

Darwin's historical sketch – an American predecessor: C. S. Rafinesque

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ABSTRACT: When early reviewers of Darwin's *On the origin of species* chided him for neglecting to mention predecessors to his theory of evolution, he added an "historical sketch" in later editions. Among the predecessors he cited was a French émigré to America named Constantine Samuel Rafinesque, who in the mid-1830s had written about the emergence of new species at a time when most naturalists (including Darwin initially) accepted the biblical story of creation and assumed the immutability of species. Rafinesque discovered and named thousands of new plants and animals in his American travels and flooded the taxonomic literature with reports, which seemed incomplete, confusing, and excessive to other naturalists. He alienated many who later dismissed his findings and excluded them from the biological literature. Soon after Rafinesque's death in 1840, Asa Gray, the young American botanist, wrote a damning critique of his work and suggested it be ignored. How Darwin learned of Rafinesque and his views on species is the focus of this essay, which also mentions briefly the two other American naturalists cited by Darwin in his sketch. Gray seems the likely informant through his correspondence with Darwin or his close associates.

KEY WORDS: Asa Gray – evolution – *On the origin of species* – naturalists – species – taxonomy.

INTRODUCTION

The bicentenary in 2009 of Charles Darwin's birth was an occasion to recall those naturalists who anticipated aspects of his theory of evolution. That theory has two principal parts – first, the continued emergence of new species and second, their survival and perpetuation by natural selection. This essay concerns an early advocate of the first part. Up through the first half of the nineteenth century most biologists (including Darwin initially) held to the biblical belief in the divine creation of the world and the immutability of species. However, a few skeptics began challenging this dogma, including eventually Darwin who, however, made no mention of such beliefs in the first two editions of *On the origin of species* (Darwin 1859, 1860a). Soon after its publication several critics chided him for not acknowledging the predecessors of his theory. So in the first American edition (Darwin 1860b) he added a "preface", which was entitled an "historical sketch" in the third English edition (Darwin 1861) and in all later ones.

In the preface of the 1860 American edition, Darwin discussed a dozen predecessors in some detail. The number was expanded to a score in the sixth English edition (Darwin 1872), which is the one frequently cited. In the third English edition, Darwin (1861) first included a quotation by Constantine Samuel Rafinesque, who in 1836 had written, "All species might have been varieties once, and many varieties are gradually becoming species by assuming constant and peculiar character" (Rafinesque 1836a: 6). Rafinesque was a French émigré to

the United States who botanized extensively in the eastern states during the early 1800s but was reviled and rejected by American naturalists during his later life. He is the one predecessor whose name is almost totally absent from the immense Darwinian literature.¹

A BRIEF BIOGRAPHY OF RAFINESQUE (1783–1840)

Constantine Samuel Rafinesque grew up in southern France and Italy, had neither a formal university education nor any scientific training, but was largely self-taught in natural history. He first came to the United States in 1802 and for several years explored in the north-eastern coastal states, studying there mainly the local flora. He corresponded briefly with President Thomas Jefferson on botanical matters, returned to southern Europe in 1805, and for a decade botanized extensively in Sicily, publishing reports in Italian and French. Between 1810 and 1812 five papers of his were entered in the Linnean Society of London's "Register of Papers read" (Boewe 2003: 359, note 17). In 1815 he took up permanent residence in the United States and traveled widely over the north-eastern states and later the Ohio River valley region. From 1819 to 1826 he was Professor of Botany and Natural History of Transylvania University in Lexington, Kentucky.²

Throughout his career Rafinesque criticized the Linnaean system of taxonomy, which involved classifying plants primarily on the basis of their sexual parts. He wrote that he had "always been opposed to the Linnaean system and its blunders" (Rafinesque 1836a: 19) and had favored "les méthodes en simples, naturelles et analytiques" (Rafinesque 1814a: 8). The natural system of botanical classification (later associated with French taxonomists) was developed by Ray, Tournefort, and Jussieu, who grouped plants together based on various structural similarities (Scharf 2009: 73–79).

