



There are multiple editions of the first volume of Benjamin Silliman's *American Journal of Science*—and why it matters

Neal Woodman

USGS Patuxent Wildlife Research Center, MRC-111, National Museum of Natural History,
Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012 U.S.A.
Email: woodmann@si.edu

Abstract

The oldest continuously-published North American scientific journal, the *American Journal of Science*, first appeared in 1818 under the management and editorship of Benjamin Silliman, a mineralogist and chemist at Yale College, New Haven, Connecticut. At that time, the journal presented articles on a multitude of natural history topics, including descriptions of new species of plants and animals. In an effort to provide complete sets of the journal to all subscribers who wanted them, Silliman subsequently republished all four numbers of the first volume of the journal. Unfortunately, this attempt to provide wide access to the journal resulted in confusion regarding the correct dates of publication for some of the scientific names that first appeared on its pages. In this paper, I address the problem caused by the publication of multiple editions of Volume 1 of the *American Journal of Science*, review the dates of publication of the editions, and describe characteristics that distinguish the editions. For taxonomists, it is relevant that all species described in Volume 1 appeared in the first edition, which spans the years 1818–1819. Hence, the date of description of a particular taxon is dependent upon the number in which it was described.

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Introduction

The *American Journal of Science* (hereafter *AJS*) from New Haven, Connecticut, is reputed to be the oldest continuously published scientific journal in North America (see *AJS* 2016). This periodical was initiated in 1818 by the geologist Benjamin Silliman (1779–1864) of Yale College, who served as the journal's primary editor for its first two decades (Dana 1918:26; Beckham 1979). Although the modern journal is focused almost exclusively on the geological sciences, *AJS* originally was intended to serve a wider audience (Silliman 1818a), and the first volume contains articles on geology, mineralogy, botany, zoology, chemistry, and physics, as well as "musical temperament." The importance of this journal to the North American scientific community in the early nineteenth century is difficult to overstate. At times during its early years, it was the only publication outlet available to many scientists (Meisel 1926). In

achieving national and international audiences for its authors and articles, the journal provided a means for North American scientists to broadly communicate their observations and helped to legitimize American science to the established scientific communities in Great Britain and continental Europe (Silliman 1847).

There is some confusion regarding the early publication history of *AJS*, specifically the dates of publication of the four numbers comprising the first volume. Date of publication is generally not a major issue for most of the natural and physical sciences, but it can be crucial for biological taxonomy in helping to assure nomenclatural stability. Given competing claims for the appropriate scientific name for a particular organism—all else being equal—priority is given to the name that was published first (ICZN 1999). The first volume of *AJS* includes the descriptions of five new genera and 22 new species of plants and animals (Table 1), so a misunderstanding of the original publication dates of the four numbers comprising it has the potential to affect the priority of the proposed names and, thereby, their nomenclatural status.

I first noted a potential problem while researching the history of the scientific name of a North American marten, *Mustela vulpina* Rafinesque (= *Martes americana vulpina*: Wozencraft 2005), which happens to be the first new species named and described in the first

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<http://hbs.bishopmuseum.org/dating/sherbornia/index.html>

Table 1. New genera and species of plants and animals described in the first edition of the first volume of the *American Journal of Science*. Spellings are as they originally were published. Dates of publication of individual numbers are from Silliman (1818b, 1847) and Meisel (1926).

Taxon name	Type of organism
Number 1 (August 1818):	
<i>Mustela vulpina</i> Rafinesque, 1818: 82	Fox marten
<i>Scytalus cupreus</i> Rafinesque, 1818: 84	Copperhead snake
Number 2 (November 1818):	
<i>Spongia albescens</i> Rafinesque, 1818: 149	Whitish sponge
<i>Spongia ostracina</i> Rafinesque, 1818: 150	Oyster sponge
<i>Spongia cespitosa</i> Rafinesque, 1818: 150	Bushy sponge
<i>Spongia cladonia</i> Rafinesque, 1818: 150	Cladonian sponge
<i>Spongia virgata</i> Rafinesque, 1818: 150	Slender sponge
<i>Xanthium maculatum</i> Rafinesque, 1818: 152	Cocklebur
<i>Phalaena devastator</i> Brace, 1818: 154	Cut-worm insect
<i>Exoglossum</i> Rafinesque, 1818: 156	Cutlip minnows
<i>Exoglossum vittatum</i> Rafinesque, 1818: 156	Little sucker
<i>Exoglossum annulatum</i> Rafinesque, 1818: 156	Black chub
Number 3 (March 1819):	
<i>Asclepias lanceolata</i> Ives, 1819: 252	Milkweed
<i>Diplocea</i> Rafinesque, 1819: 252	Grass
<i>Diplocea barbata</i> Rafinesque, 1819: 253	Grass
Number 4 (June 1819):	
<i>Rottböllia corrugata</i> Baldwin, 1819: 355	Itchgrass
<i>Rottböllia ciliata</i> Baldwin, 1819: 357	Itchgrass
<i>Cylactis</i> Rafinesque, 1819: 377	Dwarf red blackberry
<i>Cylactis montana</i> Rafinesque, 1819: 377	Dwarf red blackberry
<i>Nemopanthus</i> Rafinesque, 1819: 377	Holly
<i>Nemopanthus fascicularis</i> Rafinesque, 1819: 378	Holly
<i>Polanisia</i> Rafinesque, 1819: 378	Clammyweed
<i>Polanisia graveolens</i> Rafinesque, 1819: 379	Clammyweed
<i>Myosurus shortii</i> Rafinesque, 1819: 380	Mousetail
<i>Gnaphalium decurrens</i> Ives, 1819: 381	Cudweed
<i>Alveolites glomeratus</i> Say, 1819: 383	Fossil coral
<i>Favosites striata</i> Say, 1819: 384	Fossil coral

