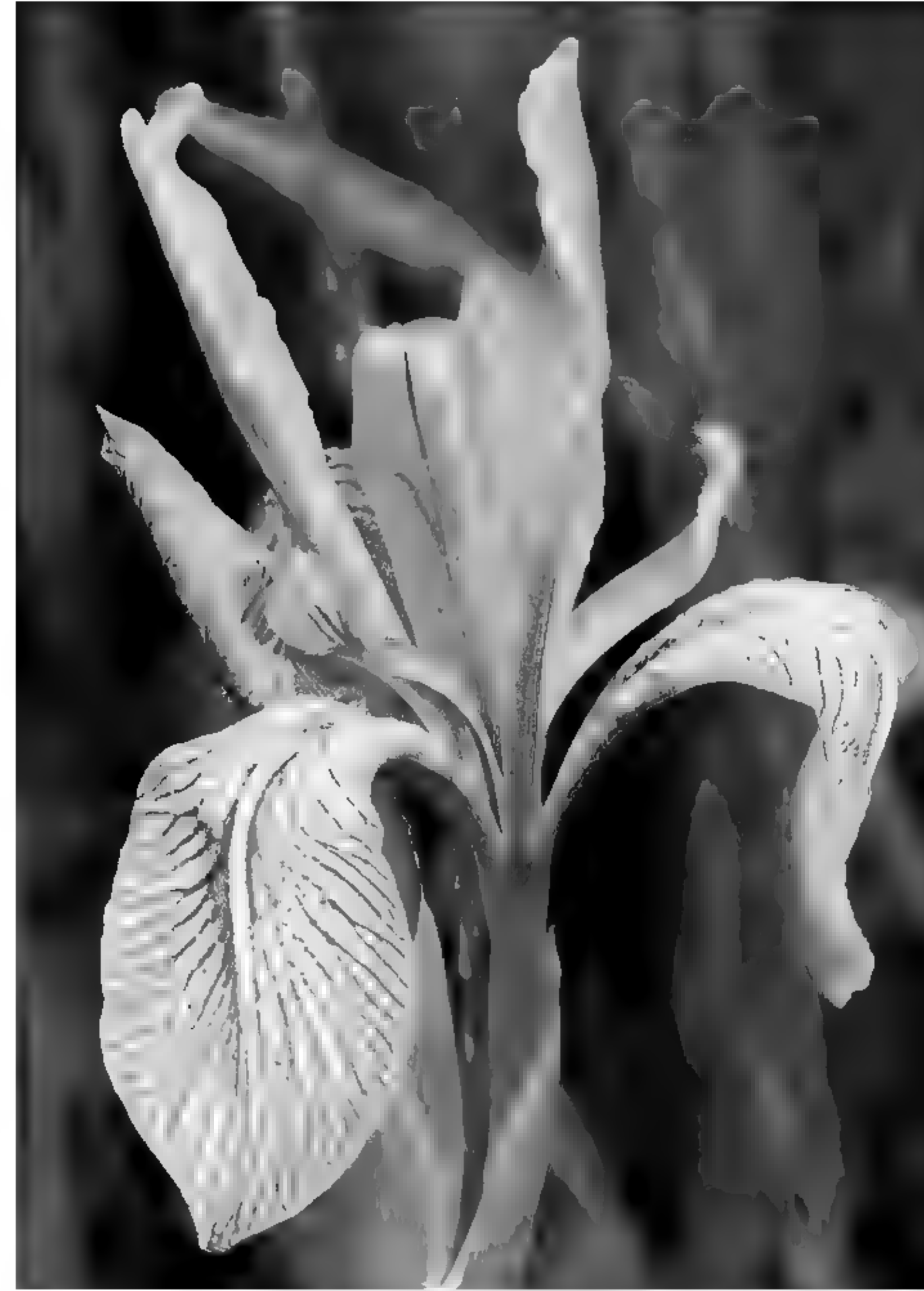
The basic question was always how best could the *Flora* be done efficiently, given the constant flow of new material from the South and West. The keys, plain and simple, were Asa Gray and Thomas Nuttall.

With Asa Gray firmly with Torrey in New York, even though Gray would be offered a professorship with the not-yet-established University of Michigan in 1838, he was basically living with Torrey (or living in Torrey's house when the family was in Princeton) and writing treatments for what was now Torrey and Gray's *Flora*. Letters flowed between the two men that give some idea as to what was being accomplished, but there is little in the way of the intimate detail on how taxonomic decisions were reached or who was writing what. Based on what one can surmise from the letters at the New York Botanical Garden and at the Gray Herbarium at Harvard University, it would appear that Gray was the writer, with Torrey the editor and final arbiter on all matters in most taxonomic groups. Still, Gray carved out distinct areas of his own — most notably the sunflower family, Asteraceae — which Torrey gladly abandoned to the younger man.

One reason for the segregation of effort was that Torrey's role in botany was being expanded by other events. In 1835, the New York General Assembly directed the Secretary of the State to report on the natural history and geology of the state. On the first of July in 1836, Torrey began to compile a flora of New York. This single task would take five years and the first volume (Fig. 14) was not published until January of 1843, a few days before the last part of Torrey and Gray's *Flora* was published in February of that year.

The pivotal person in all of this was Thomas Nuttall³¹ (Fig. 13). English by origin, Nuttall first came to the United States in 1808 and collected in the Old Northwest in 1810 for Benjamin Smith Barton (1766–1815) of Philadelphia. In 1811, Nuttall ventured up the Missouri River collecting plants from St. Louis to Fort Mandan. The threat of war, which began in 1812, caused Nuttall to return to England in late 1811, where he stayed until 1815. Back in Philadelphia, Nuttall published *The Genera of North American Plants* in 1818 (Fig. 14), setting himself up as a major taxonomist in America. He continued to explore in the South and along the Red River on the southern border of the Louisiana Territory. In 1823, Nuttall went to Harvard and remained there for the next eleven years. The desire to travel westward finally got to him and Nuttall left Harvard in 1834³² and went to Oregon and California, returning to Philadelphia in 1836 with thousands of specimens representing hundreds of new species (Figs. 15–16). No flora of North America could be accomplished without access to Nuttall's specimens. Torrey was unwilling to offer Nuttall an authorship, but was eager to publish his new species. Thus, from June of 1838, when the first part of the *Flora* was published, until February of 1843, when the last part was presented to the public, new species named or found by Thomas Nuttall were routinely proposed in Torrey and Gray's *Flora*.

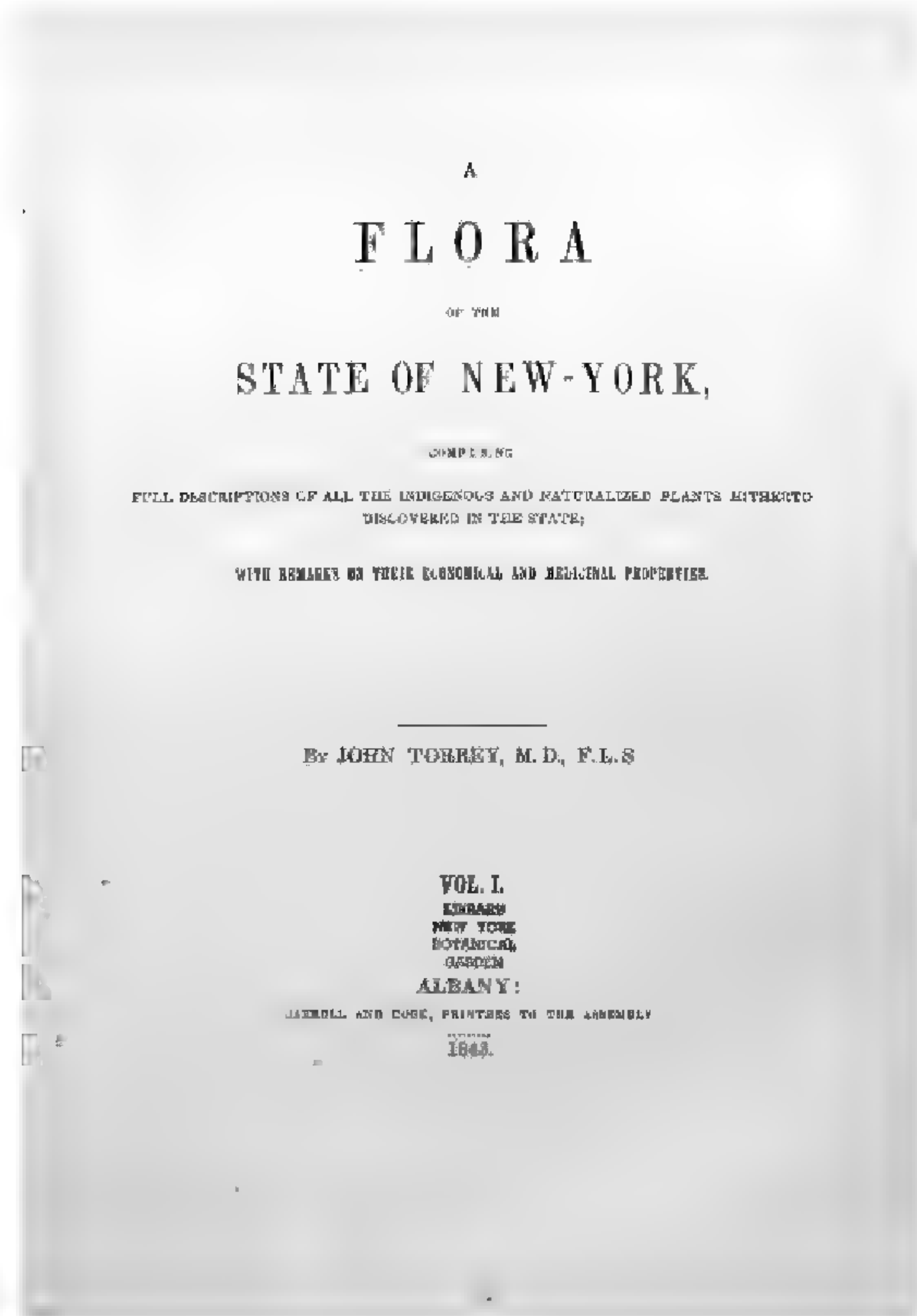
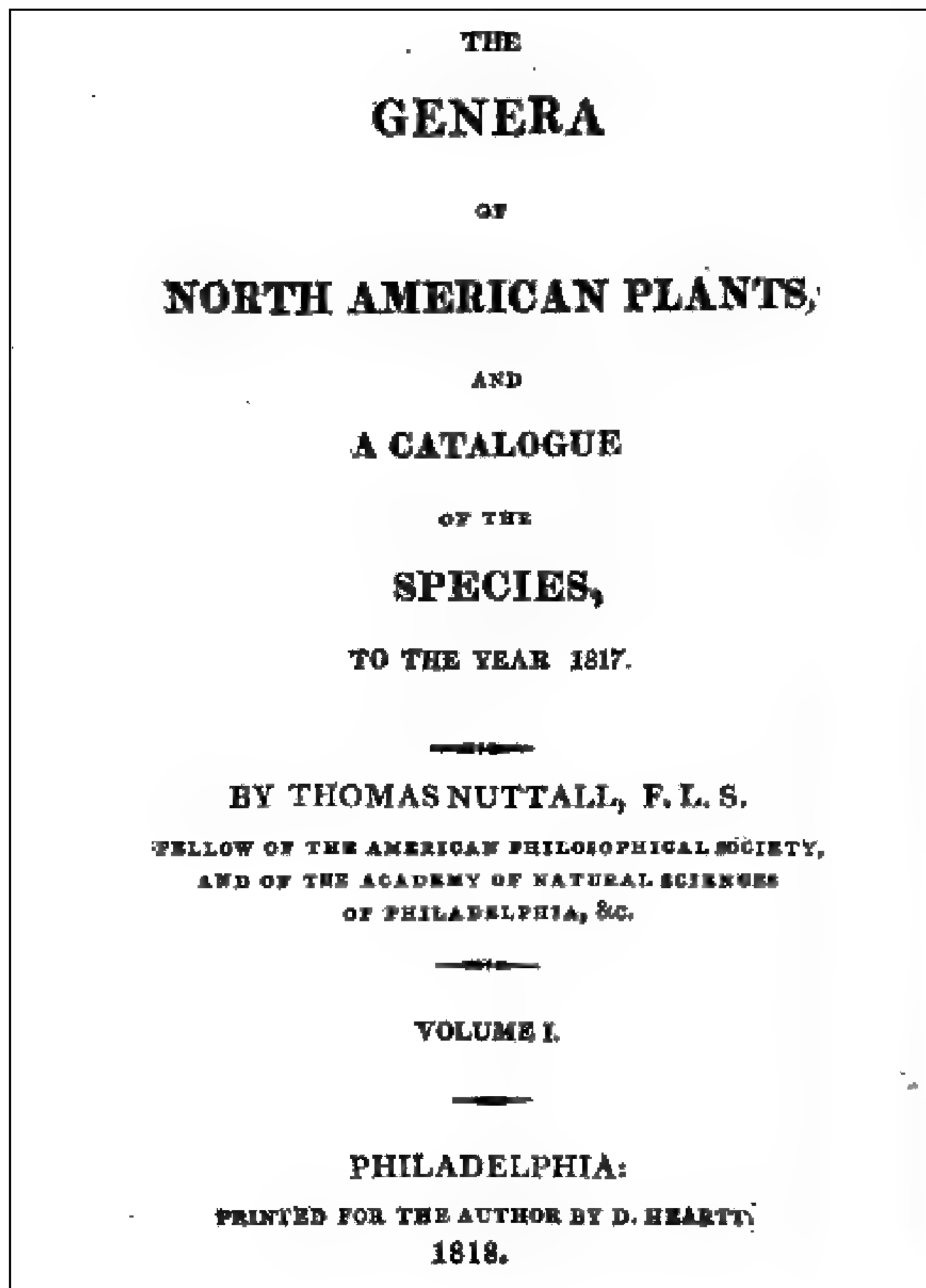
That the *Flora* was never finished can be laid, in one sense, at the feet of Thomas Nuttall. Nuttall's departure from Harvard left a vacancy and it was destined to be filled by Asa Gray. Torrey was firmly established in New York and Princeton, and Gray had a position, of sorts, with the University of Michigan. In 1842, giving up on Michigan, Gray secured the position at Harvard with the charge of giving lectures in botany and being superintendent of the botanic garden. This move meant that Torrey's writing arm, which had allowed him to teach, was gone, leaving him alone at the very moment western North American explorations were fundamentally changing systematic botany in North America by virtue of a wealth of discoveries of new genera and species. That Gray's move to Harvard ultimately would be a plus to Torrey, and especially to the future of systematic botany, floristics, and biogeography, was not something that could remotely be construed as an immediate comfort to Torrey as he witnessed the multitude of specimens crossing his desk.