Rafinesque was a passionate systematist and namer, who devised ten classes each for plants and animals and established 50 fundamental rules for nomenclature (Rafinesque 1814b). He had an insatiable urge to explore, collect, identify, and publish his findings, thus gaining priority of discovery. It was estimated that during his early decades in the United States he traveled over 8,000 miles in 14 eastern and mid-western states. He walked across the Appalachian Mountains five times, preferring to go by foot rather than ride, since this put him closer to any new plants and animals to be found along the way. He visited with the artist-naturalist John James Audubon in Kentucky. Rafinesque coined 2,700 generic and 6,700 species names for new plants and wrote a dozen works on botanical taxonomy. About one fourth of his genera are unlisted in the standard indexes. In zoology his most valuable contribution was his identification and classification of fish and mollusks of the Ohio River (Rafinesque 1820). Of interest to nineteenth-century American physicians was his most successful book, *Medical flora and botany of the United States* in two volumes (Rafinesque 1828, 1830), which described over 600 medicinal plants.

Rafinesque left Lexington in 1826, rejected by most of his conservative colleagues at Transylvania University, and moved to Philadelphia, where he continued to write on taxonomy and later pursued many other subjects. He penned around 800 works (books and articles) on astronomy, geology, mineralogy, archaeology, anthropology, philology, ancient Mayan hieroglyphics, consumption (for which he developed a presumed herbal cure), financing and banking, a utopian community, and the Hebrew Bible. He engaged in various botanical, medical, and commercial ventures which yielded funds for publishing at his own expense 18 books between 1830 and 1840. He received several impressive sounding foreign

honors but never obtained another university professorship. He read Darwin's *Journal of researches into the geology and natural history of the various countries visited by H. M. S. Beagle* (1839) and relished the voyage vicariously. Rafinesque died of stomach cancer on 18 September 1840, at age 57 – dismissed by most American naturalists for reasons described below.

THE OSTRACISM OF RAFINESQUE

During the eighteenth and early nineteenth centuries classification had become a dominant concern of naturalists because they were inundated by discoveries of new plants and animals in the Americas, Siberia, south-east Asia, and Africa – all of which needed newly devised, universally accepted scientific names. Rafinesque was one of the many field taxonomists who contributed to this deluge. In July 1818 while exploring in the Ohio River valley he claimed “the total of New Animals discovered this year by me is 581 ! Of Plants 125 !” (Boewe 2003: 117). During this same month he wrote to a botanist at the Academy of Natural Sciences of Philadelphia that within a two-month period he had found 20 new species of plants among the 600 collected, had catalogued 60 species of fossils and 26 of fish in the Ohio River (“23 are new”), and had identified ten new species of bats and ten new species of rats or mice (Pennell 2003: 10–12). His discoveries of new plants and animals prompted the flood of binomials in reports he sent to journals. His taxonomic submissions seemed unrelenting to one American editor, who finally refused to accept any more of his papers.

Taxonomy was then a highly competitive field as naturalists vied with one another devising Linnaean names for their new finds, thus getting themselves known professionally. By custom, the species name officially recognized was the one appearing first in the scientific literature. Rafinesque coined the names of so many new plants and animals and was obliged to publish them in so many often obscure places that other taxonomists found it difficult to search all the literature in order to verify by negative results the priority of their own discoveries. Rafinesque's responsibility for this problem plus his hasty descriptions of his finds, his occasional errors in taxonomy, his intemperate criticism of other biologists, and his explicit belief in newly evolving species (an heretical notion then) caused many naturalists of the period to ridicule him and others simply to ignore him.

The hostility of his American colleagues was conveyed mainly in the private world of letters. They provided an invaluable source of scientific information but also of personal gossip, as witnessed by the extensive correspondence of Darwin, Charles Lyell, Joseph Hooker, and others to be quoted later. Critical or spiteful comments about Rafinesque were frequently passed among American biologists.³ They termed him, for example, “that rattle headed genius”, a rogue, “a literary madman”, deranged, “a most bare-face liar”, and “an unprincipled charlatan” (Boewe 2003: 144–145; Pennell 2003: 172–173). Collectively, these writers belittled his taxonomic contributions in their correspondence and omitted references to them in their publications.

