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Shelley's Numerals

Paul Stephens
Leverhulme Early Career Fellow, University of York

Abstract. The manuscripts and notebooks of Percy Bysshe Shelley (1792–1822) contain several thousand numerical notations, from verse line counts to records of household expenses. Perhaps the most intriguing are the numerals representing large numbers over 500,000. Many have puzzled Shelley's greatest editors and remain unexplained in studies of his work. Why are they here? Where do they originate? What is their relationship to nearby materials? This article addresses these questions by examining a selection of the largest numerals in Shelley's manuscripts and notebooks of 1817–1822. It newly identifies the sources from which these numerals are drawn, including newspaper articles and books the poet consulted, and traces their connection to ideas in his great political essay, *A Philosophical View of Reform*, composed during the winter of 1819–1820. The article also considers the significance of numerical representation itself. It outlines how Shelley's numerals relate to his epistemological thought and achieve certain effects in his works for publication. Using a method of literary-numerical criticism, the article thus places the numerals centre stage to offer a fresh way of approaching the poet's mature writings.

One enduring mystery in the manuscripts and notebooks of Percy Bysshe Shelley (1792–1822) concerns the presence of various unexplained numerals.[1] There are several thousand numerical notations in the poet's notebooks alone, from single digits to those representing numbers in their billions. Many nestle between lines of verse or sketches of faces and trees. Some are written in neat ink whilst others are jotted in pencil. Some form part of calculations. Here we meet Shelley adopting the 'counting language' of arithmetic, using the four basic operations (addition; subtraction; multiplication; division) to create original numerical results (sums; differences; products; quotients).[2] Yet it is often unclear what these numerals and calculations signify. Why are they here? What do they mean? Where do they originate? With no obvious connection to nearby materials, they offer mere gleams of uncited reading and obscure memoranda. Neville Rogers once described the notebooks as Shelley's 'workshop' where he scribbles and edits and thinks.[3] The numerals are a vital part of this creative process too. They prompt us to consider how we appraise non-lexical materials in literary manuscripts

[1] In the Hindu-Arabic numeral system, *numerals* (e.g. '1,000,000') signify *numbers* (the idea of 'one million') using *digits* (1, 0). For Stephen Chrisomalis, numeral systems are 'relatively permanent, and primarily nonphonetic structured system[s] for representing numbers'. See *Numerical Notation: A Comparative History* (Cambridge, 2010), 3-4.
[2] Edward Kasner and James Newman, *Mathematics and the Imagination* (New York, 1940), 27.
[3] Neville Rogers, *Shelley at Work: A Critical Inquiry*, 2nd edn (Oxford, 1967), 1.

and how we might absorb them into our readings of neighbouring texts. They also foreground the distinctions between numerical notation systems and other writing systems, such as Latin script, and how we respond to their various graphemes. Can we close read numerals as we close read words? Can numerals be metaphors? Can their significance evolve?

Most of Shelley's numerical notations represent numbers under 5,000. A good portion of these smaller numerals are deciphered in the major facsimile editions of his manuscripts.[4] These numerals can be categorized into four groups and illustrated with examples from notebooks now held in the Bodleian Library, Oxford (hereafter Bod.). (1) Verse numerals relate to Shelley's composition of poetry. Including stanza numbers and line counts, they illuminate the genesis of poetic texts and his mastery of form. Clear examples appear in Bod. MS Shelley adds. e. 10, where an entire page of the notebook is devoted to sums monitoring progress on *Laon and Cythna* (1818).[5] (2) Bibliographical numerals relate to Shelley's reading. They demonstrate orderly notetaking and suggest an effort to recall sources for future use. Bod. MS Shelley adds. e. 7 features page numbers accompanying notes on the 1819 edition of David Hume's *The History of England* (1754–1761) and other works.[6] (3) Budgetary numerals relate to Shelley's income and expenditure. They indicate careful money management but also the spectre of insolvency. Bod. MS Shelley adds. e. 6 contains several pages used for currency calculations, including numerals representing Shelley's net annual income (£880) and its biannual (£440) and quarterly (£220) quotients.[7] These key figures recur in his notebooks from mid-1818 onwards.[8] Finally, (4) Sundry memoranda numerals are those whose purpose may be unclear but whose specificity indicates they represent *something* identifiable. Examples include a set of calculations on compound growth in Bod. MS Shelley adds. e. 8, a notebook used in the winter of 1820–1821.[9] Together, these various notations include cardinal numerals denoting quantity, ordinal numerals denoting sequence, and nominal numerals denoting identity. It might also be said that their meaning is determined by *what* they represent, *where* they appear, and *why* they were jotted down.