number of *AJS*. I was aware that this number of the journal was originally published in 1818, but both the authoritative online Integrated Taxonomic Information System (ITIS: <http://www.itis.gov/>, accessed 5 May 2016), as well as a number of high-profile secondary references for North American mammals (Hall and Kelson 1959; Hall 1981; Wozencraft 2005), incorrectly give the year of publication of this name as 1819—a year later. Other species described in the first volume of *AJS* have a similar problem with erroneous dates. For example, Millspaugh and Sherff (1919) incorrectly give the date of *Xanthium maculatum* Rafinesque, the cocklebur plant, as 1819, and ITIS incorrectly lists the date of *Apamea devastator* (Brace),¹ the cut-worm insect, as 1819. In contrast, ITIS correctly lists the date of *Exoglossum* Rafinesque, a genus of cutlip minnows, as 1818, even though it is named and described in the same number of *AJS* as the cocklebur and the cut-worm. At best, there is a lack of consistency in the taxonomic literature regarding the dates associated with names published in the first numbers of *AJS*.

Part of the confusion in publication dates likely derives from the fact that the first volume of *AJS* spans portions of the calendar years 1818 and 1819 (Silliman 1847; Meisel 1926; Table 1). In addition, a second edition of the first number was published in 1819. Details regarding the publication of the two editions of the first number appear to be poorly understood (WorldCat: <http://firstsearch.oclc.org/>, accessed 5 May 2016). Further confusing the history of *AJS* is the lesser known fact that Silliman produced *at least* one additional edition of the first number and a second edition of the remaining numbers of the first volume.² Hence, the “original” descriptions and names of the species appearing in Volume 1 were each published at least two or three times (e.g., Rafinesque 1818, 1819a, 1827).³ Unfortunately, it appears that the existence of multiple editions of the numbers of the first volume of *AJS* has mostly escaped the notice of botanical and zoological taxonomists, the scholarly communities for whom dates of publication are most relevant. As I have illustrated, this has led to the association of erroneous dates with some proposed names.

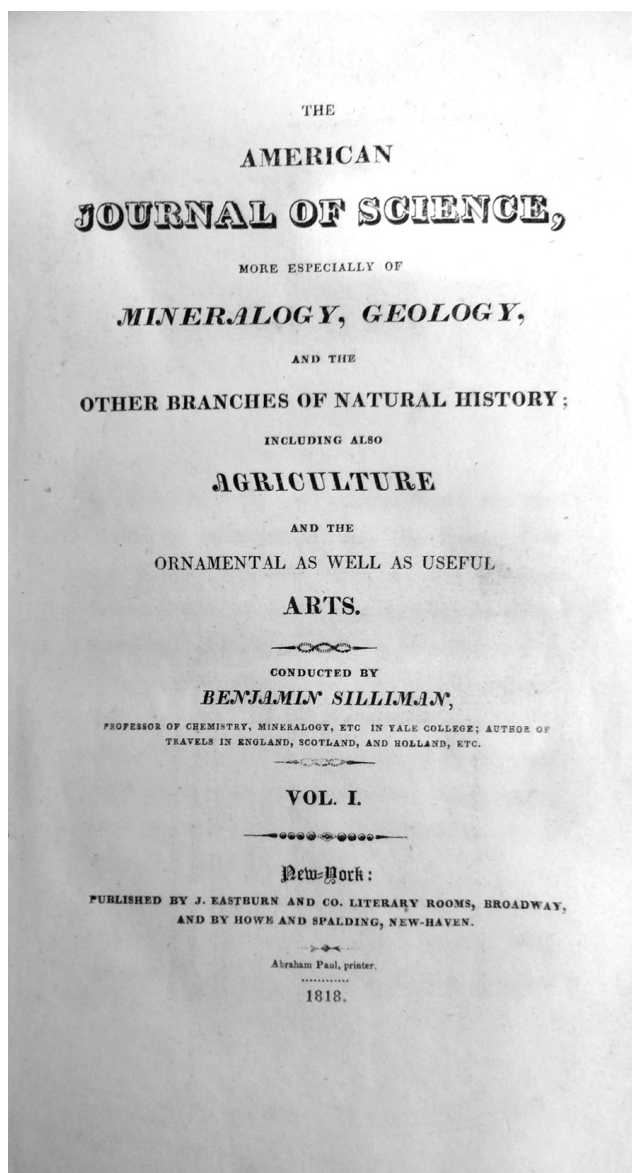


Fig. 1. Title page for the first edition of the first number of Volume 1 of Benjamin Silliman's *American Journal of Science*.

The purposes of this paper are to clarify the publication history of the first volume of the *AJS* and understand why Silliman reproduced this seminal volume; to show how different editions can be easily distinguished; and to determine whether there are tangible differences in the descriptions of new species among editions that may affect the taxonomic status of some species.

Materials and Methods

Much of the early history of the *AJS* is revealed in its own pages, either in Silliman's prefaces to his early volumes (e.g., Silliman 1818a,b, 1822a,b) or in historical summaries written in subsequent years (Silliman 1847; Dana 1918). The original paper covers of individual issues contain a wealth of publication information, and the *AJS* Editorial Office at Yale University possesses unbound copies of the first edition of the first volume of *AJS* with their original paper covers intact. Additional details can be garnered

from contemporary advertisements and announcements in the journal and in other media [e.g., Readex *America's Historical Newspapers, 1620–1922*; ProQuest *American Periodical Series (1740–1900)*]. A number of biographies of Benjamin Silliman and his contemporaries provide context for understanding the early 19th century scientific community and the significance of the *AJS* to that community (McAllister 1941; Fulton & Thompson 1968; Brown 1989). To understand variations among different editions of Volume 1 of *AJS*, I inspected 8 online, 1 microfilm, and 13 original bound copies of Volume 1 of *AJS*, as well as 5 unbound individual numbers (Appendix 2). To determine likelihood of survival of early nineteenth-century North American scientific journals, I calculated modal duration using titles and publication dates listed in Scudder (1876).