A more public indictment was issued by a rising young American naturalist, Asa Gray (1810–1888), soon after Rafinesque's death.⁴ In early 1841 Gray examined all the papers of Rafinesque which he could find and presented a thorough review of them in the *American journal of science*. He characterized Rafinesque as “an author . . . greatly in advance of the other writers on the botany of this country . . . [and] a botanist of unusual promise” but

whose defects in his later years “have caused even his early writings to be in a great measure disregarded” (Gray 1841: 221, 230–231). Gray (1841: 237) concluded his damning critique by noting a “gradual deterioration . . . 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*. This is the most charitable supposition we can entertain . . . [No consideration] whatever is due to his subsequent works.”

RAFINESQUE ON “DEVIATION OF SPECIES”

In numerous works published in America during the 1830s, Rafinesque wrote about deviation or mutations of species as if the notion were a common, self-evident belief. He advanced these ideas during the period when Darwin was circumnavigating the world (1831–1836) and was only then beginning to question the biblical story of creation. Four examples of Rafinesque’s writings about emerging species may be given.

Darwin (1861: xv) included two excerpts from Rafinesque’s *New flora and botany of North America* in one sentence: “‘All species might have been varieties once, and many varieties are gradually becoming species by assuming constant and peculiar characters:’ but further on (p. 18) he [Rafinesque] added, ‘except the original types or ancestors of the genus.’” The initial part of the quotation is from page 6 of the *New flora* and the latter part from page 18. Elsewhere in *New flora*, Rafinesque (1836a: 17) repeated this theme: “our species and genera are not quite permanent as supposed, but are gradually producing deviations of forms.”

In *Flora telluriana pars prima*, Rafinesque (1836b: 13–14) wrote the following: “Plants vary gradually, in features, aspect [*sic*], size, color &c. by a natural spontaneous deviation from seedlings. . . . These deviations may gradually form distinct varieties, next Breeds, at last becoming separate Species. . . . Therefore many of our actual or newly described Genera and Species, may be of recent origine [*sic*]” Many pages later, he declared, “Nature in the spontaneous evolution of vegetation, baffles all our petty incongruities by making new Species out of varieties, and new Genera out of floral deviations! . . .” (Rafinesque 1836b: 42). And much later in the same book, Rafinesque (1836b: 98) added, “Many of our admitted Species are in fact such new breeds or productions of a genus, that had perhaps once a single type on the Earth – as it has happened to our knowledge with MANKIND or the Genus HOMO, once a single TYPE, that has produced during many ages, so many natural varieties and breeds”

In 1836 Rafinesque composed a 6,000-line poem entitled *The world, or instability* (Warren 2004: 32; Rafinesque 1836c). Its 20 cantos were patterned after works by Milton, Pope, and Erasmus Darwin. Among its several themes Rafinesque sought to show that “Instability is a law of a nature, as attraction or gravitation.” He viewed the world at large in a state of flux and all the genera and species likewise in a state of “mutations quick or slow”.

In the short-lived *Atlantic journal*, Rafinesque (1833) had quoted from an earlier letter of his to a prominent American naturalist, John Torrey, concerning the “great universal law of PERPETUAL MUTABILITY in every thing”:

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. There is a tendency to deviations and mutations through plants and animals by gradual steps at remote irregular periods. . . . Every variety is a deviation which becomes a Sp. as soon as it is [made] permanent by reproduction.

Although Rafinesque used the terms “mutations” and “spontaneous evolution”, he never proposed a mechanism to account for the appearance of new forms of life (new species) nor addressed the second part of Darwin’s theory – the natural selection or survival of new species.