In contrast, many of the notations representing the largest numbers have puzzled Shelley's greatest editors. Over 100 numerals for numbers exceeding 500,000 appear in the notebooks alone, including same-page duplicates. One is the notation '1444000,000' in Bod.

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[4] *Shelley and His Circle, 1773–1822*, ed. Kenneth Neill Cameron et al., 12 vols (Cambridge, MA, 1961–2024); *The Manuscripts of the Younger Romantics: Percy Bysshe Shelley*, gen. ed. Donald H. Reiman, 9 vols (New York; London, 1985–1997); and *The Bodleian Shelley Manuscripts*, gen. ed. Donald H. Reiman, 23 vols (New York; London, 1986–2002). Editions hereafter *SC*, *MYRS*, and *BSM* respectively.

[5] Oxford, Bodleian Library, MS Shelley adds. e. 10, p. 216. See *BSM*, XVII, ed. Steven E. Jones (New York, 1994), 233.

[6] Oxford, Bodleian Library, MS Shelley adds. e. 7, pp. 255-47, 244-37 *reverso*. See *BSM*, XVI, ed. Donald H. Reiman and Michael J. Neth (New York, 1994), 231-5.

[7] Oxford, Bodleian Library, MS Shelley adds. e. 6, p. 106 *reverso*. Some expenses relate to the francesconi currency of Pisa in the Tuscan lira system (1 francescone = 10 paoli). See *BSM*, V, ed. Carlene A. Adamson (New York, 1997), 407.

[8] Coincidentally, the exchange rate in 1820 between sterling and francesconi fluctuated around 1:4.4 (i.e. £100 = Fr.440). See *The Letters of Percy Bysshe Shelley*, ed. Frederick L. Jones, 2 vols (Oxford, 1964), II, 165, 281-2n. Hereafter *Letters*.

[9] Oxford, Bodleian Library, MS Shelley adds. e. 8, pp. 127-8. See *BSM*, VI, ed. Carlene A. Adamson (New York, 1992). Adamson has 'no explanation' for the sums (481).

MS Shelley adds. e. 19, the first draft notebook for *Laon and Cythna* (Figure 1). In *BSM* XIII, Tatsuo Tokoo records that he 'cannot make out what is meant by the number'.[10] Another numeral appears in a notebook used by Shelley between 1819–1821 now held in the Huntington Library. A page stub features the notations '216000000000' and 'Two hundred & sixteen thousand millions of pense' (Figure 2). In *MYRS* VI, Mary A. Quinn terms them simply 'Monetary Memoranda', echoing H. Buxton Forman's uncertainty concerning their 'connexion' to Shelley's work.[11] Further notations appear on a leaf of draft lines for 'The Triumph of Life' (composed 1822), held in the Carl H. Pforzheimer Collection of Shelley and his Circle at the New York Public Library (hereafter NYPL). The recto features two multiplications with the products '23,040,000' and '2632000' (Figure 3). In *BSM* I, Donald H. Reiman concedes that he 'cannot suggest their possible significance'.[12] These comments demonstrate experienced editorial restraint from speculating on meanings without evidence and predate the digital archives that now aid our search for sources. They also indicate how Shelley's larger numerals remain marginalised in studies of his literary and political works.[13]