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Figure 13. Thomas Nuttall and *Iris missouriensis* Nutt.



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Figure 14. Title page of Nuttall's *Genera* and the title page of Torrey's *Flora*.



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Figure 15 *Clematis ligusticifolia* Nutt.



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Figure 16 *Stephanomeria exigua* Nutt.

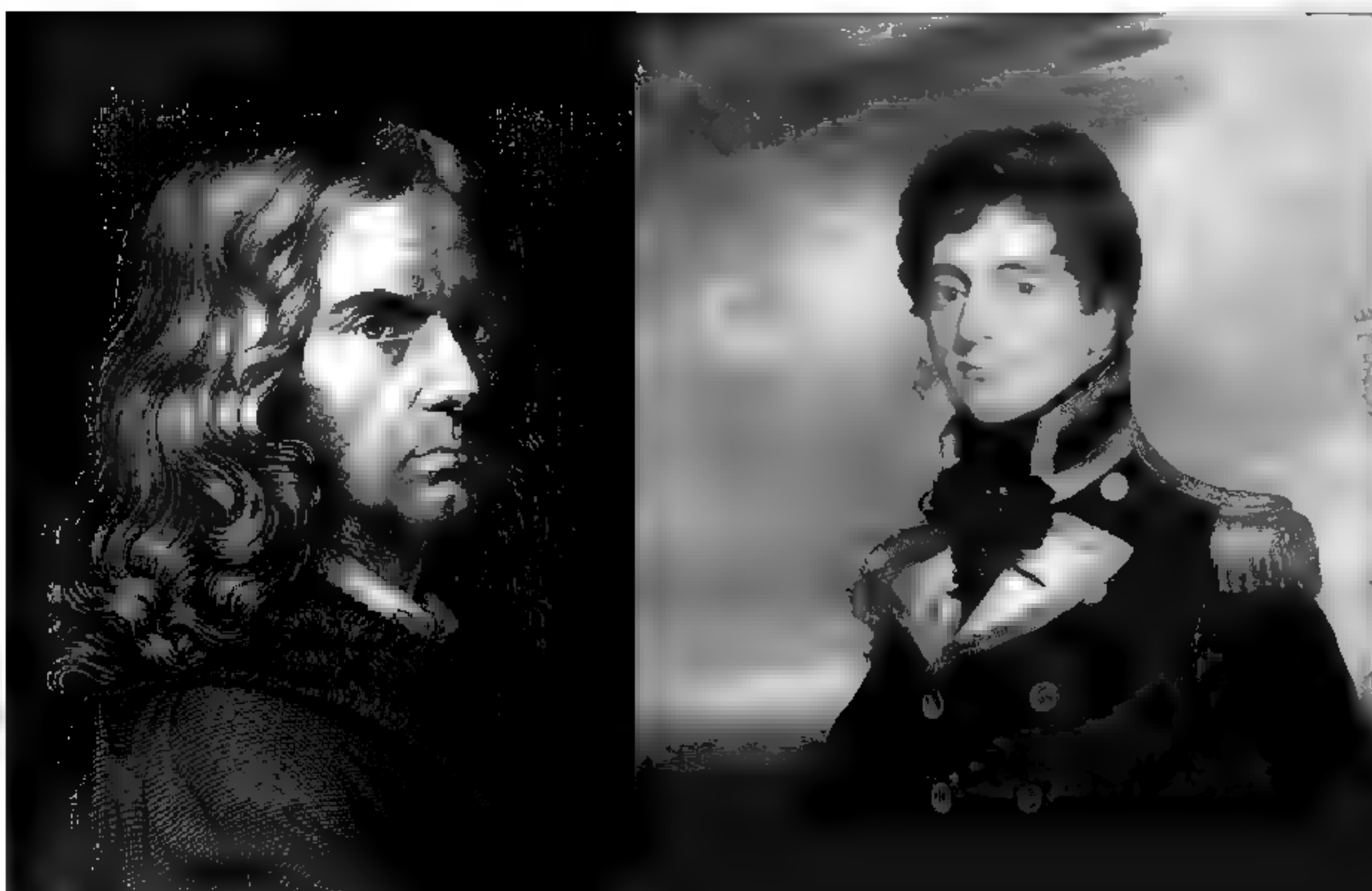
Torrey's labors on *A Flora of the State of New York*, published in 1843 in two volumes of more than a thousand pages and some 160 lithograph plates, was well received and laid a firm foundation for the continuation of *Flora of North America*. There were plans and hopes to do more, but first Gray had to get settled into his new position at Harvard, and Torrey — ever in the classroom — was doing his best to keep up with his botanical duties. He liked Lindley's 1835 *Ladies' Botany*, but instead of having this book published in America he issued his own version as lithographed class notes under the title of *Outlines of Botany* in 1841. Few copies of this work exist, and interestingly the copy at the Mertz Library lacks a date, suggesting that copies were likely printed as needed by students. Gray, too, was in the textbook business, dominated then by Amos Eaton and Almira Hart Lincoln (later Phelps). Her books, *Familiar Lectures on Botany* (1829) and *Botany for Beginners* (1833a), were widely used in girls' schools and academies, while Eaton's *Botanical Exercises* (1820) was designed for the male side. Gray's addition, initially titled *Elements of Botany* (1836) and then *The Botanical Text-book for College, Schools and Private Students* (1842), quickly became the new standard and like those of Eaton and Lincoln, Gray's own *Botanical Text-book* would undergo numerous revisions and printings³³.

John Torrey's role in westward expansion and botanical explorations

Although Thomas Jefferson had championed the notion of western explorations across the American continent, interest in government expeditions waned and the opening of the West was left to entrepreneurs, especially those engaged in the fur trade³⁴. Along the Pacific Coast, sea-borne naturalists visited various ports of call, namely Johann Friedrich Gustav von Eschscholtz (1793–1831, Fig. 17 left) and Ludolf Adelbert von Chamisso (1761–1838; Fig. 17 center) aboard the Russian vessel *Rurik* (1816), Alexander Collie (1793–1835) and George Tradescant Lay (1799–1845) aboard the British vessels *Blossom* on Captain Frederick William Beechey's (1796–1856 — Fig. 17, right; Fig. 18) voyage (1826–1827), Paola Emilia Botta (1802–1870) aboard the French vessel *Héros* (1827–1828), and Richard Brinsley Hinds (1812–1846) on *H.M.S. Sulphur* (1837, 1839), as well as naturalists supported by the Hudson's Bay Company in the Pacific Northwest, such as David Douglas, John Scouler (1804–1871), William Fraser Tomie (1812–1886), Meredith Gairdner (?–1840), and John McLeod (1795–?). Mexico dominated California and much of the Southwest, and while a few individuals, such as Thomas Coulter (1793–1843) crossed the deserts of the Southwest in 1832 to join up with Douglas in California (Coville 1895; Nelson 1988), only a few plants were actually from the deserts of the West³⁵.



Figure 17. J.F.G. von Eschscholtz



L.A. von Chamisso

F.W. Beechey

↑ © National Maritime Museum



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Figure 18 *Grindelia hirsutula* Hook. & Arn

For Torrey, essentially everything went to European botanists and, at best, all he received were already named specimens. The desire to get American naturalists into the field, especially in the West, was therefore of critical importance to him especially if a flora of North America was to be written.

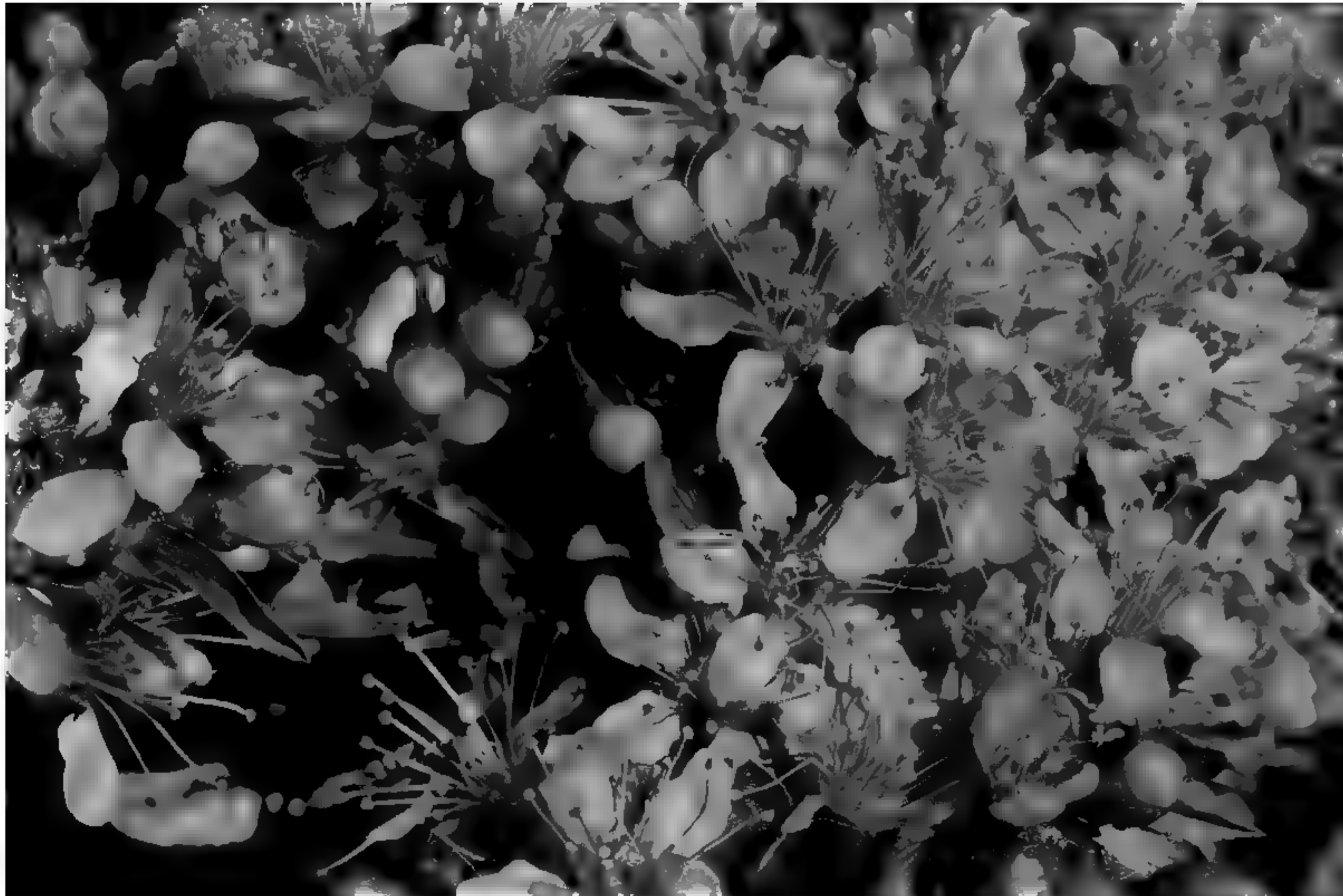
“Manifest Destiny” was a political catch phrase championed by Senator Thomas Hart Benton of Missouri³⁶, the father of Jessie Benton Fremont. Who better to lead the westward expansion of the United States than his own son-in-law whom Benton could influence? Fremont’s success as a writer, due in large part of the editorial pen of Jessie, was a surprise for Fremont’s report was an exciting read that caused many to consider moving to the West. Fremont’s third expedition left St. Louis on the first of June in 1845 with Kit Carson³⁷ and a number of other “mountain men” in his party of 55. His military orders were to explore the east side of the Rocky Mountains to the source of the Arkansas River. His “Manifest Destiny” orders were to go immediately to California as war with Mexico was possible, and the champion of “Destiny” wanted an American present to be there in case California could be captured for the United States. In this way Fremont was in California for the Bear Flag Revolt³⁸, the conquest of California accomplished with his small band, a contingent of naval personnel lead by Commodore Robert F. Stockton³⁹ and several Americans already in resident. This resulted in Fremont’s appointment by Stockton as the military governor of California. Fremont’s refusal to step down from this appointment when Brigadier General Stephen Watts Kearney⁴⁰ ordered Lieutenant Colonel Fremont to do so resulted in Fremont’s arrest and court-martial. Convicted but pardoned immediately by President James K. Polk, Fremont resigned his commission and moved to California, where he settled, albeit only on paper, on his Spanish land grant Rancho las Mariposas in

the foothills of the Sierra Nevada near the entrance to Yosemite Valley in the middle of what, two years later, would be the Mother Lode of California's gold country.