DARWIN’S HISTORICAL SKETCH

Inception

On the origin of species was first published in London by John Murray in November 1859. A month earlier Charles Lyell, the close geologist friend of Darwin, had read a draft of the work and had asked of Darwin, “In the first place, at p. 480 it cannot surely be said that the most eminent naturalists have rejected the view of the mutability of species – You do not mean to ignore G. St. Hilaire and Lamarck” (Burkhardt *et al.* 1991: 340). As if in response, in January 1860 Darwin informed Asa Gray in America that “I, also, intend to write a short Preface with a brief history of the subject” (Burkhardt *et al.* 1993: 54). That same month he wrote to Joseph Hooker, his close confidant in natural history, “I have resolved to publish a little sketch of the progress of opinion on the change of species” (Burkhardt 1993: 60). The latter title may have been inspired by “Historical Sketch of the Progress of Geology”, a chapter title in Lyell’s *Principles of geology* (1830–1833), which was an early major influence on Darwin.

The need for him to compile a short history became all the more pressing when in April 1860 Richard Owen (1804–1892), superintendent of the natural history departments of the British Museum, published a pointed critique in the *Edinburgh review* (Owen 1860: 504): “Mr. Darwin rarely refers to the writings of his predecessors, from whom . . . he might be supposed to have derived his ideas as to the origin of species. When he does allude to them, their expositions on the subjects are inadequately represented.”

By the end of his voyage on HMS *Beagle* (1831–1836) Darwin had abandoned his earlier view of the immutability of species but continued to assume that contemporary naturalists still believed in species stability. In his autobiography Darwin wrote that he had “never happened to come across a single one who seemed to doubt about the permanence of species” (Barlow 1969: 124). Upon examining the pre-1859 literature for his historical sketch, he identified 14 modern-era “predecessors” who had various non-biblical views about species. He discussed these in some detail in the preface to the first American edition (Darwin 1860b) of *Origin*. In the historical sketch of the third English edition Darwin (1861) referred to six more individuals (including Rafinesque) and in later editions he added a final three.⁵ Thus the historical sketch evolved over several versions.⁶

Rafinesque’s inclusion

In his printed works and known letters, Darwin made five references to Rafinesque – one being the quotation in the “historical sketch” (Darwin 1861) taken from *New flora*.⁷ It is not clear when Darwin first became aware of Rafinesque’s unfavorable reputation among American naturalists, but a letter to Hooker on 29 December 1860 contained another mention of the discredited taxonomist. Darwin wrote the following: “Poor Naturalist as he was, he has good sentence [*sic*] about species & vars. which I must quote in my Historical Sketch & I sadly want the date at once” (Burkhardt *et al.* 1993: 541). Darwin needed that date of *New flora* since he listed his predecessors in the sketch chronologically relative to

their expressed comments. Because he did not have access to a copy of *New flora* in December 1860, he requested in letters “the date of Part First” not only from Hooker twice, but also from Daniel Oliver (1830–1916), a young London botanist (Burkhardt *et al.* 1993: 534, 536, 541). The original version of the sketch had been completed ten months before at “Down, Bromley, Kent, February 1860”, and thus did not include Rafinesque.

As noted earlier, a more pointed statement about a new species is found in the first part of *New flora*: “. . . our species and genera are not quite permanent as supposed, but are gradually producing deviations of form” (Rafinesque 1836a: 17). Perhaps Darwin did not include this sentence in the “historical sketch” in order to avoid redundancy. On the other hand, this raises the issue of whether Darwin ever examined a full copy of what he termed “Part First”, whose actual wording is “First Part”. Instead, perhaps the two combined excerpts he used were selected and sent to him by someone. In another context he had requested just such a short (second hand) extract, as evidenced by the following request to Joseph Hooker: “Will you or Mrs. Hooker do me the favour to copy *one* sentence out of Naudins [*sic*] paper . . . on his principle of Finalité . . . with those confounded dashes over the vowels put in carefully” (Burkhardt *et al.* 1993: 60).

Darwin’s acquaintance with Rafinesque’s writings

Rafinesque fell into disrepute among American naturalists by the early 1820s and died in 1840. Since references to his works were largely omitted from the American biological literature during the several decades Darwin was gathering support for his theory, one wonders how he encountered Rafinesque’s quotation – whether he found it while reading a copy of *New flora* or whether he accepted the quotation provided by someone, as suggested above. *New flora* was not present in the Darwin library when it was transferred from Down House to the University Library, Cambridge, according to a catalogue compiled at the time (Rutherford 1908).