Because some readers may not be entirely familiar with technical terms as applied to the printing process in the era of the hand-press and hand-set movable type, it is important to clarify the significance of several words that are used in the following discussion. The term "edition" refers to all copies from a single, specific setting of the type used to print a sheet. A "signature" is a letter, number, symbol, or some combination that is printed at the bottom of a page to guide the binder in folding and sewing together the printed sheets in the correct sequence. Each sheet had multiple pages printed on it, and I used the signatures to indicate the format of the sheet. "Format," as here used, refers to the number and positioning of the pages on the sheet, rather than the size of the pages. For example, the first edition of Number 1 of *AJS* has a mixed format, beginning in quarto (4 leaves = 8 pages per sheet) format, then switching to octavo (8 leaves = 16 pages per sheet). The second edition of Number 1 is entirely octavo, and the third edition is entirely quarto (Appendix 1). Despite differences in format, each edition of a number has the same number of pages.

Distinguishing and Dating the Editions

Volume 1 is the only volume in the early history of *AJS* that is comprised of four numbers. Beginning with Volume 2, each quarterly number was to contain approximately 200 pages (increased from about 100 pages) and two numbers were to comprise a volume instead of four (Silliman 1819b, 1847). After this, and until 1828, three numbers were published per year, so volumes do not correspond directly to years.

The first two numbers of Volume 1 originally were published in 1818, and the third and fourth numbers in 1819 (Silliman 1847; Meisel 1926; Table 1). Among the 23 original and electronic copies of the complete first volume of *AJS* I inspected (Appendix 2), I identified three editions of the first number, two editions of Number 2 (along with manuscript evidence for a third edition), and two editions each of Numbers 3 and 4. Given Silliman's commitment to providing complete sets of *AJS* (see below), it is possible that additional editions may exist and that later editions may have undergone multiple printings.

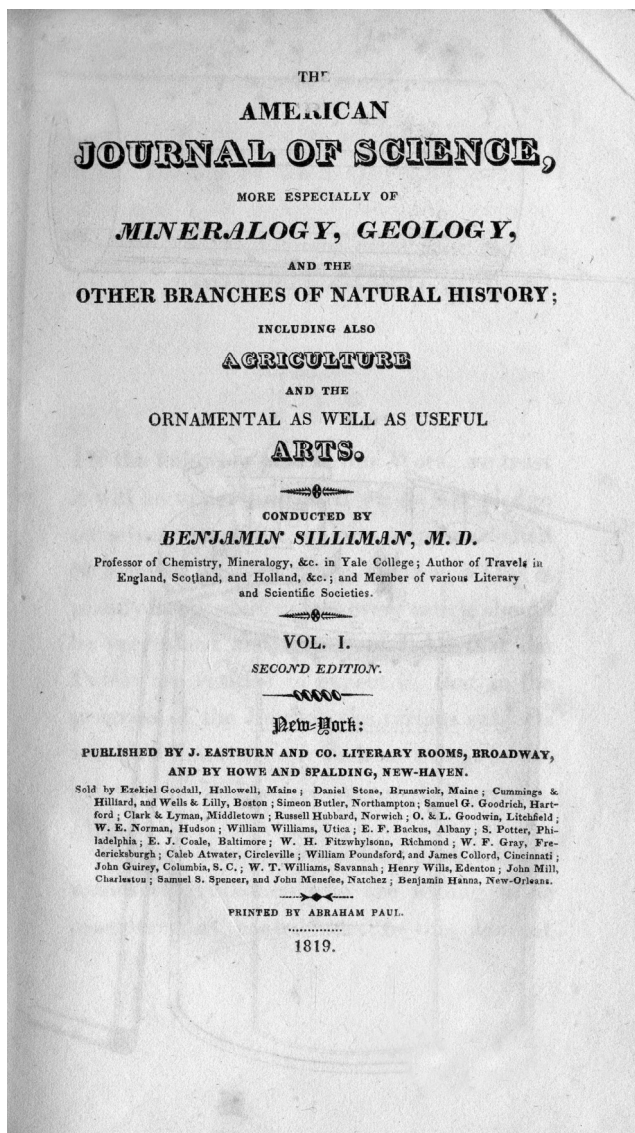


Fig. 2. Title page for the second edition of the first number of Volume 1 of Benjamin Silliman's *American Journal of Science*.

Distinguishing editions of the individual issues of the first volume of *AJS* is not particularly difficult. In addition to variations in the type faces and fonts used (most notably on the title pages of the first number), there are a number of additions, omissions, and other changes in the text of some of the articles. Most generally useful are the differences among the editions in the signatures at the bottoms of certain pages of the main text (Appendix 1).

Number 1

The first number of volume 1 is the only issue for which I identified three distinct editions. Silliman (1847) stated that the first edition of the first number appeared in July 1818. However, a notice on the back of the original paper cover of the first edition of Number 2 states, "Unforeseen circumstances, however, delayed the actual publication of No. I till August" (Silliman 1818b). The later August date is supported further by an advertisement in the *Connecticut Journal* (Anonymous 1818) and should be considered the correct date (Table

1). On the title page, the editor (i.e., "CONDUCTED BY") is listed simply as "BENJAMIN SILLIMAN," and his name is followed by a list of his qualifications (i.e., "PROFESSOR OF CHEMISTRY, MINERALOGY, ETC IN YALE COLLEGE; AUTHOR OF TRAVELS IN ENGLAND, SCOTLAND, AND HOLLAND, ETC") in small capitals (Fig. 1). "Abraham Paul, printer" appears near the bottom of the title page in a mix of upper case and lower case letters, and below that is the year "1818." A list of errata is given on page viii after the table of contents. This number is unique in having a mixed format, with the first half in quarto, the second half in octavo. Signatures run from 1 through 10 (Appendix 1).