In spite of all these military matters, Frémont gather plants which soon found their way to John Torrey and formed the basis of his "Plantae Frémontianae" published in 1853 in the *Smithsonian Contributions to Knowledge*, where Torrey proposed such new genera as *Sarcodes*, *Carpenteria*, *Spraguea*, *Coleogyne*, and *Emplectocladus* (Fig. 19). Among his new species was *Calocedrus decurrens* (Torr.) Florin (Fig. 20) and a full description and an image of *Chamaebatia foliolosa* Benth. (Fig. 21)⁴¹.

The botanical novelties gathered on the Wilkes Expedition⁴², a round-the-world voyage that lasted from 1838 to 1842, fell to Gray with Torrey dealing only with the small collections made in the Pacific Northwest. As a result Torrey published another new genus in the *Contributions*, the magnificent *Darlingtonia californica* (Fig. 22), elegantly illustrated by Isaac Sprague.

Torrey's reports on the early western expeditions were crisply written and detailed only enough to be useful to fellow botanists. It seems that Torrey was not particularly interest in the plants of areas already explored botanical so that his 1843 summary of the collections made by Charles Geyer⁴³ in the region between the Mississippi and Missouri rivers was almost pedestrian⁴⁴. Besides, Torrey was more engaged in writing and then publishing, in 1853, his *Botany of New-York*, a revision of his 1841 and 1843 summaries, to which annual supplements subsequently would be added by George William Clinton (1807-1885) of Buffalo and by Charles H. Peck (1833-1913) of Albany from 1865 to 1915⁴⁵.



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Figure 19 *Prunus fasciculata* (Torr.) A. Gray



© JLReveal

Figure 20 *Calocedrus decurrens* (Torr) Florin



© JLReveal

Figure 21 *Chamaebatia foliolosa* Benth.

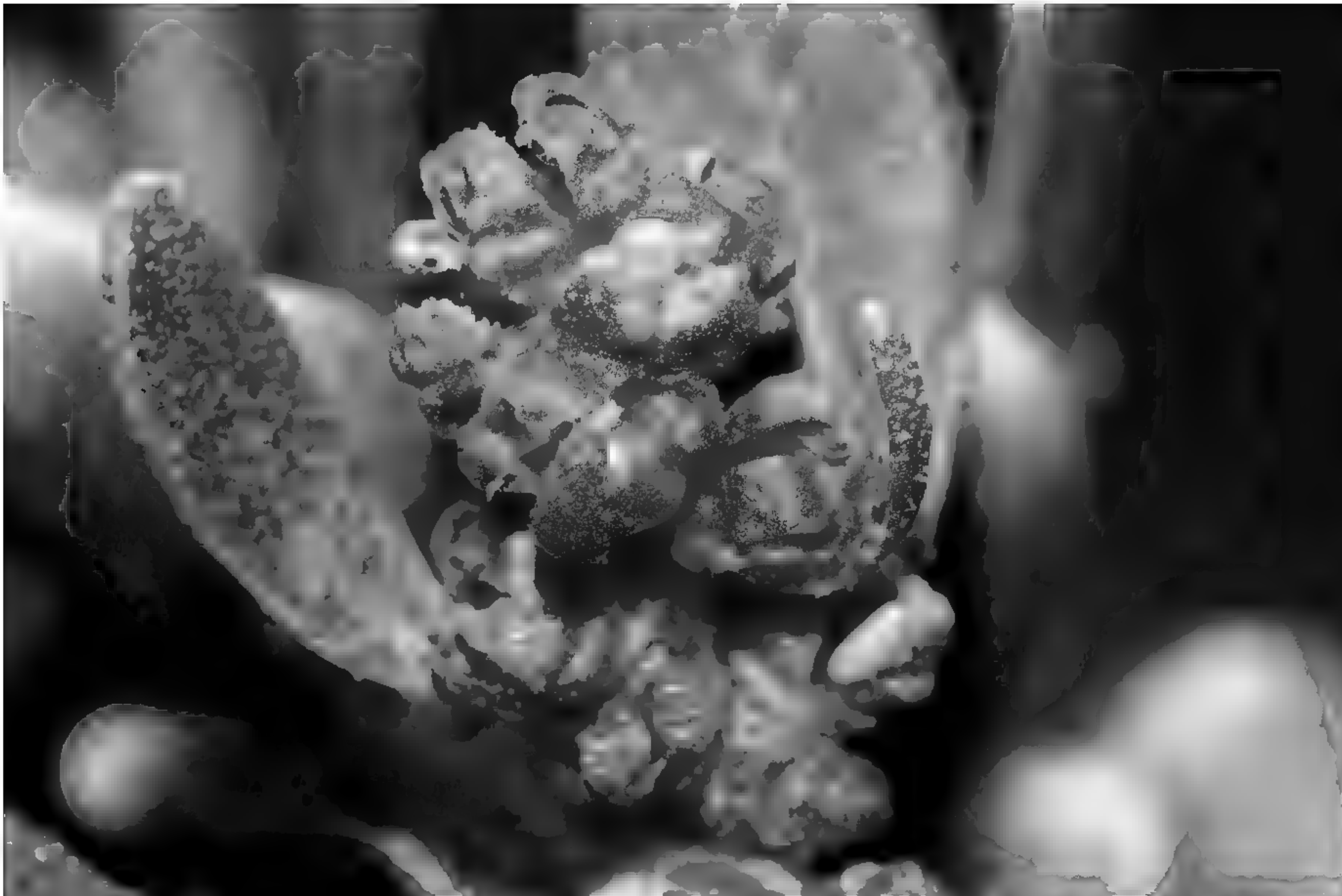


© JLRveal

Figure 22 *Darlingtonia californica* Torr

Following the two reports on Fremont's plants published in 1845, Torrey's interest became the collections of Major William H. Emory⁴⁶ whose *Notes on a Military Reconnaissance* was published in 1848 with an appendix by Torrey. Emory's route across the Southwest was hurried, but like Fremont, Emory sought to find new and curious plants. What is interesting about Emory is that he produced a series of sketches of plants which he gave to Torrey. These were of considerable value to George Engelmann⁴⁷ (1848, Fig. 24, below) of Saint Louis, who prepared the treatment of the cactus family, as the sketches provided a hint of the size and majesty of these difficult-to-collect plants. Even so, Emory wrote Torrey that his "numerous engagements" meant Emory's observations were limited.

The vagaries of the various editions of Torrey's appendix in the House and Senate versions of Emory's *Notes*, summarized by McKelvey (1955: 1014-1017), have long given botanists bibliographic nightmares (Barnhart 1895, Coville 1896, Farwell 1930) as the House and Senate versions differ not only in the plant's names and in the spelling of some scientific names but even in the number of published plates. Torrey's own copies give some hint to what is missing and otherwise were confused by the printers. Thus, Torrey's (1848a) names were first published in the Senate document (Feb-Apr) contrary to the information in Stafleu and Cowan (1976: 747), who list the House document (Mar-Jul, not "Feb-Jul") as the first place of publication (Torrey 1848b). Also, the first version of Executive Document 7 only consisted of 416 pages, later versions of this, and Executive Document 47, had 614 pages. At least Lieutenant James William Abert's⁴⁸ (1820-1897) observations of the vegetation of New Mexico (Abert 1848) were unhindered by human error, including Torrey's (1848c) list of plants in that report. The exchange of letters between Torrey and Emory in the archives of the New York Botanical Garden along with critical notes on the 72 known printed editions of Emory's *Report* in the botany library at the Gray Herbarium at Harvard University are critical to ascertain what was published and when (Fig. 23).



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Figure 23. Inflorescence of *Sarcobatus vermiculatus* (Hook.) Torr.

The next two reports were equally troubled and the letters in the Archives at the New York Botanical Garden provide more evidence of Torrey's dissatisfaction with the results, both as to the publication and to the efforts of these new western expeditions. The new plants found by Captain Lorenzo Sitgreaves⁴⁹ and described in his *Report of an Expedition down the Zuñi and Colorado Rivers*, at least, were well prepared being collected by Dr. Samuel Woodhouse⁵⁰, a most capable surgeon naturalist. The plates are excellent and illustrate for the first time such novel plants as two-needle pinyon (*Pinus edulis*; Fig. 25), desert trumpet (*Eriogonum inflatum*), and Gamble oak (*Quercus gambellii*, Fig. 26), all previously described by others. At least the Arizona walnut (*Juglans major*) proved to be new to science (Carvalho et al. 2012). As for Randolph B. Marcy's⁵¹ efforts along the Red River (Marcy 1853, 1854a, 1854b), one can read what one can only say is the professor's suggestion (Torrey 1853c) that his explorer students should do their homework: "It is remarkable that there occur[s] among your plants several species that were first discovered by Dr. James in Long's Expedition" this being slightly softened by the addition that some "have not been found since." Once again, the various editions, all prepared by local Washington printers, are fraught with errors, oversights and omissions to the point that in 1898 Frederick Coville, the foremost federal botanist of his day, called the Marcy report "a good illustration of the wasteful methods pursued in the publication of government reports."

The most successful of these early reports was that done again with the cooperation of Major William Emory. His 1859 *Report of the United States and Mexican Boundary Survey* (the second of two volumes) also marked Torrey's continued cooperation with Asa Gray (who worked as usual on the sunflower family and a few other groups) and George Engelmann whose knowledge of the cactus family (Fig. 27) was unchallenged. For a number of years Engelmann and Gray had worked on the Texas collections of Ferdinand Jacob Lindheimer⁵², and their "Plantae Lindheimerianae", starting in

1845 resulted in a close working relationship between the two of them similar to what each had with Torrey. What marked this *Report* however was the role played by the recently established Smithsonian Institution. Like most reports of the day this one too contained a summation of the natural history, geology, and even aspects of new fields such as ethnology.



Source Popular Science Monthly, vol. 29, Jan 1886
Figure 24 George Engelmann



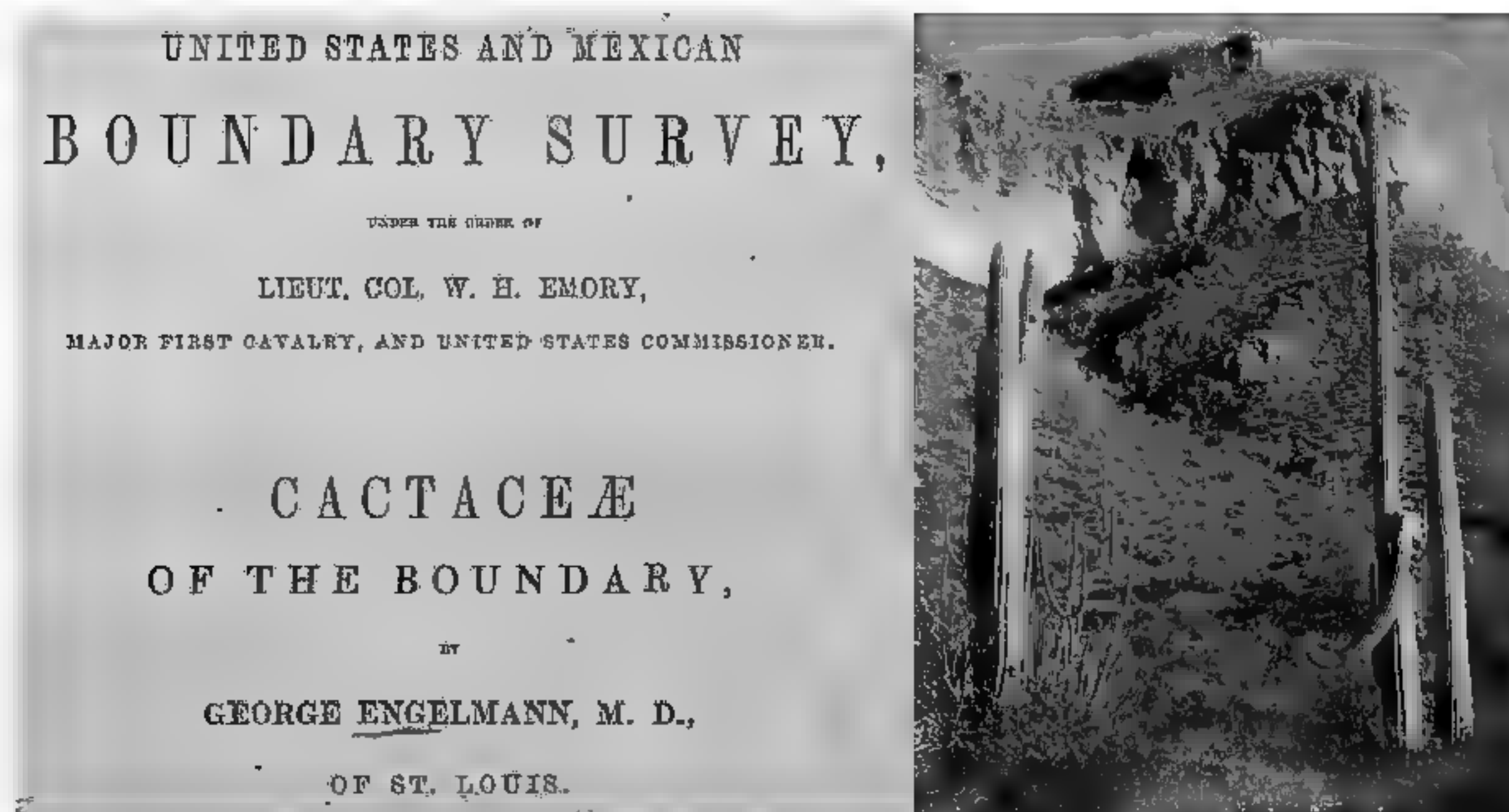
©JLReveal

Figure 25 *Pinus edulis* Engelm



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Figure 26 *Quercus gambellii* Nutt



Source BHL

© JLRveal (right)

Figure 27 Title page of Engelmann's 1859 treatment of the cacti (left), *Carnegiea gigantea* (right).