A second issue concerns who led Darwin to regard Rafinesque as a “poor naturalist”? Was it one of Darwin’s close English colleagues or an American acquaintance? Some possible candidates are discussed below with Asa Gray being the most prominent one.

Charles Lyell (1797–1875) wrote *Principles of geology*, which was first studied by Darwin early during his voyage on HMS *Beagle*. A life-long friendship between them began in 1836. Lyell traveled through the United States and Canada in 1841 and again in 1845, focusing on geology and fossils. During the latter visit he gave lectures at Boston’s Lowell Institute, which Asa Gray attended (Dupree 1988: 143). In a letter to George Ticknor in late November 1860, Lyell wrote that he had procured “all” of Gray’s articles and that Gray appears “to me the ablest, and on the whole grappling with the subject [new species] . . . better than anyone else on either side of the Atlantic” (Lyell 1881: 2: 341). Thus Lyell may have read Gray’s 1841 critique of Rafinesque and relayed it to Darwin in a letter or casual conversation. It was in late December 1860 (a month after Lyell’s letter to Ticknor) that Darwin mentioned the “poor naturalist” in his letter to Hooker.

Joseph Dalton Hooker (1817–1911) first met Asa Gray during the latter’s visit to Glasgow in 1838; an extensive correspondence ensued, which probably touched on American naturalists (Huxley 1918). Perhaps Gray’s poor opinion of Rafinesque was transmitted to Darwin indirectly by Hooker.

A prominent American naturalist whom Darwin discussed in the historical sketch was Samuel S. Haldeman (1812–1880), a professor of zoology at the Franklin Institute in

Philadelphia, where Rafinesque had taught in 1826–1827. In 1842 Haldeman published a mixed review of Rafinesque's zoological writings, which was milder than Gray's 1841 criticism of his botanical work (Haldeman 1842: 280–291). Darwin (1860b: vii) wrote that Haldeman “has ably given the arguments for and against the hypothesis of the development and modification of species: he seems to me to lean towards the side of change.” In a letter dated 21 June 1859, Darwin thanked Lyell for alerting him to the Haldeman paper and added “which I read several years ago & abstracted” (Burkhardt *et al.* 1991: 307–308). There is no known correspondence between Darwin and Haldeman and no basis for suspecting that Haldeman was the source of Darwin's low opinion of Rafinesque.

Another American included in the sketch after Haldeman and Rafinesque was Dr William Wells (1757–1817), who was an expatriate American physician practicing in London (Eiseley 1961: 119–125). But Wells had died long before Rafinesque wrote *New flora* (1836) and was conspicuous in American botany.

Not to be ignored here is Dr John Torrey (1796–1873), the noted American botanist in New York, who maintained a long, cordial correspondence with Rafinesque but who had professional reservations about him. In 1833 Torrey spent time in Glasgow with William Jackson Hooker (1785–1865), Regius Professor of Botany and father of Joseph Hooker, then age 16 (Dupree 1988: 36). But there is no indication that a low appraisal of Rafinesque came to Darwin through the elder Hooker. Finally, of all the American naturalists sharing a negative assessment of Rafinesque, as listed by Stuckey (2003: 154–178), the only one to have extensive correspondence with Darwin was Asa Gray.

Asa Gray and Charles Darwin

Gray had encountered Darwin briefly in early 1839 during a visit to the Royal College of Surgeons in London and in the spring of 1851 during a luncheon with Joseph Hooker at Kew (Dupree 1988: 192). In March 1854, Hooker sent Darwin a letter he had received from Gray, in which the latter discussed “crossing, obliterating varieties”. The subject “pleased and surprised” Darwin, who had “been collecting facts for these dozen years” (Burkhardt *et al.* 1989: 187). Darwin first wrote to Gray in April 1855, “I hope that you will remember that I had the pleasure of being introduced to you at Kew” (Burkhardt *et al.* 1989: 322).

