Viburnum rafinesqueanum—to a teenaged boy in Manitoba beginning to learn the scientific names of plants, this moniker stood out. Poa pratensis? Meadow grass or Kentucky bluegrass (pratensis = “of a meadow”). Caltha palustris? Marsh marigold (palustris = “of a marsh”). Aquilegia canadensis? Canada columbine or red columbine. Viburnum rafinesqueanum? Here was a mess of near-impenetrable letters, a poetic delight to my ears when recited, which I soon learned honored a man named Rafinesque. A few years later in a floristics lecture, the good-natured eye-rolling reaction of the professor to my question about Rafinesque started a broader curiosity about the man.

Constantine Samuel Rafinesque was among the great American naturalists of the nineteenth century. He was also among the most controversial and eccentric natural history personalities of his time. In the course of four decades, he offended nearly every establishment botanist in the United States, leading to a disdain that persisted among these botanists and succeeding generations of their students. As one result, his contributions to botany and other natural history sciences were downplayed or ignored for many decades beyond his death in 1840. His reputation has been mended somewhat since the mid-nineteenth century, as those he interacted directly with passed away and several twentieth-century historians critically examined his life and work. What emerges is that the man was a flawed genius, whose inability to work within the bounds of scientific convention necessarily led to lower recognition than he would otherwise have deserved.
To immediately give an idea of Rafinesque and aspects of his personality, it is perhaps best to learn of his many roles in his own words:

“Versatility of talents and of professions, is not uncommon in America; but those which I have exhibited in these few pages, may appear to exceed belief; it is a positive fact that in knowledge, I have been a Botanist, Naturalist, Geologist, Geographer, Historian, Poet, Philosopher, Philologist, Economist, Philanthropist … By profession, a Traveller, Merchant, Manufacturer, Collector, Improver, Professor, Teacher, Surveyor, Draftsman, Architect, Engineer, Pulmist [one who treats pulmonary diseases], Author, Editor, Bookseller, Library, Secretary … and I hardly know myself what I may not become as yet: since whenever I apply myself to any thing, which I like, I never fail to succeed if depending on me alone, unless impeded and prevent by lack of means, or the hostility of the foes of mankind.”

RAFINESQUE’S LIFE

Rafinesque was Turkish-born to a French father and a mother of German descent on October 22, 1783. He was reared in Marseilles, France, by his mother and his father’s family; his father was a merchant trader who spent much time abroad. In 1792, his family fled to Italy to escape the French Revolution. A year later, his father died during a yellow fever epidemic in Philadelphia. Rafinesque returned to France in 1797, where he remained until 1802.

At the age of 19, he landed in Philadelphia for three years, where his passion for botanizing the United States started immediately. He asserted that the brassicaceous Draba verna L. he picked up after stepping off the ship was a new species, as he generally believed that American counterparts of well-known European species could not be the same species. It is also in Philadelphia where he began to write books and papers. In 1805, he returned to Italy where he resided for a decade (occasionally living under the name Constantine Samuel Rafinesque Schmaltz, in order to avoid anti-French sentiment). Here, he married in 1809, had a daughter born in 1811 and an infant son who perished in 1814. A return to the United States was made in 1815, though the boat he was traveling on was ship-wrecked off Long Island and he lost much of his collections and notes. Rafinesque lived in New York for three years, and helped to found the Lyceum of Natural History of New York. In 1818, a brief residence of under two years was made in Philadelphia, before undertaking a posting as Professor of Natural History at Transylvania University in Lexington, Kentucky, from 1819 to 1826. Post-professorship, he returned to Philadelphia for the remainder of his life. On September 18, 1840, he died of stomach cancer.

TAXONOMIC CONTROVERSIES

Botanist, taxonomic scholar, and former director of the Arnold Arboretum Elmer Drew Merrill completed the voluminous Index Rafinesquianus in 1949 wherein he attempted the Herculean task of compiling the botanical work
of Rafinesque. Merrill seems to be ultimately sympathetic to Rafinesque, declaring:

“It is doubted if in the entire history of descriptive biology there is any other author who has suffered more from the weight of authority than Rafinesque. The leading biologists of his time, both in Europe and in America, ignored his numerous nomenclatural proposals to an extraordinary degree, whether he was correct in his conclusions or not.”