Joseph Henry⁵³, Secretary of the Smithsonian (Fig. 28 left), a friend of Torrey from when Henry was at Princeton, had urged Torrey to join the Institution as botanist, but for numerous reasons as may be seen in their letters, their reunions in Washington were little more than occasional visits. Spencer Fullerton Baird⁵⁴, a colleague of Torrey and Gray's at the American Academy of Arts and Sciences (Fig. 28, right), accepted the position of assistant secretary and zoologist so that from 1850 onward Baird, Gray and Torrey were deciding who were to be the natural history collectors on the government expeditions. Because of them, highly skilled and well-trained naturalists were in the field. James Hall⁵⁵, like Torrey a member of the New York Survey, was involved with the selection of geologists. Hall had worked on Fremont's fossils, so it was natural that he continued to describe the new western fossils. With such collectors as Arthur Schott⁵⁶ (Fig. 29) and a former student of Torrey's, Charles Christopher Parry⁵⁷, the collections gathered during the Boundary Survey were superb (Fig. 30). Sixty-one plates were devoted just to botany with a host of others—many hand-colored—profusely illustrating Emory's *Report*. The treatment of the birds by Baird was a pivot point in academic ornithology for it put America in the forefront in this field.

Building a railroad across the nation dominated the 1850s. Where to build was a political question, not one of engineering or science, and yet the best Congress could do was to commission a series of railroad surveys across possible northern, central and southern routes in the hope that perhaps facts, rather than political interests, might select "the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean." In a rapid series of highly detailed expeditions, eight reports were generated with the botany treated by Torrey and his associates.

Once again, the descriptions and plates were elegant, and the new plants plentiful. The "Railroad Reports" were the pinnacle of American natural history in the nineteenth century, and even the most casual review of the letters, images, and publications demonstrates both the hurried and yet critically careful work Torrey did to promote America's growing prominence in systematic botany even though the array of editions of the Reports and the variation in the entities published therein became a frustration to future generations of botanists⁵⁸. This aside, there is no question that Torrey was at the pinnacle of his career as a botanist.



© Smithsonian Institution

Figure 28. Joseph Henry (left) and Spencer F. Baird (right).



Source: BHL

Figure 29. Native Americans illustrated by Arthur Schott.



© JLReveal

Figure 30 *Echinocereus engelmannii* (Parry ex Engelm.) Lem

It was a fitting end to the era of Manifest Destiny. By 1861, when the last of the Topographical Engineers reports was published, the United States stretched from coast to coast. Western states were being added whenever the question of slavery could be resolved. Fremont stood for president of the United States in 1856 and lost to James Buchanan in a three-way race. Thomas Hart Benson died in 1858. Gray was becoming involved in the promotion of Charles Darwin's new theory on the origin of species — which Torrey did not accept — and Torrey's role in botany was declining as his duties as Assayer of the Mint become more and more demanding. So it was that Lieutenant Joseph C. Ives's *Report upon the Colorado River of the West* was published⁵⁹. Again Torrey, Gray and Engelmann collaborated to produce a modest summary of the botany. The three men were aware of their duty and performed the task with care, but their heart and soul were much more committed to other efforts burdened by the fear that a war threatened the nation, an event they all recognized, that would fragment botanists as well.

The war years greatly curtailed botanical explorations and discoveries throughout the nation. Most of the newly discovered plants found after 1861 fell to Gray who rapidly replaced Torrey as the nation's foremost plant taxonomist with specimens flowing to Harvard instead of New York, the labors of the older generation were now moving on to a new one dominated by Gray.

The three botanical papers published by Torrey published after 1861 bespeak of his decline. The first was in the *Annals* published in 1867. He discussed a root parasite named *Ammobroma sonorae* by Torrey in Gray's 1854 "*Plantae novae thurberianae*". Today, sandfood is known as *Pholisma sonorae*. It looks more like a mushroom with small pinkish-purple flowers on the cap than a true flowering plant. The second paper, "A revision of the Engoneae" [sic, Eriogoneae] bears Torrey's name, but he wrote hardly a word. This paper, published in 1870, is considered one of the

best of the Torrey and Gray papers. The last appeared a year after Torrey's death. Much of the text had been written by Torrey, but it remained for Gray to rewrite, edit, and correct the original text, and so it was that the long-delayed report on the "Phanerogamia of Pacific North America" was published in Charles Wilkes's *United States Exploring Expedition* decades after it had any taxonomic significance.



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Figure 31. *Eriogonum watsonii* Torr. & A. Gray; its type was collected in the Humboldt Mountains of Pershing County, Nevada, by Torrey in 1865.

Torrey's gradual move away from the day-to-day demands of taxonomy was largely due to his new duties as Assayer, and the shift can be seen in his correspondence. He played a significant role in the development of the U.S. National Herbarium at the Smithsonian with many duplicates moving from his own herbarium to Washington. His travels were more numerous with frequent visits to Washington and elsewhere. By 1862 Torrey was living near Columbia College in New York City, and his herbarium was sold to the College in 1860 on the condition he could continue to use it. In 1865 Torrey sailed to California, and went overland to Virginia City in Nevada (figs. 31, 32). He was on business for the Secretary of the Treasury, but old habits were hard to break, and so he collected. A late spring trip to Florida in 1868 gave him an opportunity to see *Torreya* in the wild. He went westward again, in 1872, this time by train, stopping to admire from afar an honor bestowed upon him by Charles Parry, his old student and faithful associate. His seventy-six years prevented him from climbing Torreys Peak but at 14,275 feet elevation, it was only three feet less than the adjacent Grays Peak about a mile away. Together, these high peaks in the Rocky Mountains stand as a fitting monument to the team of John Torrey and Asa Gray.

Torrey's life at the end and his legacy today

The final honors came late. Once settled at Columbia, the botanical world came to Torrey in informal gatherings, a kind of a botany club, and so it was that on December 2nd, 1867, the Torrey Botanical Club was born with John Torrey its first president⁶⁰. In 1869, the Smithsonian Herbarium, still in Torrey's possession, went to Washington with Parry taking care of the transfer. Torrey hoped his young friend, now a well-established botanist would assume the curatorship, but alas that fell to another. Torrey's children were away, married with their own families. The sadness of his wife's death in 1855, smoothed over by his children, was eased somewhat by grandchildren, but botany was now reduced to a little collecting and an occasional meeting of an old friend he knew only from dried, flattened specimens. In time, even that lessened so that it was only meetings of the Torrey Botanical Club and an occasionally letter. In February of 1873 his "pleuritis" — for so it was called — worsened, and death came for John Torrey in his seventy-seventh year on March 10th of that year.



© JLReveal

Figure 32 *Mentzelia torreyi* A. Gray var *acerosa* (M.E. Jones) Barney

The life of John Torrey remains a part of the history of botanical explorations and discoveries in the United States and especially in the American West. To read his letters, see his books, and touch his specimens is a privilege. Torrey's role in taxonomy remains fundamental to the mission of all botanists, especially at the New York Botanical Garden. Britton and Brown continued Torrey's work on the flora of the northeastern United States,⁶¹ John Kunkel Small⁶² botanized in the Southeast, and Per Axel Rydberg⁶³ matched Torrey's early work on the Rocky Mountains by writing floras of Montana (1900), Colorado (1906), the Rocky Mountains (1917) and then the Great Plains (1932). Torrey's work on the Pacific Northwest plants was matched a century later by the contributions of the Garden's Arthur Cronquist⁶⁴ to a series of illustrated volumes on the Pacific Northwest flora, and Cronquist also saw to the publication of the *Intermountain Flora*, its final volume published in 2012 by the Garden's botanists Noel and Pat Holmgren, with a little help from others.

What Torrey began nearly two century ago continues. The New York Botanical Garden, along with the Smithsonian Institution and the Missouri Botanical Garden, are at the forefront of botanical explorations and discovers in the twenty-first century. *A Flora of North America North of Mexico* continues to appear; Torrey would be pleased. And yet, even in an era of online resources and instant communication over the internet, the role of the herbarium for specimens and the library for real books remains first and foremost for here is where the real knowledge is stored. And, most importantly, that knowledge remains fundamentally tied to the out-of-doors and that is something no molecule or electron can ever replace.

End notes

¹ John Charles Frémont (1813–1890), *The Pathfinder*, was the first child of an affair between Anne Beverley Whiting Pryor and Charles Frémon, a French immigrant who was hired by the elder Major John Pryor (1750–1823) in 1810 to tutor his teenage wife. The young couple fled Virginia and because Major Pryor's divorce petition was rejected by the Virginia House of Delegates, John was born out of wedlock, a fact that later would be a factor in Frémont's 1856 run for the presidency of the United States. Educated at the College of Charleston (1829–1831), he taught mathematics for the United States Navy before being appointed a second lieutenant in the newly formed Corps of Topographical Engineers charged with mapping the nation. Frémont's early expeditions were between the Mississippi and the Missouri rivers, so that when appointed to head his own expedition to the South Pass region of present-day Wyoming he was highly skilled in the tasks of recording both general and scientific observations. This quick trip in 1842 was followed by a second along the Oregon Trail in 1843, which took him to the Pacific Ocean and then south to California (Fig. 33), crossing the Sierra Nevada in January and February of 1844. Unlike other explorers of the period Frémont described, with Torrey, his own plants. Frémont returned to California again in 1845 and in 1846 became engaged in the Bear Flag Revolt, which resulted in the United States annexing the whole of Mexico's possessions in the Far West. His fourth expedition was privately organized and proved to be tragic, with the death of ten of his men in the snows of the southern Rocky Mountains. He briefly served as the military governor of California in 1847, and then was one of first two California senators, serving only a few months in 1850 and 1851. Frémont was the first Republican presidential candidate but placed second in the 1856 contest. Awarded the rank of major general during the Civil War, Frémont's war record was dubious and in 1862 he resigned and moved to New York. From 1878 until 1881 Frémont served as governor of the Arizona Territory, but soon he was destitute and died in 1890, living on the income from his wife's writings. For more information see Nevins (1955), Jackson and Spence (1970–1984), and Chaffin (2002). Frémont's correspondence with Torrey is in the archives of the Mertz Library at the New York Botanical Garden, Bronx, New York (Lenley 1973). See Herr (1987) for a biography on Jessie, and Herr and Spence (1993) for her letters. The short profile on Jessie by Petruionis (2001) is excellent. For historical novels on the couple, see Stone (1944) and Denton (2009).

² Frémont actively collected plants along his entire route, gathering some 1400 specimens, but not all reached Torrey. A mule fell into a deep canyon in the Sierra Nevada with specimens gathered from the Columbia River to the Great Basin, but this loss was minor compared to a sudden flood that stuck the expedition in southwestern Kansas on their return in 1844. Water damage is obvious on many of the specimens in Torrey's herbarium at the New York Botanical Garden, and Torrey (1845: 311) reports "more than half of specimens were ruined before he [Frémont] reached the borders of civilization." Torrey and Frémont's "Descriptions of some new genera and species" along with four plates was published in Frémont's Report (1845: 311). For all of Frémont's botanical collection activities, see Welsh (1998).