Their ensuing correspondence proved to be a rewarding one for both men with a hundred or so letters passing between them in the 22 years from 1855 to 1877. Gray arranged for the American publication of *Origin* by the New York firm of Appleton in May 1860 (Burkhardt *et al.* 1991: 440). He further endeared himself by sending American postage stamps to one of Darwin's sons (Leonard) during his illness (Burkhardt *et al.* 1997: 341). Gray's letters were welcomed, because, as Darwin wrote, “there is always something in them that shows that he is a very lovable man” (Burkhardt *et al.* 1990: 325).

Darwin's initial note to Gray contained a request for general information on American plants. Also he wrote, “I have for several years been collecting facts on ‘Variation’, and when I find that any general remark seems to hold good amongst animals, I try to test it in Plants” (Burkhardt *et al.* 1989: 322). We may reasonably assume that Gray responded fully to Darwin's interests and relayed to him the views on species variation held by various American naturalists. During the early phase of their correspondence Gray would have conveyed Rafinesque's ideas about continually emerging species but also perhaps his negative impression of Rafinesque's taxonomic work (noted earlier in this essay).

In his 1841 criticism of “the Botanical Writings of the late C. S. Rafinesque” Gray (1841: 239) wrote:

According to his principles, this business of establishing new genera and species will be endless; for he [Rafinesque] 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 . . . and [he] assumes thirty to one hundred years as the average time required for the production of a new species

Gray’s use of the terms “this business” and “insists” suggests his own reservations about Rafinesque’s heretical views – reservations likely reflecting Gray’s orthodox belief then in the constancy of species.⁸ This critique was written 14 years before his ideas began to change during his long correspondence with Darwin. There is no indication that Gray ever later acknowledged that Rafinesque might have been correct about this one aspect of nature.

Gray met with Darwin at Down House in 1868 and 1881, but these occasions were long after the “historical sketch” had been composed. Apart from conversations, two sources existed then for transmitting information – publications and letters. Gray’s own copy of Rafinesque’s *New flora* remains in the Harvard Botany Library in Cambridge, Massachusetts, and thus was not sent to Darwin.⁹ There is no reference to Rafinesque in the extant letters from Darwin to Gray (and the single one from Gray) found in Francis Darwin’s three-volume collection of his father’s letters nor in the relevant ones more recently edited by Burkhardt and his collaborators. Since Darwin wrote at least 48 letters to Gray, the latter probably replied with a corresponding number, of which we have only the single one. Darwin apparently destroyed most incoming letters prior to 1862, and Gray did not keep copies of his outgoing letters (Gray 1894: 388, 454). Apart from the two Darwin letters cited above to Hooker and one to Daniel Oliver, there is no mention in any other Darwin correspondence of the “indefatigable writer”, as Gray (1841: 241) once termed Rafinesque.

CONCLUSION

In his historical sketch Darwin conceded that he was “not familiar” with his predecessors “from the classical period to that of Buffon” and thus began his discussion with Lamarck. Some of those whom Darwin then listed may have influenced the early formulation of his theory – notably Erasmus Darwin, the Geoffroy Saint-Hilaires, the Reverend William Herbert, Professor Robert Grant, Professor Richard Owen, and the anonymous author of *Vestiges of the natural history of creation*. This was a “transmutationary tract” which went through over ten editions and had great popular appeal in England (Browne 2002: 21). Darwin became well acquainted with all the named predecessors (including Rafinesque) while researching background information for the sketch.¹⁰

The various influences on Darwin’s ideas and writings have become diverting quests for many scholars, and this essay concerns mainly how Darwin learned of Rafinesque. In England both Hooker and Oliver knew about his *New flora*, and one of them presumably informed Darwin of its date of publication. But merely having read *New flora* would not have led either botanist to acquire a negative impression of its author, which later they might have conveyed to Darwin.

That image would likely have come from an American, such as Asa Gray, who was Darwin’s one correspondent most familiar with the writings of the ostracized émigré

taxonomist. Thus, based on circumstantial evidence, I suggest that Gray alerted Darwin to Rafinesque's damaged reputation either directly in his correspondence with Darwin or indirectly via his letters to Lyell or Hooker. In either case, if true, it would seem ironic that Gray, who declared in 1841 that no consideration was due Rafinesque's "subsequent works", should be responsible also for his immortal citation in Darwin's "historical sketch".