However, from the perspective of a taxonomist, Merrill also states:

“After years of effort devoted in part to a consideration of the unending series of problems in botany alone, raised by Rafinesque’s work, my frank conclusion is that in taxonomy and nomenclature we would have been infinitely better off today had Rafinesque never written or published anything appertaining to the subject.”

How did Rafinesque engender such a conclusion? The answer begins with the nomenclatural system developed by Carl Linnaeus, the father of modern taxonomy. Prior to Linnaeus, the names of species were descriptive Latin polynomials (i.e., multiple words were used as a name). Linnaeus simplified this system to the consistent use of binomials, with the first word representing the genus or group (e.g., *Acer*, the maples) and the second representing the specific epithet (e.g., *rubrum*, or red). Combined with the author who first (validly) published the name, a species name is created, for example, *Acer rubrum* L. (L. is an abbreviation for Linnaeus). Linnaeus’s system quickly became adopted by other scientists and remains in widespread use today.

A later addition to the Linnaean system was the concept of type specimens. The underlying idea of type specimens is that a name (an abstract notion) must be connected to a physical object, which provides an example of the taxon. Most often this type specimen is a dried herbarium specimen, but it can also be an illustration. Type specimens provide taxonomists with a way to re-examine the specimens that led to the establishment of a new species or presently define a species (in instances where a species was named prior to the concept of typification or where the type specimen was lost.
due to fire or other disasters), a nod to the principle of reproducibility in the scientific method.

An additional, and critical, concept to understanding the controversy surrounding Rafinesque is that the Linnaean system makes no attempt to define the boundaries of taxa. Though a hierarchical framework is provided, the questions of “What is a species?” or “What constitutes a genus?” are left to the determination of taxonomists. This leeway gives the taxonomist much latitude in determining what might constitute a taxon. If the taxonomist errs on making too broad of a definition (i.e., “lumps” too much variability within a taxon), it increases the likelihood that her or his work will be revised by the next taxonomist to examine the taxon. Similarly, if the taxonomist errs on making too narrow of a definition (i.e., “splits” a group into separate taxa based on too little variability), the likelihood of revisi-

The genus *Lomatium* was proposed in 1819. It did not see much use for the next century, as critics declared it too close to the name *Lomatia* R. Br. (Proteaceae). Coulter and Rose briefly adopted it in a 1900 monograph of the Umbelliferae, but it didn’t see widespread use until 1920 when Macbrie pointed out that, according to the rules of botanical nomenclature, it was a valid generic name despite the similarity to *Lomatia*. Seen here, *Lomatium brandegeei* (Coult. & Rose) J.F. Macbr. is native to British Columbia and Washington.

*Parnassia glauca* was one of a number of species published posthumously in 1840, in Rafinesque’s *Autikon Botanikon.*
An accurate, stable, and useful representation of taxa is the goal, though "lumpers" and "splitters" disagree on how best to reach that ideal.

Finally, it is also necessary to know the nomenclatural concept of "priority." Priority is the principle that the first valid publication of a name for a taxon establishes the name when that taxonomic entity is recognized. At its most basic application, this idea resolves which name should take precedence when multiple names for a taxon have been published. In the modern age with peer review, ready access to a significant amount of published literature, and digitized herbarium specimens, it is an infrequent occurrence for a taxonomist to rename an already-named taxon. In the early nineteenth century in the United States, however, communication about newly described species (of which there were many) was difficult and only readily accessed in major centers. Different authors contemporaneously giving separate names to the same taxon was a frequent occurrence, which later taxonomists resolved using the principle of priority.