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Figure 33 Bridgeport Lake and Sierra Nevada from the foothills of the Masonic Mountains

- ³ Isaac Sprague (1811–1895) is considered the best known of the early American botanical illustrators (Rudolph 1990). Born in Massachusetts he was self-taught, gaining considerable experience while serving as an assistant to John James Audubon (1785–1851) on an expedition up the Missouri River in 1843. A now rare bird, *Anthus spragueii*, or Sprague's pipit, was named for him by Audubon in 1844, who stated Sprague “shot it on the 19th of June, 1843, near Fort Union, Upper Missouri.” While working on a book on the botanical collections of Meriwether Lewis and William Clark (Earle & Reveal 2004), I would occasionally spot the bird along the Missouri in eastern Montana. Sprague would illustrate many of Torrey and Asa Gray's new western species obtained during expeditions from 1838 to the mid-1850s. The original drawings may be seen at the Hunt Institute for Botanical Documentation at Carnegie Mellon University in Pittsburgh, at Harvard University, and a few at the New York Botanical Garden. The plant genus *Spraguea* was named for him by Torrey in 1853.
- ⁴ “*Plantae Frémontianae*” (Torrey 1853) was a carefully crafted and beautifully illustrated report on the more elegant and impressive plants gathered by Frémont. Frémont's specimen of *Sarcodes sanguinea* (Fig. 1, above) was nowhere nearly as elegant as the Isaac Sprague illustration, but the details were there in the exactness few illustrators of the day could match. Years later Torrey saw the snowplant in a pot in a drug store window in San Francisco. In a letter to Gray, written a few weeks later on 31 July of 1865, Torrey expressed his amazement of a plant he knew only from Frémont's flattened specimen after seeing hundreds of them dotting the valley floor in Yosemite. His reactions were like those of others who first spy snowplant, pure wonderment! Isaac Sprague (1811–1895) was a noted botanical and zoological illustrator who worked for both John James Audubon and Gray. Working with George Lincoln Goodale (1839–1923) from 1876 until 1882, Sprague wrote *Wild Flowers of America*, published in parts of four plates and eight pages, with a summary volume published late in 1882 under a slightly different title with Alpheus Baker Hervey (1839–1931) as a co-author, and again under a third title in 1887.
- ⁵ The article by Reveal and Reveal (1985) was, in part, a response to Lewis (1981). The Sweetwater Mountains are east of the Sierra Nevada in northern Mono County, California, and extend into portions of southern Douglas and Lyon counties, Nevada. The pieces of the carriage recovered by the United States Forest Service were found downslope from the site suggested in 1985; the pieces are housed at the office of the District Ranger in Bridgeport, California (see Wilusz 2011; Vogel 2012; Anonymous 2014; Graham 2014).
- ⁶ The primary bibliography of John Torrey remains Rodgers (1942), followed closely by Robbins (1968); both have extensive reference sections. Details about the man were taken by both authors from Torrey's correspondence and writings at the Mertz Library; see “John Torrey Papers” (http://library.nybg.org/finding_guide/archiv/torrey_ppf.html). The bulk of Torrey's correspondence was transferred long ago to the New York Botanical Garden by Columbia University. To the many works on Torrey cited by Stafleu and Cowan (1986: 401), two additional references can be mentioned here: Isley (1994) and Reveal and Pringle (1993).
- ⁷ The history of Lyceum, detailed by Baatz (1990), is a review of The New York Academy of Sciences, as the Lyceum of Natural History would eventually be called starting in 1877. The eleven volumes of the *Annals of the Lyceum of Natural History of New-York* were published from 1823 to 1876.
- ⁸ Amos Eaton (1776–1842) was the great popularizer of botany primarily because of the widespread use of his *Manual of Botany* (1817) which went through eight editions (1817–1840; see Stafleu and Cowan 1976: 718) in his life time. His misadventures with the New York legal system are discussed by Rodgers (1942: 13) and by Humphrey (1961: 78); see also Spanagel (2014).
- ⁹ Although this work was attributed to all three members of a committee charged with writing the flora, only Torrey was its actual author. Yet, it is interesting that in the appendix there are descriptions of new plants by both Torrey and John Eaton Leconte, Jr. (1784–1860), the latter destined to be known for his expertise in entomology as well as botany (Barnhart 1917). Like Torrey, Leconte (also spelled LeConte or Le Conte) also attended Columbia College and was

schooled in botany by David Hosack (1769–1835; see Robbins 1964 and Sherk 2002) whose title was professor of theory and practice of physic. Hosack was the founder of the Elgin Botanical Garden and the author of *Hortus Elginensis* (1811). Leconte published a small track, *Catalogus Plantarum quas sponte Crescentes in Insula Noveboraco*, on the plants of Manhattan Island in 1811, but he is best known for his book, with Jean Baptiste Boissieu, *Histoire Général et Iconographie des Lépidoptères*, which is famed for the many illustrations by John Abbot (1751–1841; see Calhoun 2007).

- ¹⁰ Antoine Laurent de Jussieu (1748–1836), a French noble, was professor of botany at the Jardin des Plantes from 1770 to 1826 where, taking guidance from his uncle Bernard (1699–1777), he formulated the modern system of natural classification of plants in a series of lectures held over the years prior to his formal publication of *Genera Plantarum* in 1789 (Stevens 1994). By international agreement (McNeill et al. 2012), our modern names of plant families date from this work although some modern names were published before this date, and in fact one of de Jussieu's students, Jean François Durande (1732–1794), published most of his system in a text book some years before (1782) as did a competitor, August J.G.C. Batsch (1761–1802) whose best known work is *Dispositio Generum Plantarum Jenensium* (1786).
- ¹¹ As may be seen by consulting Stafleu and Cowan (1979: 418), Edwin James (1797–1861) was long considered a minor footnote in western American botanical history. He is mentioned in many references (e.g., Pammel 1907–1908), but only two gave him real notice, the first being Ewan (1950: 13) and then McKelvey (1955: 211). The books by Goodman and Lawson (1995) and by Evans (1997) have done much to correct this oversight, especially when it comes to the natural history of the Stephen Harriman Long (1784–1864) expedition of 1820 to the Rocky Mountains. James wrote an account of his journey in December of 1822 and described several of his own species in 1825, with Torrey adding others in 1823 and 1824, before a full summary was presented three years later (Torrey 1826–1827).
- ¹² When President Thomas Jefferson (1743–1826) dispatched Zebulon Montgomery Pike (1779–1813) to find the headwaters of the Arkansas River, being the southern boundary of the Louisiana Purchase, he gave specific instructions that Pike was to thoroughly observe and collect natural history objects (Buckley & Harris 2012). These instructions were not unlike those given earlier to Meriwether Lewis in 1803. That Pike ignored them—collecting plants and animals being beneath the dignity of a military officer, and then getting himself and his men captured by the Spanish for crossing into Mexico—were minor offenses, it seems, to geographers. Pike did see the highest of the Colorado peaks, and indeed gave it a name, Grand Peak. After Edwin James climbed the peak, Stephen H. Long decided a more appropriate name would be James Peak. But alas, an honor like that, given to a lowly surgeon naturalist, was not to last and so it was that Frémont altered the name to Pikes Peak (14,415 feet elevation) in 1840. Today, there is a James Peak (at a mere 13,294 feet elevation) named for Edwin James by the botanist Charles Parry (1862: 235); in 1862 Parry was the second person to climb Pikes Peak (Weber 1997).
- ¹³ All of the species mentioned here were based on specimens collected by Edwin James and may be seen on the web at <http://sciweb.nybg.org/science2/hcol/vasc/index.asp>. However, an original specimen of the limber pine (*Pinus flexilis*) apparently never existed. For some unexplainable reason, the replacement type (a neotype) resides at Southern Illinois University with duplicates at Harvard University, Missouri Botanical Garden, Michigan State University, and the National Arboretum in Washington, D.C. (Andresen and Steinhoff 1971), but not at the New York Botanical Garden! One of the best known species found by James is the columbine, *Aquilegia coerulea* (Fig. 34), and except for the loss of color in the flowers, even today this is an exquisite specimen. One of James's new species that Torrey named was *Primula angustifolia*, a prized rock garden species. The best known of the grasses is what Torrey termed *Pleuraphis jamesii*, long known as *Hilaria jamesii* (Torr.) Benth. Its formal common name is "galleta grass" although among range management types the name "laughing jim grass" is frequently uttered. The type specimen gathered by James has an original illustration by Torrey added to the sheet.



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Figure 34 *Aquilegia coerulea* James

- ¹⁴ The 1830 Lindley book *An Introduction to the Natural System of Botany*, was widely adopted. In addition to the 1831 American edition promoted by Torrey, a German translation (by Johann Bernhard Wilbrand [1779–1846]) was published in 1834, with a series of extracts presented by Carl Traugott Beilschmied (1793–1848) in the journal *Flora* in 1834. Even Lindley's key was translated by Beilschmied in 1832.
- ¹⁵ The life and time of Asa Gray (1810–1888) was the subject of a senior thesis by A. Hunter Dupree (1959) and remains to this day the single best work on the man. Many of his letters were compiled and published in 1894 by his wife, Jane Loring Gray (1821–1909), and two volumes of his papers were assembled in 1889 by the first director of the Arnold Arboretum at Harvard, Charles Sprague Sargent (1841–1927). Stafleu and Cowan (1974–1983) have a long list of bibliographic notes on Gray, to which may be added the several papers recently published by Romero-González et al. (2010), including one by Reveal (2010). Gray's papers are at the Harvard University Herbaria (see <http://www.huh.harvard.edu/libraries/asa/ASABIO.html>, where there is also a detailed chronology).
- ¹⁶ Lewis David von Schweinitz (1780–1835), a member of the Moravian community in Pennsylvania, traveled widely in Europe as a young man before settling in Salem, North Carolina (1812–1821) and then in Bethlehem, Pennsylvania (1821–1835). Today, von Schweinitz is considered to be the “patron saint” of North American mycology (Rogers 1977), his herbarium of some 23,000 specimens (mostly fungi) is at the Academy of Natural Sciences in Philadelphia. Stafleu and Cowan (1985: 437) provide a rather full listing of references about him. The discussed cryptogamic flora was published by von Schweinitz alone in 1821. The authorship of the late 1825 von Schweinitz monograph of *Carex* must be noted. The title given in the *Annals* is as given in the Reference section of the present work (see Schweinitz 1825b), but in the table of

contents the authorship is cited as “L.D. De Schwinitz and J. Torrey” and there is (on page 374) the following message to the Committee of Publication from von Schweinitz dated December 20, 1825:

The Monograph of the Carices, in its present shape, differs so essentially from the unfinished materials, which, on my departure for Europe, I confided to my friend Dr Torrey, with a request to make such use of them as he deemed proper, that it would be an act of injustice to that gentleman to consider him simply in the light of an editor. The judicious and elaborate amendments he has proposed, and the mass of new and valuable matter he has added, entitle him to a participation in the authorship of the work. I am anxious, therefore, that the Monograph should be considered and quoted in all respects, as the joint production of Dr Torrey and myself.

Although the modern rules of nomenclature (McNeill et al. 2012) mandate that the authorship must be that given in the original publication, Art. 46.9 does allow external evidence to be used to determine authorship, and so it is that the few new names published in late December of 1826 are now treated as “Schwein. & Torr.” The majority of new names suggested by Torrey to Schweinitz as well as those newly recognized by him were published in an earlier volume of the *Annals* (Schwinitz 1824).

Schweinitz is also known for his study of *Viola* (1822) and his summary of the Thomas Say collection of plants from the Old North West (1825a). His final work was on the fungi of North America published in 1832 (see Rogers 1977: 238).

¹⁷ Chester Dewey (1784–1867), then at Williams College, ultimately moved to Rochester, New York, in 1836 and took a position at the Collegiate Institute of Rochester, ending his career as professor of chemistry and natural philosophy at the University of Rochester (Stafleu and Mennega 1998: 255; Seelve 1900). Aside from his numerous papers on *Carex* in the *American Journal of Sciences and Arts* and elsewhere, his 1840 *Report on the Herbaceous Flowering Plants of Massachusetts* is noteworthy as he adopted Lindley’s arrangement of families.

¹⁸ Gray’s 1873 obituary is available online at http://www.huh.harvard.edu/libraries/GrayBicent/gray_torrey.htm with a number of images. The quote about Dewey is on p. 415.

¹⁹ See Rodgers (1942: 91).

²⁰ See Rodgers (1942: 97), quotes taken from a letter to von Schweinitz.

²¹ William Jackson Hooker (1785–1865) was one of the foremost botanists in England and became an important correspondent of John Torrey’s. Hooker’s primary work of interest to Torrey was *Flora Boreali-Americana*, which was published in 12 parts from 1829 to 1840. Hooker and George Arnold Walker Arnott (1796–1868) jointly authored *The Botany of Captain Beechey’s Voyage*, which included stops along the Pacific Coast of North America in 1826, 1827, and 1828 (McKelvey 1955). As a prolific author and editor (Stafleu and Cowan 1979: 283), numerous North American plants came to his attention, and it was through Hooker that both Torrey and Gray received specimens made by European botanists that were critical to the Americans own monographic and floristic efforts. Like Torrey, Hooker worked on cryptogams, ferns, conifers, and flowering plants. For more information on Hooker see J.D. Hooker (1902) and Allan (1967).