TWO AFTERTHOUGHTS

The religious-intellectual climate of the 1830s was not yet generally open to anti-biblical notions such as the mutability of species, and so at that time Rafinesque's views were heretical, premature, and duly ignored. Indeed, they were not presented again until two decades later by Darwin and not cited in print elsewhere until Osborn's book in 1905¹ and Kohlbrugge's review in 1915.⁶

No letter from Gray to Darwin, Lyell, or Hooker mentioning Rafinesque has been found, but the search for one has pointed up aspects of Darwin's personality seldom commented upon. They became evident while noting similarities and differences between Rafinesque and Darwin – the former a presumed failure in American taxonomy and the latter a pre-eminent name in Western biology.

Rafinesque began as an intrepid taxonomist but ended as an unfocused polymath. He suffered most grievously from what Asa Gray sought to avoid in himself: having "too many irons in the fire" (Gray 1894: 388). Rafinesque's many pursuits overshadowed his one key insight into a major feature of nature – continually emerging species. Darwin's interests also ranged widely: embracing natural history, geology and geography. But all were directed to one ultimate end: understanding organic evolution.

Rafinesque exhibited a manic quest for fame through priority of discovery; he focused on reporting new species but failed to describe them clearly and neglected in many instances to preserve type specimens. Priority was also much on Darwin's mind during the month of June 1858, when he received a manuscript from Alfred Russel Wallace (1823–1913) describing a theory of natural selection which Wallace had originated independently while visiting the Malay Archipelago. Darwin seemed terrified that Wallace's paper might eclipse the primacy of his own conclusions about evolution. He expressed his fear in two letters to Lyell – 18 and 26 June 1859. "Your words have come true . . . that I should be forestalled . . . [and] all my originality . . . will be smashed" (Burkhardt *et al.* 1991: 107). "It seems hard on me that I should be thus compelled to lose my priority of many years' standing" (Burkhardt *et al.* 1991: 119). And on 29 June 1859 he wrote to Hooker, "It is miserable in me to care at all about priority" (Burkhardt *et al.* 1991: 122).

Rafinesque was a prolific writer like Darwin, who, however, was the more prodigious correspondent.¹¹ Haldeman (1842: 284–285) criticized Rafinesque for requesting "rare pamphlets and publications . . . information or news relating to natural science . . . with the intention of getting new genera, species, and observations, from the labors of others." Darwin was even more tenacious in soliciting useful information via letters from his many hundred correspondents (Browne 2002: 11).

Rafinesque had an exaggerated ego that repelled many of his contemporaries. Darwin had a resolute personality and one dominant interest which was appreciated by his colleagues. According to Francis Darwin (1887: 1: 125), his father explained his patience by "saying that he could not bear to be beaten". His dogged persistence in his extensive

question-filled correspondence was a reflection of this drive. In his autobiography, Darwin recognized the compulsion in his writings “to impress my readers” and concluded that “he who succeeds in doing so deserves, in my opinion, all the credit” (Barlow 1969: 125) for convincing them of the point at issue.

Today Rafinesque remains relatively unknown in biology. In contrast, Darwin gained immortal fame for his theory of evolution by natural selection, but in a striking understatement he expressed mock astonishment at his success. The closing sentence of his autobiography reads: “With such moderate abilities as I possess, it is truly surprising that I should have influenced to a considerable extent the belief of scientific men on some important points” (Barlow 1969; 145).

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NOTES

¹ Rafinesque was not mentioned in *Forerunners of Darwin 1745–1859* (Glass *et al.*, 1968), Mayr's *The growth of biological thought* (1982), or Lovejoy's *The great chain of being* (1936), nor in biographies of Darwin by Himmelfarb (1959), Eiseley (1961, 1979), de Beer (1967), Brent (1981), Desmond and Moore (1991) and Browne (1995, 2002). Rafinesque was not listed in the index of Francis Darwin's three-volume *The life and letters of Charles Darwin* (1887) nor of the edition of Darwin's autobiography edited by Barlow (1958).