All available copies of the first edition of Number 1 were distributed before Number 2 was published, and Silliman intended to reprint it. A notice on the back of the original paper cover of Number 2, which came out in November 1818, states:

The whole edition of No. 1. having been called for, new subscribers are informed that they can be furnished with that Number as soon as it is reprinted : this will probably be done at no very distant period. In the mean time any probable demand for No. II. can be supplied, as a larger edition of it than of No. I. has been published.

The second edition of Number 1 was published by March 1819 and was available before the first edition of Number 3 was published in the same month. On the back of the original paper cover of Number 3, a notice reads: "NUMBER 1 has been reprinted, and complete sets of the Numbers published, may be obtained."

The second edition bears the year "1819" at the bottom of its title page (Fig. 2). The editor is listed with his medical degree as "BENJAMIN SILLIMAN, M.D.," and "Member of various Literary and Scientific Societies" is added to his qualifications, which are printed in upper and lower case letters; this particular qualification is missing from both the first and third editions. Below the volume number are the words, "SECOND EDITION." Below the publishers' names on the title page is a long list of distributors; this list is absent from both the first and third editions. Below the list, "PRINTED BY ABRAHAM PAUL" appears in small capitals. There is no list of errata at the end of the table of contents, and most of the corrections listed as errata in the first edition have been made in the text of the second edition. This edition of Number 1 is in octavo format, and signatures run from 1 through 7 (Appendix 1).

The style of the third edition of Number 1 appears to have been modeled more closely on the first edition than on the second edition (Fig. 3): the type faces and wording on the title page are more similar between the first and third editions than either is to the second edition, the editor is listed simply as "BENJAMIN SILLIMAN," and there is no list of distributors. Unlike the first edition, however, the title page of the third edition bears no year, and "T. G. WOODWARD, PRINTER" appears in small capitals below the publishers' names. There is no list of errata at the end of the table of contents. The format of this edition of Number 1 is quarto,

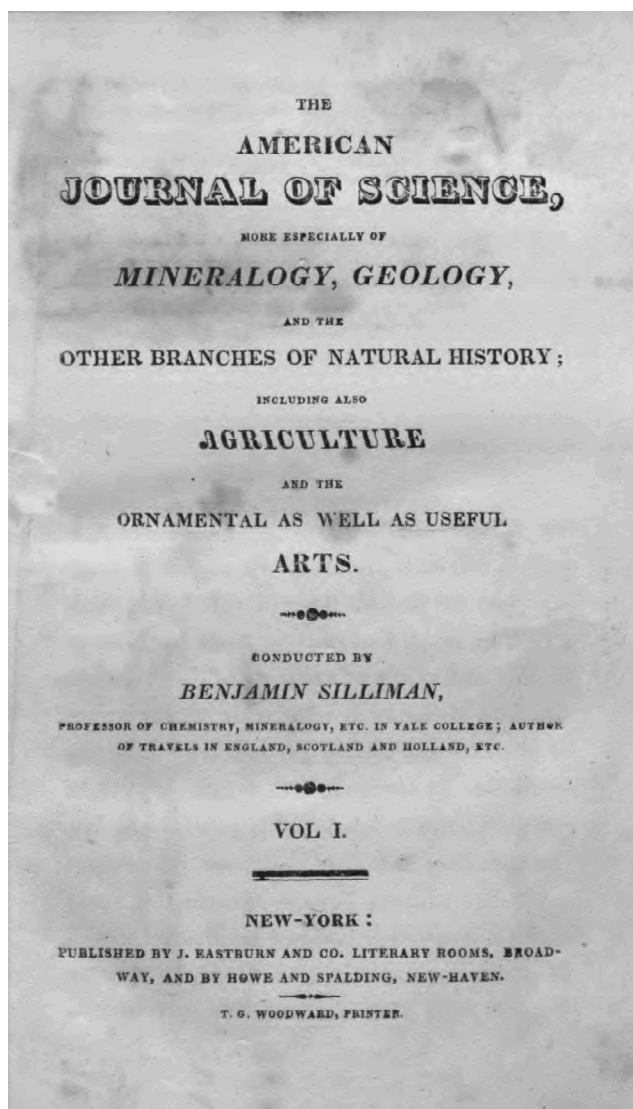


Fig. 3. Title page for the third edition of the first number of Volume 1 of Benjamin Silliman's *American Journal of Science*.

and signatures run from 1 through 13 (Appendix 1). The numbered signatures are continuous between this third edition of Number 1 and the second edition of Number 2, indicating that the two numbers are likely from the same continuous print run. A footnote in the second edition of Number 2 (see below) is dated July 1827, indicating that Number 1 probably was published sometime before that date, but almost certainly in that same year.

Number 2

The second number of Volume 1 was first published in November 1818 (Meisel 1926). In the first edition of Number 2, the fifth line of the title of Article I in the table of contents reads: “[Prin-]cipal of Deerfield Academy.” The title of Article XI requires three lines in the table of contents, and the signature at the bottom of this page is a capital “A.” There is an “Erratum” at the end of the table of contents indicating that, in the text, Article XVII was mistakenly numbered as Article XIX and all of the following articles are consequently misnumbered. On page 105 (the first page of text), vermillion is incorrectly

spelled with a single “l,” and there is no footnote at the bottom of the page. The format in Number 2 is octavo. Signatures continue from the first edition of Number 1 and run from 11 through 17 (Appendix 1). The first edition of Number 2 is typically bound with either the first or second edition of Number 1 (Appendix 2). Only 1000 copies of the first edition of Number 1 were published, whereas the print run was increased to 1500 copies for the first edition of Number 2 (Brown 1989). It is likely that the second edition of Number 1 was printed to be paired with the additional 500 copies of Number 2.