The controversy surrounding the botanical work of Rafinesque was in large part a matter of his flooding the published literature with names, sometimes accompanied by poor descriptions. Often, it was claimed (and sometimes rightly so) that he did not need to see a specimen to ascribe it a new name. He was a splitter without equal:

"Altho’ this attempt may astonish or perplex some timid Botanists, my labors will be duly appreciated ere long, and my increasing efforts to improve the science meet with a kind reception from the new improving school. The axiom that a multiplication of names enlarges our ideas, holds true in all cases and sciences, since they are based on facts or mental entities. Some Linneists have vainly tried to discredit on generic
reform, and called us Genera-mongers. We may in return call them Genera-shufflers, who want to squeeze plants into improper genera, and delay improvements by opposing the corrections of botanical blunders. It is to them that we owe the superfluity of synonyms: they often shuffle plants into 3 or 4 Genera, as Linnaeus did for *Heliopsis*, until it must at last form a Genus of itself. It is a fact that almost all plants of doubtful Genera, are types of peculiar ones; the chances of it increase, as they are shifted."

With the establishment of the Linnaean system and the publication of *Species Plantarum* as the nomenclatural benchmark, Linnaeus is credited with the valid publication of a large number of genera and species. Linnaeus described about 1,440 genera, and most of these names are still in use today. By contrast, the splitter Rafinesque described approximately 2,700 genera—of these, no more than 50 or 60 are applied to recognized genera today (yet, had priority been applied, he would be credited with at least 160). Linnaeus also generated almost 9,000 binomials (species names), and again, the large majority of these are in use today. Rafinesque did not quite match Linnaeus in this category. Of the 6,700 or so species names published by Rafinesque, fewer than 300 are generally accepted.

Rafinesque's proclivity to deem the most minor variations as new species (and sometimes new genera) created work—much more work—for anyone who later attempted to publish a new species, write a monograph, or clarify names in a taxon. To give an example, *Clintonia* is a genus named by Rafinesque (and still recognized today). Before Rafinesque erected a new genus for this group in 1832, its species were variously recognized as being in *Dracaena* (the first published name was in 1789), *Convalaria*, and *Smilacina*. According to The Plant List (drawing on information from the World Checklist of Selected Plant Families), 41 names have been published within *Clintonia* (the actual number is likely higher). Working with a dataset of 35 names of "High Confidence Level" ("applied to the status of name records derived from taxonomic datasets which treat the whole of the taxonomic group in question on a global basis and have been peer reviewed"), 30 are at the species rank (5 below the species level). Five of the species names are confidently recognized as "Accepted" species, and a single name for a recently described (1993) Asian species remains unresolved. The remaining 24 names are listed as synonyms, i.e., names that are considered to be already represented within the concept of a different name. Of these 24 synonyms, 19 were published by Rafinesque. Examples of species recognized by Rafinesque but generally regarded as minor variations within *Clintonia uniflora* (Sol.) Raf. include *Clintonia angustifolia* Raf. (a narrow-leaved entity), *Clintonia biflora* Raf. (a two-flowered entity), and *Clintonia ciliata* Raf. (presumably with fine hairs along the margins of an organ like a leaf or petal).

If a taxonomist were to discover what she/he believes to be a new species of *Clintonia*, the taxonomic work involved would require at a minimum comparing it against the type specimens of other members of the genus and reviewing the taxonomic literature to ensure a previously published name and description (including all synonyms) does not conform to the purported new species. In practice, the taxonomist would further compare it against additional specimens of each species in order to properly account for variation within each species. In order to name a new species in *Clintonia*, the work required would involve reviewing all of Rafinesque’s names and descriptions to determine if he had named the entity first. For a relatively simple group of species like *Clintonia* (5 accepted species), the task would be difficult in modern times, and very difficult at the time of Rafinesque. For more taxonomically complicated genera, like *Trillium*, Rafinesque made the difficult near-impossible. There are about 38 recognized species of *Trillium* in North America, with more than two-thirds of these from eastern North America. Rafinesque is presently responsible for 3 of these accepted names, though he described an additional 31 species and 67 varieties.