Apart from references to Rafinesque in Darwin's “historical sketch” (1861) and in three of his letters (December 1860), Rafinesque was only mentioned again by Osborn (1905: 211) in *From the Greeks to Darwin: an outline of the evolution idea*, and here Osborn clearly garnered the name from Darwin's sketch.

² Transylvania was the first school of higher learning west of the Allegheny Mountains, having been founded in 1780. Its Department of Medicine (1799–1859) was the fifth medical school established in the United States of America and during the 1830s and 1840s rivaled the medical schools of Harvard and Pennsylvania (Ambrose 2005).

³ Early nineteenth-century American naturalists had mixed feelings about the eccentric Rafinesque; many criticized his work, including Amos Eaton (1776–1842), Isaac Lea (1792–1886), and John Torrey (1796–1873). But none of these is known to have had any contact or correspondence with Darwin, who was, however, familiar with Torrey and Gray's *A flora of North America* (1838–1843) perhaps because its co-author was Asa Gray (Stuckey 2003).

⁴ Two years later in 1842 Gray became Fisher Professor of Natural History (botany) at Harvard.

⁵ The 14 precursors first discussed in some detail by Darwin (1860b) included J. B. Lamarck, Etienne Geoffroy Saint Hilaire, W. Herbert, S. S. Haldeman, J. d'O. d'Hallorz (*sic*), Isidore Geoffroy Saint Hilaire, H. Spencer, N. Naudin, H. Lecoq (in a footnote), A. A. Keyserling, Baden Powell, A. R. Wallace, T. H. Huxley, and J. D. Hooker. The six added in 1861 (third English edition) included R. W. Grant, P. Matthew, C. S. Rafinesque, R. Owen, H. Freke and H. Schaaffhausen. And the final three added in later editions were W. C. Wells, L. von Buch and K. E. von Baer.

⁶ In a paper about Darwin's contemporaries (“Zeitgenossen”), Kohlbrugge (1915) identified 87 biologists who from 1830 to 1859 taught the variability of organisms and structures (“die die Variabilität der Organismen lehrten”). Rafinesque was number 16, chronologically. Kohlbrugge (1915: 95–98) also listed 79 authors who before 1830 accepted mutability of species based on the vast number recognized in modern times and the inadequate room in Noah's ark for all these animals (“weil sonst der Arche Noah kein Raum für alle Tiere gewesen sei”).

⁷ *New flora* was privately printed in four parts: 100 pages in 1836, 96 pages in 1837, 96 and 112 pages in 1838. The quotation is found in its “First Part. Introd. Lexicon &c.” Some of the parts may have been distributed

separately (Pennell 2003: 42). According to Boewe (2003: 351) “many of Rafinesque’s later works were issued in editions of a hundred copies or less, and all were ignored by his contemporaries.”

⁸ During his early adult life Gray professed being an orthodox Presbyterian who believed in the biblical creation and the constancy of species (Dupree 1988: 54, 139, 239). But later when defending Darwin’s ideas in his 1860 *Atlantic monthly* essays, Gray (1860) wrote, “We believe that species vary, and that “Natural Selection” works” (Gray 1861: 30).

⁹ Tessa Updike (Harvard University Botany Libraries), pers. comm., 9 December 2008.

¹⁰ No references can be found in Darwin’s letters before 1859 for the following predecessors discussed in the sketch: Matthew, von Buch, Rafinesque, Haldeman, Halloz, Freke, Naudin, Keysserling, Schaaffhausen, LeCoq and von Baer. But he obviously had read works by or about them. Several by Naudin, LeCoq, and Haldeman are listed in his “reading notebooks” (Buckhardt *et al.* 1988: 481, 484, 486, 525).

¹¹ Rafinesque claimed authorship of “220 works, pamphlets, essays, and tracts,” but others have determined that his published writings number “nearly 800 titles” with many consisting of only a few paragraphs (Boewe 2003: 340). Haldeman purchased some of Rafinesque’s papers in his estate after his death. Many were subsequently destroyed, but some remain today with the American Philosophical Society in Philadelphia. Darwin received or wrote over 14,000 letters; most have been preserved, but others have been destroyed or are yet to be discovered (Browne 2002: 11).

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