²² David Douglas (1799–1834), a Scottish botanist and collector, is probably the best known of the early western naturalists and his plant specimens were critical to Torrey and Gray as they wrote their *Flora*. His adventures have been widely documented as noted by Stafleu and Cowan (1976: 674) who failed to mention a 1962 episode, “The Grass Man”, on the television series *Death Valley Days*. Stafleu and Mennega (2000: 66) account for much of the more recent literature, to which may be added a few recent books (House and Mitchell 1999; Bown 2002; Mitchell et al. 2005; Nisbet 2009). Two earlier books not mentioned in 2000 are those by Spongberg (1990) and Reveal (1992). Of critical importance to Douglas’s early explorations in

the Pacific Northwest is his journal (Douglas 1914) published 70 years after his untimely death in Hawaii

- ²³ André Michaux (1746–1802) was an adventurous French botanical collector who explored much of eastern North America from 1785 until 1796, gathering primarily plants of potential horticultural or naval stores value for the French government (Deleuze 1804, 1805, MacPhail 1981, Savage and Savage 1986, Taylor et al. 1998, Taylor and Norman 2002, Baranski 2004). For a portion of the time, he collected with his son François André (1770–1855, F. A. Michaux 1805). *Flora Boreali-Americana*, published in 1803, was the first major treatment of the native plants of the region. The beautifully illustrated work on oaks (Michaux 1801, 1810), followed by the three volume work on North American trees by François (Michaux 1810–1813), are among the best of the early illustrated works on the forest trees of North America. There is no evidence that Torrey received any of Michaux's original American specimens, however.
- ²⁴ George Bentham (1800–1884), an English gentleman and famed botanist, was a frequent correspondent with Torrey (Lenley 1973). He published many new species of North American plants sent to him by Torrey (see Stafleu and Cowan 1976: 173, Jackson 1906, Isley 1994).
- ²⁵ Robert Brown (1773–1858) was the best known of the English naturalists when Torrey visited England (see Stafleu and Cowan 1976: 364, Mabberley 1985).
- ²⁶ Moses Ashley Curtis (1808–1872) is best known as a mycologist and a correspondent with von Schweinitz (Petersen 1980, Berkeley 1986). He made a number of contributions on the cryptogams in the 1840s and 1850s for reports on the explorations of the American West.
- ²⁷ Hardy Bryan Croom (1797–1837) died in the breakup of a passenger steamboat off Cape Hatteras (Hale 1837, Redfearn 1935, Flowers 1979, Rogers and Clark 1999, Conrad 2011), but in spite of his short life he is known today for the genus *Croomia* named by Torrey in 1840. Letters from Torrey to Croom are preserved in The Southern Historical Collection at the University of North Carolina. Croom's 1833 *Catalogue*, published with Henry Loomis, was revised and published again in 1837 with the help of Torrey. Croom's paper on *Sarracenia* (Fig. 35) was published in the *Lyceum* in 1837.



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Figure 35 A flower of *Sarracenia purpurea* L. in early fruit.

- ²⁸ John Leonard Riddell (1807–1865) was broadly interested in natural history, and like most of his contemporaries he took a medical degree in 1836 and then spent the remainder of his life at the Medical College of Louisiana (now Tulane University). Also, like Torrey, Riddell was associated with a mint (at New Orleans), but unlike Torrey, Riddell (1847) was also a science fiction writer. Botanically, Riddell is best known for his collecting activities in eastern Texas (Stafleu and Cowan 1983: 784). Two works were important to Torrey, his 1835 “Synopsis of the flora of the western states” and Riddell’s now famous “Catalogus florae ludovicianae,” published in 1852 and 1853, which supposedly was supported by specimens and illustrations sent to the Smithsonian Institution. Originally, the manuscript was sent to Gray, who suppressed its publication but apparently kept some of the collections (Ewan 1967: 45). The taxonomic significance of the long-ignored 1852–1853 publication in the *New Orleans Medical and Surgical Journal* was reviewed by Wilbur and Whitson (2005, 2007).
- ²⁹ Constantine Samuel Rafinesque (1783–1840) is without doubt the single most interesting, and controversial, naturalist in North American history (Boewe 1982, 2005, 2011). An acknowledged genius with exceptional abilities, he is also credited with being one of systematic biologists most destructive, especially when it comes to nomenclature (Kastner 1977; Flannery 1998). After a three year visit to America (1802–1805) as an apprentice in a mercantile house in Philadelphia, he returned in 1815 only to lose all of his books, collections, and manuscripts in a shipwreck off the coast of Connecticut. His interest in American natural history began much earlier when he approached Thomas Jefferson in 1804 to obtain an appointment as a naturalist for the 1806 Freeman-Custis expedition along the southern border of the Louisiana Purchase. He was passed over in favor of Peter Custis (1781–1842), who proved to be singularly unsuccessful at the task although his observations of the vegetation were critical (Morton 1967; Flores 1984). When Torrey first met Rafinesque he was much more reasonable, at least in terms of nomenclature, and the two men developed a close relationship, especially since Rafinesque had a professional relationship with Dr. Samuel Latham Mitchill (1764–1831; Aberbach 1988), whose prominence in medicine, natural history, and politics was well established, and as the owner of the journal *Medical Repository*, allowed Rafinesque a ready avenue to publish his findings. Torrey and Rafinesque collected together, but upon Rafinesque’s return from a personal trip into the Allegheny Mountains in 1818, his suggestion that he found more than 250 new species must have caused Torrey some concern. The relationship between the two soon dimmed, especially in the 1830s when Rafinesque, already a prolific author (Stafleu & Cowan 1983: 549), proposed hundreds of new genera and species of little or no merit in Torrey’s view, so that finally Torrey and Gray essentially ignored what Rafinesque wrote—a view largely adopted by others until the 1970s. When Merrill (1949) finally compiled Rafinesque’s botanical efforts he showed that Rafinesque proposed nearly 2700 new generic names and more than 6700 species in about 1000 publications. Unfortunately, only a few of Rafinesque’s types exist today as his herbarium was basically destroyed after his death (Stuckey 1971).
- ³⁰ Charles Wilkins Short (1794–1863) was one of the most prolific of Torrey and Gray’s many correspondents, and letters from both botanists are found in Short’s archives at the University of North Carolina (in the Southern Historical Collection). Like Rafinesque, Short was also associated with the Transylvania and the Filson Club, as mentioned by Stafleu and Cowan (1985: 568). Short’s work, “Florula lexingtoniensis,” published in 1828 and 1829, was the basis for his 1833 “Catalogue” published with Robert Peter (1805–1894) and Henry A. Griswold, with a series of supplements following until 1840; see Stuckey (1978) for a detailed analysis.
- ³¹ Thomas Nuttall (1786–1859) was the single most important source of new information on North American plants for Torrey and Gray. The life and times of Nuttall are reviewed in detail by Graustein (1967) and Ewan (1971), with information on his travels into the Old Northwest by Graustein (1957), his ascent of the Arkansas River by Lawson (2004), and his trans-Mississippi travels by McKelvey (1955) and more recently by Williams (2003). Nuttall came to North America in 1808 and went westward for Benjamin Smith Barton (1766–1815) in 1810, and then

ascending the Missouri River in 1811 (Reveal 1968, Fig. 36). Nuttall's *Genera of North American Plants*, published in 1818, served Torrey well in his own early works, and Nuttall's later *North American Sylva* (1842-1849) replaced the earlier work of François Michaux (see Stafleu and Cowan 1981: 781). Nuttall provided Torrey and Gray with numerous manuscript names that were published in their *Flora*, crediting the names to Nuttall, or modifying the descriptions. Nuttall is also well-known for his work in ornithology, being honored in 1873 with the establishment of the Nuttall Ornithological Club, the oldest such group in the United States.



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Figure 36 *Eriogonum flavum* Nutt. (left), *Rudbeckia columnifera* (Nutt.) Wootton & Standl. (right, digital painting), both collected by Nuttall in 1811 and named in 1813.

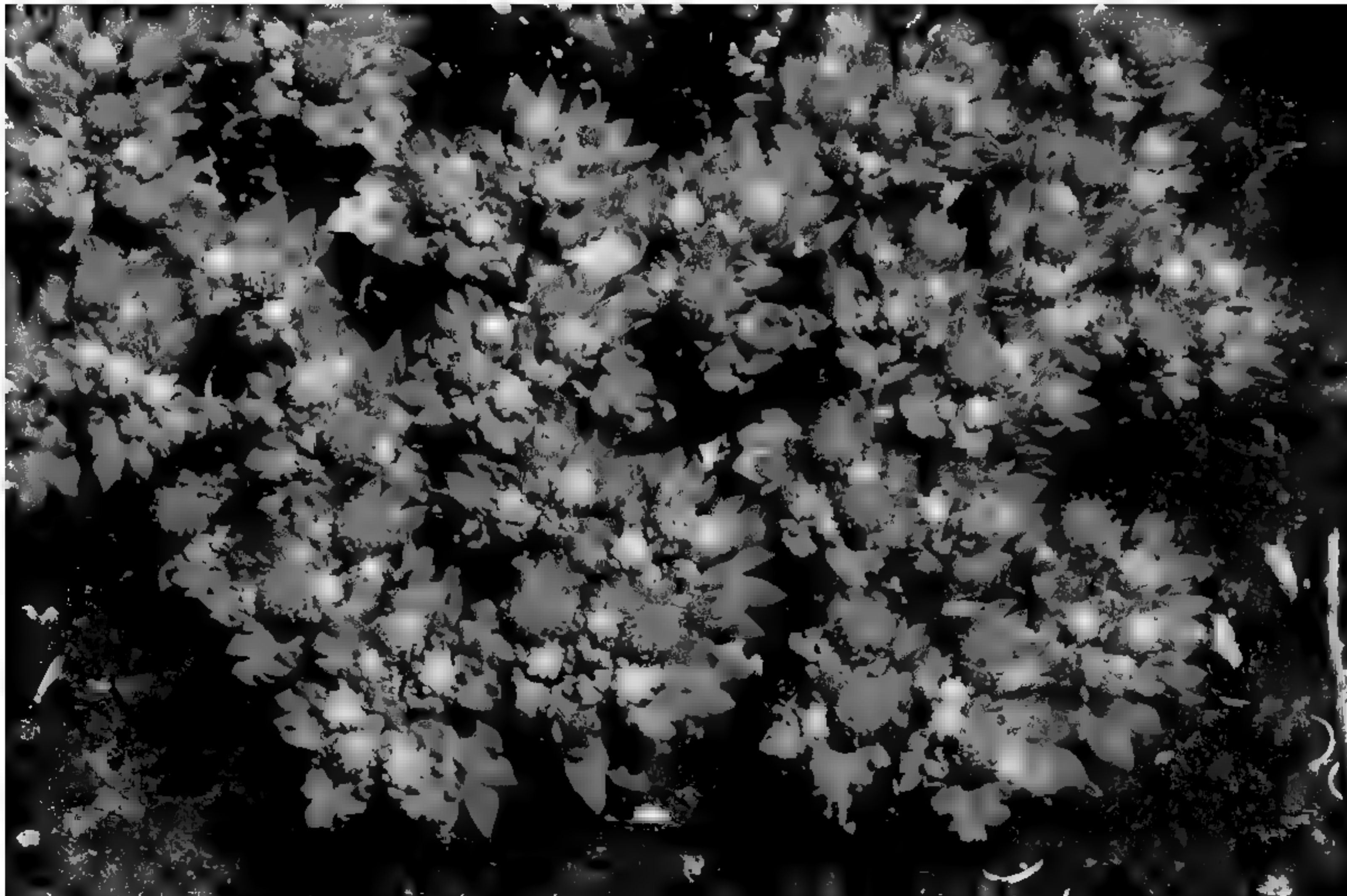
³² Nuttall left Harvard when Nathaniel Jarvis Wyeth (1802-1856), a Boston merchant, convinced him to go to Oregon in 1834. While many of Nuttall's new western plants were accounted for by Torrey and Gray, Nuttall (1834a, 1834b, 1840-1841, 1842) published several papers and left a multitude of specimens at the Academy of Natural History in Philadelphia. A provision in an uncle's will mandated that Nuttall reside in England at least nine months each year so that Nuttall returned to America only once (1847-1848), where he published two papers with many new western species (Nuttall 1848a, 1848b). In 1832 Wyeth collected numerous new species in western Montana, southeastern Idaho, and elsewhere along his route, one being *Iris missouriensis* (Fig. 13, above). Nuttall's own discoveries were far more numerous. For more information on Wyeth and Nuttall see McKelvey (1955) and especially Graustein (1967).

³³ The rise of botany in general education can be traced to Phelps (1833b) for young women and to Eaton for young men. Lincoln's (nee Phelps) book underwent two major revisions (1845, 1853) with 39 printings (Rudolph 1984). Her *Botany for Beginners* saw 27 printings. Eaton's 1820 *Botanical Exercises* introduced botanical laboratories into college curricula (Rudolph 1996). Gray's 1836 *Elements* was revised and renamed *The Botanical Text-book* in 1842 and went through six editions and numerous printings (Stafleu & Cowan 1976-1986).