In the second edition of Number 2, the fifth line of the title of Article I in the table of contents is shorter than in the first edition: “[Deer-]field Academy.” The title of Article XI fits onto two lines, and there is no signature on this page. There is no “Erratum” at the end of the table of contents, but the misnumbering of Articles XVII–XXIII in the text as Articles XIX–XXV, respectively, persists. On page 105 (the first page of text), vermillion is spelled correctly. The second edition lacks the “Geological Map of a part of Massachusetts on Connecticut River, 1817,” a plate associated with an article by Edward Hitchcock (pp. 105–116), and the “Plates illustrating Revolving Steam Engine of Samuel Morey,” associated with an article by John L. Sullivan (pp. 157–168). The omission of Hitchcock’s geological map is explained in a footnote by the editor on p. 105:

As Prof. Hitchcock has published in this Journal (Vol. VI. p. 1.) a more extended account of the geology of the Connecticut, with an improved map, (p. 200. Vol. VI.) it has not been thought necessary to insert in this new edition of the present number the comparatively imperfect map published in the first and second editions. July, 1827.—Ed.

The date of this footnote indicates the second edition of Number 2 was published during or slightly after July 1827. The format is quarto, and signatures in this edition of Number 2 are continuous from the third edition of Number 1, running from 14 through 26 (Appendix 1). The second edition of Number 2 is typically bound with the third edition of Number 1, the second edition of Number 3, and either the first or second edition of Number 4 (Appendix 2).

In the footnote on p. 105, Silliman’s reference to “the first and second editions” preceding the 1827 edition of Number 2 provides textual evidence for another, “intermediate” edition that would have been published in the interval between the first edition and the 1827 edition (thereby rendering the 1827 edition the third edition rather than the second). The sequence of editions is further confused, however, by a second, undated footnote on page 163 that explains the omission of the plates associated with Sullivan’s article on Morey’s steam engine:

Mr. Sullivan, having published an improved account of this engine, (p. 106, Vol. II.) with finished and beautiful drawings, (p. 176,) whose description may be seen on p. 112–13, it appeared superfluous to republish, in this second edition of the second number, the sketches which were inserted in the first edition. B. S.

This footnote here appears to refer to the 1827 edition as “this second edition of the second number.” It is possible that the first footnote is simply incorrect, and no intermediate edition exists. Alternatively, it may be that first footnote is correct, and the second footnote first appeared in an as-yet-unidentified intermediate edition of Number 2 and was simply carried over unaltered into the 1827 edition because the information in the footnote was still generally relevant. Based on the information in the two footnotes, if an intermediate edition does exist, it would have been published between April 1820, when the first number of Volume 2 appeared, and January 1823, when the first number of Volume 6 was published (Silliman 1820; Meisel 1926). It also would be expected to include Hitchcock’s original “Geological Map of a part of Massachusetts on Connecticut River, 1817,” but lack Sullivan’s “Plates illustrating Revolving Steam Engine of Samuel Morey.”

Number 3

There are two identified editions of Number 3. The first edition was published in March 1819 (Meisel 1926). This date conforms to the date “*March 8th, 1819,*” that is present after the last line of text on p. 316 (although this date was reprinted in the second edition, which is clearly later). The format is octavo, and the signatures continue in sequence from the first editions of Numbers 1 and 2 and run from 18 through 25 (Appendix 1). The first edition of Number 3 is typically bound with first or second editions of Numbers 1 and 4, and the first edition of Number 2 (Appendix 2).

The date of publication of the second edition is unknown. On the title page (p. 209), the words “SECOND EDITION” appear in small capitals immediately below the name of the journal. In the title of the first article, the word “letter” is misspelled with three “t”s. The format is quarto, and signatures run from 1 through 14 and are not continuous with any other known numbers, indicating that this edition of Number 3 was published independently of any other numbers (Appendix 1). It is typically bound with the third edition of Number 1, the second edition of Number 2, and either the first or second edition of Number 4 (Appendix 2).

Number 4

There are two known editions of Number 4. Meisel (1926) gives May 1819 as the date of publication of the first edition of Number 4, but Silliman (1847: iii) states, “in June, 1819, the first volume of four numbers and 448 pages was completed.” The later date is supported by contemporary notices in the *Connecticut Journal* and the *Commercial Advertiser*.⁴ On the title page, which is also the first page of text (p. 317), the title and author name for Article 1 require five lines. A footnote on p. 338 reads simply, “See Map.” Format is octavo, and signatures continue the sequence from the first editions of Numbers 1–3 and run from 26 through 33 (Appendix 1). This edition is typically bound with the first or second editions of Number 1 and first editions of Numbers 2 and 3. However, I have seen two copies

in which the first edition of Number 4 was bound with the third edition of Number 1 and second editions of Number 2 and 3 (Appendix 2), suggesting that the print run of the first edition of Number 4 was increased over those of the preceding numbers.

On the title page (p. 317) of the second edition of Number 4, the words “SECOND EDITION” appear in small capitals immediately below the journal’s name. The title and author name for Article 1 fill four lines. The footnote on p. 338 still reads, “See Map,” but also includes a note from the editor explaining that the map was omitted:

Remark—*Prof. Dewey afterwards published in Vol. VI of this Journal, an enlarged account and map of this region. It is therefore deemed unnecessary to give again the original map, which is omitted in this reprint.*
Jan. 31, 1830.—Ed.

Dewey’s “enlarged” account and map was actually published in the first number of Volume 8 (pp. 1–60), which appeared in May, 1824 (Meisel 1926), rather than in Volume 6, as stated by Silliman. The date of January 31, 1830, suggests that this edition of Number 4 was probably published soon after. The format is quarto. The signatures run from 1 through 16 and are not continuous with any other known numbers (Appendix 1). The second edition of Number 4 is typically bound with the third edition of Number 1 and the second editions of Numbers 2 and 3 (Appendix 2).

Taxonomic considerations

Although several of the articles, particularly on geology, were edited between editions, the numbers and types of articles remain the same between and among editions of each number. More important, page numbering of articles also is consistent between and among editions. For taxonomists, it is important to realize that all first usages of scientific names proposed in the first volume of *AJS* appear in the first edition (as well as in later editions). Because the first edition of this volume spans 1818–1819, however, it is critical to know in which particular number a given name was proposed in order to correctly determine its date of publication (Table 1).