This onslaught of published names of additional genera and species in many eastern North American plant groups, sometimes poorly described, was not well received. Amos Eaton, a botanist and author of the 1817 *Manual of Botany for the Northern States*, was generally
Four of the five recognized species of Clintonia, clockwise from above: Clintonia borealis (Sol.) Raf., the type species of the genus erected by Rafinesque in 1832; Clintonia umbellulata (Michx.) Morong, first named by Michaux as Convallaria umbellulata in 1803, then eventually transferred by Morong into Clintonia in 1894 after residing in a number of other genera; Clintonia uniflora (Menzies ex Schult. & Schult. f.) Kunth, transferred into Clintonia by Kunth in 1850; and Clintonia andrewsiana Torr., first described and published in 1857 after Rafinesque’s proposal of Clintonia became generally accepted.
sympathetic to Rafinesque and considered him a friend. However, in 1817, he wrote to his student John Torrey:

“I am glad Mr. Rafinesque has not set you all wild. Why can not he give up that foolish European foolery, which leads him to treat Americans like half-taught school boys? He may be assured, he will never succeed in this way. His new names with which he is overwhelming the science will meet with universal contempt.”

Eaton accurately predicted the ultimate approach by much of the botanical establishment—ignore much of Rafinesque’s work, to the extent that the principle of priority was overridden in many cases to exclude Rafinesque’s contributions.

Asa Gray, the pre-eminent American botanist of the nineteenth century, contributed to the practice of discounting Rafinesque. Though he was charitable towards Rafinesque’s earlier work, Gray’s influence cemented the rejection of Rafinesque’s ideas about new genera and species when he wrote the following about Rafinesque after his death:

“Many of Rafinesque’s names should have been adopted; some as a matter of courtesy, and others in accordance with the strict rule… One who, like Rafinesque, followed the easy rule of founding new genera upon all these species, could not fail to make now and then an excellent hit; but as he very seldom knew the plants themselves, he was unable to characterize his proposed genera, or to advance our knowledge respecting them in the slightest degree. In his later publications, this practice is carried to so absurd an extent as entirely to defeat its object … A gradual deterioration will be observed in Rafinesque’s botanical writings from 1819 to about 1830, when the passion for establishing new genera and species, appears to have become a complete monomania”.

**ON EVOLUTION**

Another area where Rafinesque generated controversy was in his ideas about how species and genera were formed. One of the reasons Rafinesque named so many species and genera was because (in his own words, from 1832), “The truth is that Species and perhaps Genera also, are forming in organized beings by gradual deviations of shapes, forms and organs, taking place in the lapse of time,” and that “every variety is a deviation which becomes a species as soon as it is permanent by reproduction.”

Rafinesque’s ideas were informed by Adanson from 1763, to whom he gives credit:

“Adanson … was like Linnaeus, Necker and myself [in fact like all acute observers] a strenuous supporter of the doctrine that Species were unlimited, and increasing by the natural process of semination, deviation, variation, hybridization and such. Whence he concluded that we could hardly ascertain the primitive types of species, that many known to ancient Botanists were lost or no longer found, while new ones were evolved in mountains, groves, fields, and gardens.”
To give context, the dogma of the time was that species were fixed entities, unchanging. Nearly all of Rafinesque’s contemporaries used Rafinesque’s descriptions of evolutionary trees and the formation of new genera and species as proof that his ideas in all areas (including taxonomy) were to be shunned. Gray also made note of this in his obituary of Rafinesque, reminding others of how Rafinesque strayed from the dogma of the time:

“According to his principles, this business of establishing new genera and species will be endless; for he insists, in his later works particularly, that both new species and new genera are continually produced by the deviation of existing forms, which at length give rise to new species.”


**RAFINESQUE’S LEGACY**

Upon Rafinesque’s death, his belongings were junked or sold, including his plant collections and some of the over one thousand papers and books he authored. He died a pauper, with the money generated from the sale of his belongings not even covering the cost of his burial.

Proof of Rafinesque’s genius resides in the 160 or so genera he would have established had the principles of priority been followed. That he would have surpassed ten percent of Linnaeus’s total named genera, in a country that had already been relatively well explored, is testament to his keen observational skills and botanical acumen. Had he more credibility with his peers, his ideas on the formation of new genera and species may have invited additional exploration from other brilliant biological minds of the time, perhaps advancing the science of evolutionary biology by decades. Historians continue to mend his reputation, such that one of Rafinesque’s statements seems prophetic: “Time renders justice to all at last.”

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