- ³⁴ The history of early scientific exploration and discoveries in western North America was summarized by Goetzmann (1959, 1966, 1986). The earlier trilogy by Bernard De Voto (1943, 1947, 1952), takes a larger view and covers a broader period. The role of scientists in the West was reviewed by Reveal and Hafen (1970). The classical work on the fur trade remains Hafen's (1965–1972) ten-volume work on the subject.
- ³⁵ The best resource for these collectors remains McKelvey (1955; see in particular her bibliography) although brief summaries of many of these naturalists are provided by Thomas (1969), Reveal (1992), Reveal and Pringle (1993), and Beidleman (2006). The classical work on Chamisso (Lentzner 1893) remains still the best source of information on this naturalist, who is better known for his poetry. The life of Alexander Collie, who resided in Australia from 1831 until his death in 1835, was summarized by Chessell (2008). Beechey's (1832) account of his visit to California is detailed and the western American botanical discoveries by Collie and Lay were dealt with by Hooker and Arnott (1839). Bentham (1844–1846) described the plants found by Hinds. Tolmie's journals are now available, being published in 1963; see also Lamb (1982).
- ³⁶ Thomas Hart Benton (1782–1858) was *the* advocate in the Senate for westward expansion throughout his five terms (1821–1851) and he was a major, behind-the-scene force, supporting western exploration by the U.S. Army and early enthusiasm for an intercontinental railroad from the Atlantic to the Pacific. Torrey, well aware of the power Benton had in the Senate, no doubt "allowed" Frémont to author the new species collected by Frémont as a means of ensuring Benson's continued support of future western explorations.
- ³⁷ Christopher Houston Carson (1809–1868), mountain man, trapper, and guide, is equally well-known today as a western frontiersman and a pulp-fiction hero (Averill 1849) as well as a character in comic books, movies and a television series. Separating fact from fiction is not always easy, but for Frémont, Carson was the perfect man for the task of trekking from Missouri to California. Frémont would name many places for his guide; today, the best known is Carson City, the capitol of Nevada. Of the numerous scholarly books about Carson the more recent are by Carter (1968), Dunlay (2000), Roberts (2001), Remley (2011), Sides (2006), and Simmons (2003); many of Carson papers are at The Bancroft Library at the University of California.
- ³⁸ The Bear Flag Revolt was a brief (10 June to 9 July 1846) armed revolt against the Mexican government in Alta California carried out by a small group of Americans with the aid of Frémont. After the Revolt, the battle for California was taken over by Frémont and Commodore Stockton (see below) while awaiting arrival of the U.S. Army under the command of General Kearney (see below). Not surprising, throughout this period Frémont continued to collect plants.
- ³⁹ Robert Field Stockton (1795–1866) joined the U.S. Navy in 1811 and served initially in the War of 1812. He resumed his career in 1836 and being a member of a political family—his father was a senator from New Jersey—young Stockton was soon offered the position of U.S. Secretary of the Navy in 1841 which he declined. After serving in Texas (1844–1846) he took command of the Pacific Squadron and aboard the *USS Congress* he soon was involved in the conquest of California, ultimately commanding the relief command that saved Major Kearny and his dragoons at the Battle for San Pasqual (December 1846). Just prior to this Stockton appointed Frémont military governor of California (see endnote 40, below). In 1851, Stockton was elected to the Senate serving just as Frémont was leaving his brief tenure as a senator from California.
- ⁴⁰ Stephen Watts Kearny (1794–1848), like others of his generation, served in the War of 1812, but was soon in the West, being a member of an 1819 expedition along the Yellowstone River in Montana and Wyoming and another in 1820 along the Missouri River (Kearney 1908). He returned in 1825 on another expedition (Atkinson 2000) prior to assuming the command of a military barracks near St. Louis in 1826. In 1836 Kearny took command of the 1st Dragoon Regiment and was stationed at Fort Leavenworth charged with the task of protecting the western frontier by providing military protection for wagon trains crossing the Great Plains. His Army of the West was assigned to Santa Fe with the charge of establishing a joint civil and military government. Interestingly, each of the subcommanders was assigned the task of collecting

natural history objects, with the plants going to Torrey for identification. When he reached San Pasqual in southern California, his men were trapped and relief came in the form of Kit Carson alone and a small command of Stockton's marines. Both Kearny and Stockton were of equal military rank, but who was supreme was not defined. Frémont, being of lower rank and already appointed the military governor of California by Stockton, initially refused to abandon his duties whereupon he was ordered to Washington to face a court-martialed for insubordination and disregard of orders.

- ⁴¹ Publication of "Plantae frémontianae" in April of 1853 was a singular effort combining the field work of a member of the U.S. Army's Corp of Topographical Engineers (Frémont), the critical analysis by an American botanist (Torrey), and the artistic skill of an illustrator (Issac Sprague). In many respects this would establish the minimal requirement for publication of new names of western North American plants over the next two decades. Besides the snowplant (*Sarcodes sanguinea*, Fig. 1, above), Torrey's *Carpenteria californica* (tree anemone) and *Coleogyne ramosissima* (blackbrush) are still recognized with *Spraguea umbellata* now assigned to *Cistanthe* and Torrey's new shrub genus, *Emplectocladus fasciculata* (Fig. 19, above) placed in *Prunus*. Although Frémont saw incense cedar in February of 1844 and collected a specimen, it is likely that the majority of the gathering was damaged in a river flood in Kansas on Frémont's return trip so that Torrey had in hand only a few fragments of the tree. As a result when the species was described in 1853, Torrey used as the basis of his description, and the published illustration, a Gilbert White Hulse (1807-1883) gathering from northern California obtained in 1850. Welsh (1998: 303) designated the fragments obtained by Frémont as the "holotype" (actually a lectotype). While his choice was unfortunate, the few fragments are not ambiguous; the typification must stand, and no epitype is necessary.



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Figure 37 *Psathyrotes annua* (Nutt.) A. Gray

- ⁴² Naval Lieutenant Charles Wilkes (1798–1877) was given the command of the United States Exploring Expedition in 1838, the American equivalent of the many, earlier around-the-world expeditions long-sponsored by European governments. Like the expeditions of England's James Cook (1728–1779), and especially the first abroad *HMS Endeavour* (1768–1770), the Wilkes Expedition included naturalists and artists for the sole purpose of collecting and documenting natural objects as well as naval personnel capable of carrying out the primary purpose of conducting detailed naval surveys (Henderson 1953; Tyler 1968; Barkan 1987; Philbrick 2003; Blumenthal 2009). Gray's 1854 summary of the botany of the Expedition only had a limited printing of 100 copies of which 21 were lost in a fire; a run of 150 copies was unofficially printed in New York (Stafleu & Cowan 1976: 991). A second report by Gray, issued in 1856, was composed of 100 plates, and again there were both official and unofficial printings.
- ⁴³ Carl ["Charles"] Andreas Geyer (1809–1853) was a German botanist who collected in the United States on the Mississippi and Missouri rivers from 1842 until 1843 mainly with Joseph Nicolas Nicollet (1786–1843). Nicollet, formerly a professor of mathematics and an astronomer in his native France before immigrating to the United States, was an ideal choice to make corrections to the already existing maps of the area. Geyer was personally employed by Nicollet and, without an explanation, Nicollet stated in his report that "owing to the loss of a case containing near one-half of my original collection" the summary given by Torrey (1843a) was limited (McKelvey 1955). Engelmann (1843) also comment on Geyer collections from Illinois and Missouri. Upon completion of his employment with Nicollet, Geyer went west, initially with Sir William Drummond Stewart in 1843 (Porter & Davenport 1963; Benemann 2012), gathering plants that made their way to Hooker who arranged for their sale and accounted for the new species (Hooker 1847, 1851, 1853, 1855, 1856). Geyer (1845–1846) wrote an account of his travels mainly in the West. Likewise, his activities, especially in the Pacific Northwest, were recorded in letters and journals written by others, which reveal a great deal about the temperament of the man, all of which is summarized not always in a kindly way by McKelvey.
- ⁴⁴ Curiously, the copy of the report now in the Mertz Library at the New York Botanical Garden is the later (1845b) printing. As several of Torrey's original volumes are now in private hands, the missing 1843 volume may well be one of those.
- ⁴⁵ The Mertz Library has a series of detached *Annual Reports of the Geological Survey of New York* published by Torrey including one in 1840 and another from 1849. Clinton published supplements in 1865 and 1866, as did Peck in 1867, with minor reports appearing regularly until 1913. There is also an 1848 paper by Lee on medicinal plants. No doubt several of these early papers were used by Torrey to compile his 1853 report.
- ⁴⁶ William Hemsley Emory (1811–1887) was a noted explorer mainly in Texas and later along the newly established border of the United States and Mexico (Norris et al. 1998). He was born of an established family of modest wealth in 1811 at Poplar Grove, an old estate in Queen Anne's County, Maryland, dating back to the 1660s (Goodheart 2008). Educated at West Point (he graduated in 1831), his early years in the army were uneventful until he began a career of mapping the United States border, first the Canadian (1844–1846) and then the Mexican (1848–1853). Although Emory went to California with Kearney, he was impressed by the vegetation and routinely collected plants not only then (Emory 1848) but later when he directed the United States and Mexican Boundary Survey (Emory 1858–1859; McKelvey 1955). Emory was forced to retire from the Army in 1876 and died in 1887.
- ⁴⁷ George Engelmann (1809–1884), German by birth but American throughout his professional career as a physician and botanist, resided in Saint Louis from 1835 onward except for a brief visit to his native country in 1840, where he married, and two additional voyages to Europe in 1857 and 1868 that were entirely botanical. His interest in botany began early and even his dissertation for his medical degree (Engelmann 1832) was more on botany than medicine. In 1842 he published his monograph on *Cuscuta* (revised in 1860) and began his study of the cacti, a group readily conceded to him by Torrey and Gray. It was only late in his life (1879) that Engelmann

actually went west mainly to continue his study of conifers (Engelmann 1880). For most of his botanical career, Engelmann was more commonly associated with Gray than Torrey. Also, he concentrated his efforts mainly on collections of plants made by fellow Germans in Texas and Mexico (Geiser 1937, 1948), and with various collectors in the Rocky Mountains (Ewan 1950; Isley 1994).



Source: BHL

Figure 38 View of the Santa Fe mission and Fort Marcy (background) by J W Abert

- ⁴⁸ James William Abert (1810–1897), the son of John James Abert (1788–1863) who was the head of the Corps of Topographical Engineers, joined the Corps in 1843 and was soon in the field on Frémont's third expedition and then, in 1846, with Kearney. Frémont assigned the task of completing the mandate of his third expedition to Abert, and in the process Abert collected natural history objects (Goetzman 1959). He did the same with Kearney (Abert 1848). For the published reports of both Frémont and Emory, Abert provide numerous illustrations (Fig. 38) and after the Civil War and his retirement from the U.S. Army, he taught drawing at the University of Missouri.
- ⁴⁹ Lorenzo Sitgreaves (1810–1888), a graduate of West Point in 1832, was assigned to Virginia only to resign and study civil engineering so that when he rejoined the U.S. Army in 1838 he became a member of the Corps of Topographical Engineers, surveying the Canadian boundary (1839–1841) and then in Louisiana and Texas (1841–1842) before going to the main office of the Corps in Washington, D.C. His only major western expedition was the survey of the Zuñi River in 1851, although he was involved in the war with Mexico (1846–1848). In ill health, Sitgreaves served as a mustering officer during the Civil War, retiring from the Army in 1866.
- ⁵⁰ Samuel Washington Woodhouse (1821–1904) was a skilled physician and naturalist who was assigned in 1849 to survey the boundary of the Creek Nation with Lorenzo Sitgreaves in the Indian Territory of modern-day Oklahoma (Woodhouse 1992). Woodhouse was especially interested in birds and made numerous specimens that gradually made their way to ornithologists in Washington and Philadelphia. His botanical specimens were given to Torrey to evaluate. As the expedition's physician, he treated himself in 1851 when he was bitten by a rattlesnake and

later when wounded by an arrow in a skirmish with local Indians along the Colorado River (Woodhouse 2007). A small number of plants (e.g., *Picradeniopsis woodhousei*) and animals (e.g., *Bufo woodhousei*) were named in his honor. The Woodhouse scrub-jay (*Aphelocoma woodhousei*) ranges from the northern Great Basin to Sonora and Chihuahua in Mexico.

- ⁵¹ Randolph Barnes Marcy (1812–1887) was a graduate of West Point and spent his entire professional life as a military officer serving first in the so-called Black Hawk War of 1832 and in the war with Mexico in 1846. He was an officer on an expedition in 1857 to confront the Mormons of Utah. All of this first-hand experience in the West, including a perilous journal across the Rocky Mountains in the dead of winter in 1858, resulted in a book entitled *The Prairie Traveler* which, like Fremont's writings before him, became a well-known guide to the trails and dangers of crossing the deserts and mountains of the West. Most of his notable efforts were after his 1852 expedition to the headwaters of the Red River in Colorado that Pike had failed to locate in 1806. One of his officers was George B. McClellan, who later won fame as a general during the American Civil War and married Marcy's daughter, Ellen Mary, in 1860.
- ⁵² Ferdinand Jacob Lindheimer (1801–1879, Fig. 39) is one of the more remarkable characters on the botanical frontier of the American West, and especially in Texas (Lich 1996). Born in Frankfurt, Germany, and schooled at the University of Bonn, he was politically active on the losing side of a reform movement and consequently emigrated to the United States in 1834, settling briefly in New Orleans before moving into Texas and then into northern Mexico only to depart from there in late 1835 as the so-called Texas Revolution was starting. It seems that Lindheimer arrived one day after the Battle of San Jacinto (21 April 1836), in which Sam Houston (1793–1863) and his band of Texan colonists routed the Mexican forces led by General Antonio Lopez de Santa Anna (1794–1876) in a battle lasting just 18 minutes and that resulted in the death of more than 600 Mexican soldiers. Following the war, Lindheimer resigned from the army (in 1837) in response to a query by Engelmann, and after residing in St. Louis during the winter of 1839–1840, he took up the task of seriously collecting plants — an effort that was to last for the next 13 years — sending specimens to Engelmann, Asa Gray, and even to botanists (via the sale of his large sets of specimens) in Europe, the most notable being G. H. Adolf Scheele (1808–1864) who published several new species in an 1849 issue of the journal *Linnaea*.