My inspection of selected taxonomic descriptions so far has not revealed any differences in the wording among the editions. The descriptions of *Mustela vulpina* (pp. 82–84), *Scytalus cupreus* (pp. 84–86), and *Exoglossum* (pp. 155–156), for example, appear to be word-for-word the same among all three editions of the Number 1. The only differences are in the spacing of some words in the third edition and in the signatures at the bottoms of some pages (Appendix 1). Hence, re-published descriptions generally reflect original descriptions in content, pagination, and quality, but cannot be relied upon for determining date of publication.

Why did Silliman produce multiple editions?

As interest in the study of natural history increased in the United States in the early nineteenth century, the need for publication outlets to transmit results of research and observations, both in the United States and abroad, became apparent. But, managing and publishing a scientific journal in the nascent United States was a “hazardous enterprize” (Silliman 1822b: iii). Of 52 North American scientific journals listed in Scudder (1876) that were initiated from 1800 through 1830, modal duration was only one year. Only 17 of these journals survived 15 or more years, and only four (including *AJS*) were still extant in 1876.⁵ Many difficulties accompanied the production of such a journal, not the least of which were obtaining enough subscribers or other means to cover editing, printing, and distribution costs; receiving sufficient interesting material to publish; and timely distribution of the finished product in a country lacking adequate transportation infrastructure (Silliman 1822b; Dana 1918; Brown 1989).

Given the difficulties inherent in publication of a science journal, it is curious that Silliman (1847: xiv) expended valuable time and resources in producing new editions of published material, an enterprise that he later acknowledged “incurred a heavy extra expenditure in reprinting exhausted numbers.” The timing of the republication of the first number in 1819—before the first volume was completed—is all the more surprising when one considers that the journal was in debt and nearly folded during this time (Silliman 1822a, b, 1847). Understanding why Silliman persevered in the publication and republication of *AJS* despite both professional and personal debts and set-backs (Fulton & Thomson 1968) requires an appreciation for an era in which American scientists were still working to achieve a level of competency on par with their European colleagues and to be appreciated as an independent scientific community capable of contributing to the greater international community (Semonin 2000). High-quality science required a respected outlet for communications, a medium with which Americans were still struggling. It may have been from frustration with previous unreliable publishing ventures that Silliman (1847) became committed to providing a permanent journal for American scientists.

In 1810, the physician and mineralogist Archibald Bruce⁶ had begun publication of the *American Mineralogical Journal*, a periodical devoted to geology, mineralogy, and chemistry. The journal was “most favorably received both at home and abroad” (Silliman 1847: iii), but only three numbers appeared in consecutive Januaries from 1810 through 1812. In 1814, these three numbers were republished together with a new fourth number as a single volume (Meisel 1926). Publication of the journal ceased entirely as a result of Bruce’s failing health. Despite the long intervals between numbers, its loss was deeply regretted by the North American geological community. To fill the gap left by the demise of Bruce’s journal, the influential mineralogist Colonel George

Gibbs⁷ proposed that Silliman found and edit a new scientific publication (Silliman 1833, 1847). With additional encouragement from Bruce and other prominent mineralogists such as Parker Cleaveland⁸ and Edward Darrell Smith,⁹ as well as possible financial assistance from Gibbs (Brown 1989), Silliman founded the *AJS* in 1818. Although Silliman was primarily interested in the geological sciences, he envisioned the scope of the new journal to be much broader and determined that it would “embrace the circle of the Physical Sciences, with their application to the Arts, and to every useful purpose” (Silliman 1818a: v).

The *AJS* nearly followed the typical path to an early demise. After the first volume, the “receipts proved insufficient to sustain the expenses” (Silliman 1847: iii), and Silliman’s New York publisher withdrew from the project. One problem was that the first volume initially had only 350 subscribers (Silliman 1847; Fulton & Thomson 1968). More relevant to the journal’s bottom line was that Silliman trusted subscribers to remit payment upon delivery of the first number, which many failed to do (Silliman 1819b; Dana 1918: 30; Brown 1989: 306). It also did not help that a substantial number of subscriptions were sent in exchange for other domestic and European journals, which did not offset publication expenses (Silliman 1822a).¹⁰ The journal’s New York agent noted that, of 1500 copies of the first volume, all but about 250 copies had been distributed by 1 March 1820, yet fewer than 400 copies had actually been paid for (Goodrich & Co. 1820).

Silliman reorganized financial arrangements so that he and his new printer in New Haven shared responsibility for expenses, requiring Silliman to take out a bank loan to meet this financial obligation (Silliman 1847; Fulton & Thomson 1968). For the second volume, Silliman and his agents made a second important change: “The price is 3 dollars a volume, payable *in advance, postage to be paid* on all remittances by mail; the experience of the first volume renders these conditions indispensable” (Goodrich & Co. 1820: 392). The new arrangements delayed work on the journal, and the first number of the second volume of *AJS* was not published until April 1820 (Silliman 1820; Meisel 1926). Ultimately, it took four years and five volumes before *AJS* was able to break even financially. In the meantime, Silliman supported the journal through its financial difficulties despite his personal debts (Fulton & Thomson 1968).

The first run of 1000 copies of the first number of Volume 1 was distributed by the end of October 1818. To accommodate demand, the print run of the second number was increased to 1500 (Brown 1989: 306), and, despite the cost, “a second edition of the first number was printed very soon after its publication” (Littell & Henry 1819: 304). The editor explained that he was determined to provide a complete set of *AJS* to any individual or institution requesting the journal (Silliman 1847: xiv):

No application for an entire set has ever yet been disappointed, and complete sets of the volumes are to

be found in many institutions and in the hands of many individuals, both in Europe and in the United States. Entire sets have often been presented gratuitously to our infant colleges and to scientific institutions and distinguished individuals in Europe. A few remain on hand, and it is our intention to furnish them as long as we can afford to republish, or can repurchase numbers that have run out.