Source: Wikimedia Commons

Figure 39 *Oenothera lindheimeri* (Engelm. & A. Gray) W.L. Wagner & Hoch

- ⁵³ Joseph Henry (1797–1878) was a founding member of the National Institute for the Promotion of Science which was organized in Washington, D.C., in 1840 and, as an organization, served as the precursor to the Smithsonian Institution which was founded in 1846. As a member of the Institute, Henry, then at Princeton, urged that this organization house the natural history collections made by Charles Wilkes and others during the United States Exploring Expedition, an around-the-world expedition that lasted from 1838 until 1842. Although funding for a national museum was provided to the United States via the will of James Smithson (1765–1829), the some \$500,000 was the subject of a prolonged and often bitter partisan debate in Congress as to what was meant by Smithson's request that the money be used "for the increase and diffusion of knowledge" (Ewing 2007). As the Smithsonian Institution's first Secretary, Henry established the focus of the organization as the nation's leading scientific center and repository for all government-sponsored collections. Henry served as Secretary until his death (Moyer 1997).
- ⁵⁴ Spencer Fullerton Baird (1823–1887), like John Torrey in botany, basically ruled zoology in terms of the collecting and naming of animals found in the United States, and especially those gathered on federally sponsored expeditions. Torrey knew Baird as a student at the College of Physicians and Surgeon. When Baird left Dickerson College and went to the Smithsonian in 1850, he reportedly brought two box-cars of books and specimens, thereby strengthening the Institution's scientific holdings; by the time he died, the Smithsonian had more than two million items largely due to Baird's efforts (Ripley 1971). Baird was the Institution's first curator and, starting in 1878, its second Secretary. Baird had a broad interest in natural history but is best known for his book *A History of North American Birds*, published in 1874, although his works on fishes were equally important. As the first U.S. Commissioner of Fisheries (starting in 1871) he did much to promote sound fisheries practices as well as to oversee the establishment of a marine biology laboratory at Woods Hole in Massachusetts (Rivinus & Youssef 1992).
- ⁵⁵ James Hall (1811–1898) was an early paleontologist in the United States (Clarke 1923). Educated at the Rensselaer Polytechnic Institute in Troy, New York, where one of his professors was Torrey's own early mentor, Amos Eaton. Hall's work with the New York survey, started in 1836, ultimately resulted in his appointment as the State's paleontologist. It was at this time, too, that Hall studied the stratigraphy of New York and established the modern nomenclatural practices for defining, naming, and classifying strata. After working in such states as Iowa and Wisconsin, he returned to New York in 1866 and became director of the New York State Museum of Natural History. Through Torrey, Hall was able to examine a multitude of fossils obtained on the various western North American expeditions. He was a founding member of the National Academy of Sciences and the first president of the Geological Society of America.
- ⁵⁶ Arthur Carl Victor Schott (1814–1875), German by birth, gathered plants not only on the Mexican Boundary Survey but also in Brazil, Colombia, and Mexico. On the Survey, Schott gathered not only plants and animals but drew many of the illustrations that went into Emory's report. Some of his most elegant illustrations were those of the Native Americans encountered in Texas and the Southwest (see Fig. 29, above).
- ⁵⁷ Charles Christopher Parry (1823–1890) would have a continuing role for much of the last three decades of Torrey's life. Born in England, his family moved to the United States in 1832 and settled in New York City where, in time, young Parry studied botany with Torrey in pursuit of a degree in medicine, which he received in 1846. He moved to Davenport, Iowa, in 1843, and in 1847 Parry became a member of a geological survey group for Iowa. He then accepted the position of botanist and surgeon on the United States and Mexican Boundary Survey, which lasted from 1849 until 1853. His experience on the Boundary Survey established Parry's reputation as a skilled botanist and because of his association with Torrey and Gray he was able to travel each summer almost yearly to collect plants in the West, especially in Colorado, Utah, and California. For three years (1869–1871) Parry was the first botanist for the U.S. Department of Agriculture to serve at the Smithsonian Institution. Numerous plants were named for Parry, and it was he who named Gray Peak and Torrey Peak in the Colorado Rocky Mountains for his

two botanical mentors. His 1883 paper on early botanical collections along the Pacific Ocean is most informative, although now somewhat dated. The primary source of information on Parry is a 1997 book by W.A. Weber.

⁵⁸ The bibliographic problems associated with the railroad reports have been discussed at length by Johnston (1943) and by McKelvey (1959). Most of the botanical reports were prepared by Torrey (1856, 1857a, b, c), Torrey and Gray (1857a, b), or, at the end, by Gray (1860) alone, with additional essays by others. John Milton Bigelow (1804–1878) was the surgeon-naturalist for the Amiel Weeks Whipple (1818–1863; Fig. 40) expedition in 1853 and 1854; Bigelow published two reports in 1857, with the cacti treated jointly by himself and Engelmann. John Strong Newberry (1822–1892), eventually the chair of the geology department at Columbia College (1866–1890), was also a friend of Torrey's. Both Torrey and Gray assisted Newberry in his 1857 report. William Starling Sullivant (1803–1873) concentrated on mosses and liverworts (Sullivant 1857), and Edward Tuckerman (1817–1886) contributed the lichens (Stafleu & Cowan 1986: 524). Elias Magliore Durand (1794–1873), a French botanist associated with the Academy of Natural Sciences of Philadelphia, and Theodore Charles Hilgard (1828–1875), a physician and friend of George Engelmann, described the plants obtained by Adolphus L. Heermann (1818–1865; Fig. 41) in California in 1853 during the Williamson expedition. Heermann, a noted birder (Stone 1907), is best known for his ornithological discoveries (Beidleman 2006). The final contributions to the railroad reports were published in 1860 by Gray and by James Graham Cooper (1830–1902). Cooper, a military surgeon and naturalist, was an assistant to Baird and saw that the plants of the Pacific Northwest were catalogued even though Cooper's major contribution was a two-volume work on ornithology published in 1870 with Baird (Coan 1983; Beidleman l.c.).



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Figure 40 *Hesperoyucca whipplei* (Torr.) Baker

- ⁵⁹ Joseph Christmas Ives (1829–1868), initially an assistant to Whipple on the railroad surveys, was along the Colorado River in 1857 and 1858. The geologist John Newberry, who was associated with the newly established Smithsonian Institution, served Ives as his surgeon naturalist. The 1861 Ives report, with Gray and others, was one of Torrey's last contributions to the botany of a western expedition.



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Figure 41 *Eriogonum heermannii* Durand & Hilg var *sulcatum* (S. Watson) Munz & Reveal

- ⁶⁰ An online history of the Torrey Botanical Club is available online (Cooney 2000).
- ⁶¹ Nathaniel Lord Britton (1859–1934) was a founder and the first director of the New York Botanical Garden established in 1891. Britton and his colleagues at the Garden believed that a major focus of their research should be floristics. As a result Britton authored or co-authored floras of the northeastern United States (1888, 1889, 1896–1898, 1901, 1905b, 1907b, 1913), the Bahama Islands (1905a, 1905c, 1906, 1907a, 1918a, 1920), and Porto Rico and the Virgin Islands (1918b, 1923–1924, 1925–1930). Britton also felt botanists at the Garden should conduct monographic studies, so it was that Joseph Nelson Rose (1862–1928) and Britton published monographs on Crassulaceae (1903) and Cactaceae (1919–1923). Addison Brown (1830–1913), president of the Garden and co-author with Britton of *An Illustrated Flora of the Northern United States, Canada and the British Possessions*, formulated common names for the species recognized in this work. The accompanying *Manual of the Flora of the Northern States and Canada*, published in 1901, was not only designed to promote Britton and Brown's three-volume illustrated flora but to compete directly with Gray's *Manual*, then authored by Sereno Watson (1826–1892), Gray's successor at Harvard University, and by John Merle Coulter (1851–1928), president of Lake Forest University. Coulter later moved to New York and was involved in the establishment of the Boyce Thompson Institute for Plant Research (Rodgers 1944). A seventh edition of Gray's *Manual* was published by Benjamin Lincoln Robinson (1864–1935) and

Merritt Lyndon Fernald (1873–1950) in 1908. Britton and Brown revised their illustrated flora in 1913. The final acts in this regional competition happened in the 1950s. After decades of labor on a new *Manual of Botany*, Fernald published his revision in 1950, the book appearing just three months before he died. New York responded with Henry Allan Gleason's (1882–1975) *The New Britton and Brown Illustrated Flora* in 1952; this was followed a decade later by Gleason and Cronquist's *Manual* in 1963 (revised in 1991) which was subsequently augmented by illustrations (Holmgren 1998). Gleason, known primarily as an ecologist (McIntosh 1975; Nicolson 1990; Nicolson & McIntosh 2002), came to the Garden in 1919 and in the 1930s moved into taxonomy and worked mainly in South America (Smith 1951; Cronquist 1976; see also his unpublished "The short and simple annals of Henry A. Gleason" in the Archives at the Garden) before concentrating on a new Britton and Brown flora.

⁶² John Kunkel Small (1869–1938) became curator of Torrey's herbarium at Columbia College in 1895, but with the herbarium's transfer to the New York Botanical Garden in 1898, he began his 40-year career with the Garden (Barnhart 1935, 1938). A prolific author of some 450 published papers (see Stafleu and Cowan 1985: 650, for a sample) and a botanical collector of over 60,000 specimens, Small contributed significantly to the growth of the Garden. His work on Polygonaceae was monographic (Small 1895, 1898, 1906). He is best known for his flora of the southeastern United States (Small 1903, 1913, 1933). In 1918, the illustrator Mary Emily Eaton (1873–1961) traveled with him, and her efforts are preserved in the Library at the The Natural History Museum in London, the National Geographic Society, New York Botanical Garden, and the Smithsonian Institution (Mitich 2000). Small published a number of individual papers in 1925 and in 1927 on *Iris* in the journal *Adansonia*, with each species illustrated by a color plate; the original art work is at the New York Botanical Garden (Small & Alexander 1931).

⁶³ For western botanists, Per Axel Rydberg (1860–1931) is synonymous with a period of proliferation of private journals, scientific names, and a power struggle to control systematic botany in the United States (Reveal 1991; Reveal & Pringle 1993; Tiehm & Stafleu 1990). Publication of new American plant names was controlled by Torrey until 1861, when the task fell to Gray. Watson and Robinson attempted to maintain dominance after Gray's death in 1888, but by then western rebels were wresting control of their own material. Prior to this, either all new plants went to Torrey and Gray to be named or they assigned others to name them. Thus, few new species were proposed during the period from 1830 until 1888 without the expressed approval of Torrey or Gray. For western botanists, now residing at a growing number of land grant colleges, the mere idea that Gray had to approve any new species before it could be published was an anathema. John Coulter assumed this role for papers published in the *Botanical Gazette* in 1875; Nathaniel Britton did the same for the *Bulletin of the Torrey Botanical Club* when he became editor. Authors were required to send specimens along with their papers, and only once the plants were deemed to be worthy of a name would these editors allow a paper be published. Floristic work was also controlled, albeit to a lesser degree, by the Smithsonian Institution.

Two early rebels were Edward Lee Greene (1843–1915), who began *Pittoma* in 1887, and Marcus Eugene Jones (1852–1934), who published *Contributions to Western Botany* starting in 1902 (Welsh 1982; Lenz 1986). Willis Linn Jepson (1867–1946) edited *Erythea* from 1893 until 1922. *Zoe*, a journal published in San Francisco by the Zoe Publishing Company starting in 1890, was the creation of Townshend Stith Brandegee (1843–1925) and his wife Mary Katherine [Lane, Curran] Brandegee (1844–1920). Even Rydberg attempted to control who and what was published, especially in the *Bulletin of the Torrey Botanical Club*, well into the 1920s.

Rydberg was a "splitter." His monographic and floristic efforts were considerable (Stafleu & Cowan 1983: 1014) during his tenure at the Garden (1906–1931). His most noteworthy were *Catalogue of a Flora of Montana* (1900), *Flora of Colorado* (1906), *Flora of the Rocky Mountains* (1917, 1923), and *Flora of the Prairies and Plains of Central North America* (1932). His monographic work on *Astragalus* and on Rosaceae were all published in the *Bulletin of the Torrey Botanical Club*.⁶⁴ Arthur John Cronquist (1919–1992) was one of the foremost

taxonomist of the twentieth century to be associated with the New York Botanical Garden in fulfilling Britton's mandate for monographic and floristic research (Barkley 1992, 1996, Ertter 1993, Takhtajan 1996) He came to the Garden in 1943 and remained until 1946 only to return in 1952 Over his last 40 years he was actively involved in floristics, first with Gleason, then with Charles Leo "Hitchy" Hitchcock (1902-1986) and Francis Marion Ownbey (1910-1974) on an illustrated flora for the Pacific Northwest (Hitchcock et al. 1955-1969, Hitchcock & Cronquist 1973) and finally the *Intermountain Flora*, an eight-volume work that was first published in 1972 Cronquist published treatments in six of the volumes (with one by Rupert Charles Barneby [1911-2000]) The last volume was completed in 2012 by Noel H. Holmgren, Patricia K. Holmgren (Fig. 42), and myself in collaboration with others Globally, Cronquist is best known for his popular textbooks (1961, 1971, 1973, 1982), a work on plant geography with Gleason (1964), and most of all for his summaries on the classification of flowering plants (1968, 1981, 1988)



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Figure 42 *Chamernion angustifolium* (L.) Holub
var. *canescens* (A.W. Wood) N.H. Holmgren & P.K. Holmgren

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Figure 43. *Ipomoea leptophylla* Torr.

The type of *Ipomoea leptophylla* was gathered by Frémont on 22 July 1842, most likely near present-day Glendo, Platte County, Wyoming. The above was photographed 170 years later (in 2012) along the Oregon Trail near Fort Laramie in Goshen County, Wyoming.