The exchange, or even gifting, of complete sets of journals among scientific societies was viewed as an important step in communicating science and knowledge throughout the early United States, to whose development it contributed (Brown 1989: 292). The international appeal of *AJS* made its distribution all the more important as a means of communicating the development of American science to Europe and the rest of the world. Although Silliman's determination to provide ready access to *AJS* and communicate scientific results widely is laudable, an *entire set* of the journal, however, was not an *original set*. The editor's republication of exhausted numbers unintentionally set the stage for future confusion regarding the original dates of description for the new species of plants and animals that appeared on its pages.

Acknowledgments

The staffs of the following libraries and institutions graciously made their copies of *AJS* available to me for study: the Cushing/Whitney Medical Historical Library, the Sterling Memorial Library, the Beinecke Rare Book & Manuscript Library, the Peabody Museum Archives, and the *AJS* editorial office, Yale University, New Haven, CT; the Joseph F. Cullman 3rd Library of Natural History and the National Museum of Natural History Library, Smithsonian Libraries, Washington, DC; Library of Congress, Washington, DC; The Booth Family Center for Special Collections, Joseph Mark Lauinger Memorial Library, Georgetown University, Washington, DC; National Agricultural Library, Beltsville, MD; and Peter B. Lewis Library, Princeton University, Princeton, NJ. I particularly thank Louise F. Deis (Lewis Library), Leslie Overstreet (Culman Library), Florence Gillich (Cushing/Whitney Library), Barbara Narendra (Peabody Archives), Joan and Danny Rye (*AJS*); Mary Beth Corrigan (Lauinger Memorial Library); Tim Schoepke (National Agricultural Library). Eric Sargis and Blaire Hensley-Marsch and made my visit to New Haven possible and productive. Sandy Feinstein, Alfred L. Gardner, and Leslie K. Overstreet provided substantive comments that greatly improved this manuscript. I am particularly grateful to Leslie K. Overstreet for sharing her knowledge of early 19th century printing and printing terminology, which added important details to the story of Silliman's *Journal*. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. government.

End Notes

¹ The cutworm insect was originally named *Phalaena devastator* Brace, 1818.

² The existence of a third edition of Number 1 is unacknowledged in Bolton (1885), Scudder (1876), Meisel (1926), and the current WorldCat website (<http://firstsearch.oclc.org/>; accessed 5 May 2016).

³ The description of *Mustela vulpina* Rafinesque was actually published at least *four* times. In addition to appearing in the three editions of the first number of *AJS*, it also was published in London's *Philosophical Magazine and Journal* of June 1819 (Rafinesque 1819b).

⁴ The *Connecticut Journal* (New Haven; vol. 60, p. 2) for 29 June 1819, announced, "The fourth number of this valuable publication [*AJS*] is now before the public...." The *Commercial Advertiser* for 30 June 1819 (New York; vol. 22(60), p. 3) stated, "Subscribers to the above work [*AJS*] are respectfully informed, that the 4th number is just published and ready for delivery at the Literary Rooms, Broadway."

⁵ Three other journals initiated in 1800–1830 and active through 1876 were *Annals of the Lyceum of Natural History of New York* (first published 1823), the *Journal of the Franklin Institute* (1826), and the *Transactions of the Albany Institute* (1830). *Journal of the Academy of Natural Sciences of Philadelphia* (1817) also began publication during this period, but there is a gap in publication between 1842 and 1847. *Transactions of the American Philosophical Society* (1771) was not included in this analysis because its origin predates 1800 (Scudder 1879).

⁶ Archibald Bruce (1777–1818) was an American physician (M.D. 1800, University of Edinburgh) and mineralogist. He served as a professor of mineralogy and *materia medica* at the College of Physicians and Surgeons of the State of New York (now the Medical School of Columbia University) from 1807–1811 and subsequently at Queen's College, New Jersey (now Rutgers University). In 1824, the French mineralogist François S. Beudant (1832: 637) named the mineral brucite [$Mg(OH)_2$] in honor of him. The name brucite also was applied earlier to the mineral chondrodite by Colonel George Gibbs, but the name "chondrodite" had precedence (Silliman 1819a; Beudant 1832; Dana 1859; Merrill 1906; Dana and Hurlbut 1941; Greene 1968; Beckham 1979).

⁷ Colonel George Gibbs (1777–1834) was a wealthy and influential mineralogist who had inherited part ownership of an international import/export company and investments in American mining concerns. He published several articles on geological topics, helped found geological and mineralogical scientific societies, and materially supported the research of his geological colleagues. Amos Eaton, then professor of natural history at the Medical College, Castleton, Vermont, wrote to John Torrey, a New York physician, botanist, and chemist [27 February 1820, quoted in McAllister (1941: 264)]:

Gibbs will always be remembered in this country as the father of correct American Mineralogy. There were some pretty good mineralogists before he began; but his cabinet first set us all off to work, hunting up our own minerals. Besides his own exertions, you know, are unequalled.

Gibbs' extensive mineral collection (ca. 20,000 specimens) served as an important resource for North American mineralogists and was transferred to Yale College in 1811 and purchased by that institution in 1824. The mineral gibbsite [$Al(OH)_3$] was named for Gibbs by Torrey (1822; Mitchell 1808; Silliman 1833; McAllister 1941; Beckham 1979; Brown 1989).

⁸ Parker Cleaveland (1780–1858) was professor of mathematics, natural philosophy, chemistry, and mineralogy at Bowdoin College, Brunswick, Maine. His book, *An Elementary Treatise on Mineralogy and Geology* (Boston, 1816) was the first authoritative mineralogy text published in the United States and earned him the title of the “Father of American Mineralogy.” A white, platy variety of the mineral albite was named cleavelandite in his honor in 1823 by the English mineralogist Henry J. Brooke (Silliman 1858; Dana 1859; Anonymous 1905; Burbank 1988).

⁹ A native of Charleston, South Carolina, Edward Darrell Smith (1777–1819) was a physician (University of Pennsylvania Medical School, 1800) and professor of chemical and experimental philosophy and mineralogy at the South Carolina College in Berkeley. He was known for translating the works of the Parisian surgeon Pierre Joseph Desault into English (Mitchill and Miller 1808; Bichat 1814; Smith 1818; Society of the Alumni of the Medical Department 1877; Brown 1989).

¹⁰ Silliman (1847: xiv) later stated that *AJS*

... never reached one thousand paying subscribers, and has rarely exceeded seven or eight hundred—for many years it fluctuated between six and seven hundred. ... It has a large gratuitous distribution, both at home and abroad, and an extensive good-will exchange with works often having no particular bearing upon its peculiar objects.

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Appendix 1. Differences in signatures and formats among editions of the four numbers of the first volume of the *American Journal of Science*. Asterisks are part of some octavo signatures. Each number has the same number of pages of preliminary material and text regardless of the edition.

Number 1 (pp. i–viii, 1–104)

Page	1 st edition quarto/octavo (August 1818)	2 nd edition octavo (by March 1819)	3 rd edition quarto (before July 1827?)
1	1	1	1
3	–	1*	–
9	2	–	2
17	3	2	3
19	–	2*	–
25	4	–	4
33	5	3	5
35	–	3*	–
41	6	–	6
49	7	4	7
51	7*	4*	–
57	–	–	8
65	8	5	9
67	8*	5*	–
73	–	–	10
81	9	6	11
83	9*	6*	–
89	–	–	12
97	10	7	13

Number 2 (pp. i–ii, 105–208)

Page	1 st edition octavo (November 1818)	2 nd edition quarto (after July 1827)
i	A	–
105	11	14
107	11*	–
113	–	15
121	12	16
123	12*	–
129	–	17
137	13	18
139	13*	–
145	–	19
153	14	20
155	14*	–
161	–	21
169	15	22
171	15*	–
177	–	23
185	16	24
187	16*	–
193	–	25
201	17	26

Appendix 1. (Continued).

Number 3 (pp. i–iv, 209–316)

Page	1 st edition octavo (March 1819)	2 nd edition quarto (before 1830?)
i	a	–
209	18	1
211	18*	–
217	–	2
225	19	3
227	19*	–
233	–	4
241	20	5
243	20*	–
249	–	6
257	21	7
259	21*	–
265	–	8
273	22	9
275	22*	–
281	–	10
289	23	11
291	23*	–
297	–	12
305	24	13
313	25	14

Number 4 (pp. i–iv, 317–448)

Page	1 st edition octavo (June 1819)	2 nd edition quarto (1830)
i	a	A
317	26	1
319	26*	–
325	–	2
333	27	3
335	27*	–
341	–	4
349	28	5
351	28*	–
357	–	6
365	29	7
367	29*	–
373	–	8
381	30	9
383	30*	–
389	–	10
397	31	11
399	31*	–
405	–	12
413	32	13
415	32*	–
421	–	14
429	33	15
431	33*	–
437	–	16
445	34	17

Appendix 2. Copies of Volume 1 of the *American Journal of Science* examined. Ordinal numerals represent the edition of each number in a given copy.

	Number			
	#1	#2	#3	#4
Bound volumes:				
Beinecke Library, YU* (2007 S7)	1 st	1 st	1 st	1 st
Cushing/Whitney Medical Historical Library, YU	1 st	1 st	1 st	1 st
Peabody Museum Archives, YU, Copy 2 (YPM AR 877)	1 st	1 st	1 st	1 st
Sterling Library, YU (Yzz9 AM35 1, 1818)	1 st	1 st	1 st	1 st
National Agricultural Library (470 AM34)	1 st	1 st	1 st	1 st
Smithsonian Libraries (Q1. A512 NH)	2 nd	1 st	1 st	1 st
Sterling Library, YU (Yzz9 AM35 1b, 1819)	2 nd	1 st	1 st	1 st
Library of Congress (Q1 .A5)	2 nd	1 st	1 st	1 st
Library of Congress (Q1 .A5 2 nd Copy)	2 nd	1 st	1 st	1 st
AJS editorial office, YU (Ohio University Library copy)	3 rd	2 nd	2 nd	1 st
Georgetown University (Q1 .A5)	3 rd	2 nd	2 nd	1 st
Lewis Library, PU (8001 .129)	3 rd	2 nd	2 nd	2 nd
Peabody Museum Archives, YU Copy 1	3 rd	2 nd	2 nd	2 nd
Individual unbound numbers:				
AJS editorial office, YU	1 st	1 st	1 st , 2 nd	2 nd
Imaged volumes:				
Harvard University**	1 st	1 st	1 st	1 st
University of California**	1 st	1 st	1 st	1 st
University of Chicago***	1 st	1 st	1 st	1 st
University of Michigan (SIL – microfilm 000449)	1 st	1 st	1 st	1 st
Boston Society of Natural History†	2 nd	1 st	1 st	1 st
Indiana University**	2 nd	1 st	1 st	1 st
University of Illinois, Urbana- Champaign**	2 nd	1 st	1 st	1 st
University of Minnesota**	2 nd	1 st	1 st	1 st
Missouri Botanical Garden††	3 rd	2 nd	2 nd	2 nd

* Institutional abbreviations: PU, Princeton University; SIL, Smithsonian Libraries; YU, Yale University.

** Hathitrust Digital Library (<https://www.hathitrust.org/>)

*** GoogleBooks (<https://books.google.com/>)

† Carnegie Mellon University Libraries Digital Collections (<http://digitalcollections.library.cmu.edu/>)

†† Biodiversity Heritage Library (<http://www.biodiversitylibrary.org/>)