The present article responds by examining Shelley's larger numerical notations using a method of literary-numerical criticism. The method combines textual scholarship and hermeneutic interpretation to consider the fuller significance of the numerals and how we might read them as literary critics. It contributes to the recent mathematical turn in literary studies that explores the connections between numerical and lexical representation. For instance, Stefanie Markovits urges us to hone our 'number sense' to comprehend the 'numberiness' of nineteenth-century literary texts, and Anirudh Sridhar traces 'modernist poetry's resistance to the mathematization of reality'.[14] These fine studies focus on polished texts. In contrast, this article places manuscript notations centre stage. It introduces Shelley's use of large numerals (Section I), close reads several notations (Sections II–VI), and concludes with a coda on numerical representation (Section VII). Each reading identifies the origin of the numerals, from newspaper reports to items in the 'Manuscript List of Books from the Library of Percy Bysshe Shelley' (1818), a crucial document known as the 'Marlow List' now held in the NYPL.[15] Numerals are chosen for their connection to ideas in *A Philosophical*

[10] *BSM*, XIII, ed. Tatsuo Tokoo (New York, 1992), 12.
[11] *MYRS*, VI, ed. Mary A. Quinn (New York, 1994), 202; H. Buxton Forman, *Note Books of Percy Bysshe Shelley*, 3 vols (Missouri, 1911), I, 159.
[12] *BSM*, I, ed. Donald H. Reiman (New York, 1986), 315.
[13] The 'Calculations and Figures' section of the *BSM* General Index omits several larger numerals, such as '5100', '51000' (twice), and '5100,000' in Oxford, Bodleian Library, MS Shelley adds. e. 20, f. 24^{r}. See *BSM*, XXIII, ed. Tatsuo Tokoo and B. C. Barker-Benfield (New York, 2002), 310-11.
[14] Stefanie Markovits, *The Number Sense of Nineteenth-Century British Literature* (Oxford, 2025), 1; Anirudh Sridhar, *Agon: Poetry's Challenge to the Mathematization of Reality (1920s–1960s)* (Oxford, 2025), 252. See also Marilyn Gaull, 'Romantic Numeracy: The "Tuneless Numbers" and "Shadows Numberless"', *Wordsworth Circle*, 22 (1991), 124-31; and Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago, 1998).
[15] New York, NYPL, Pforzheimer Collection, MS S'ANA 1082. The 'Marlow List' is a 12-leaf inventory of c.315 works that Shelley possessed in February 1818. Nora Crook's annotated digital edition of 'The Marlow Shelley Library List' is forthcoming on *Romantic Circles*. Citations of the 'Marlow List' are indebted to Crook's edition.

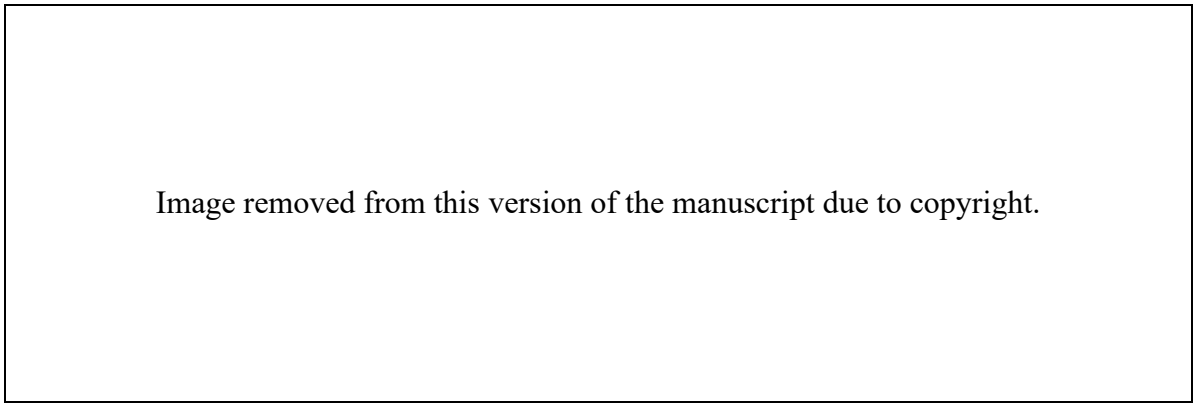

Fig. 1. Oxford, Bodleian Library, MS Shelley adds. e. 19, p. 4 (detail). CC-BY-NC 4.0. Photo © Bodleian Libraries, University of Oxford.
https://digital.bodleian.ox.ac.uk/objects/60631ca7-3e8a-435a-becc-f421fb142bcf/

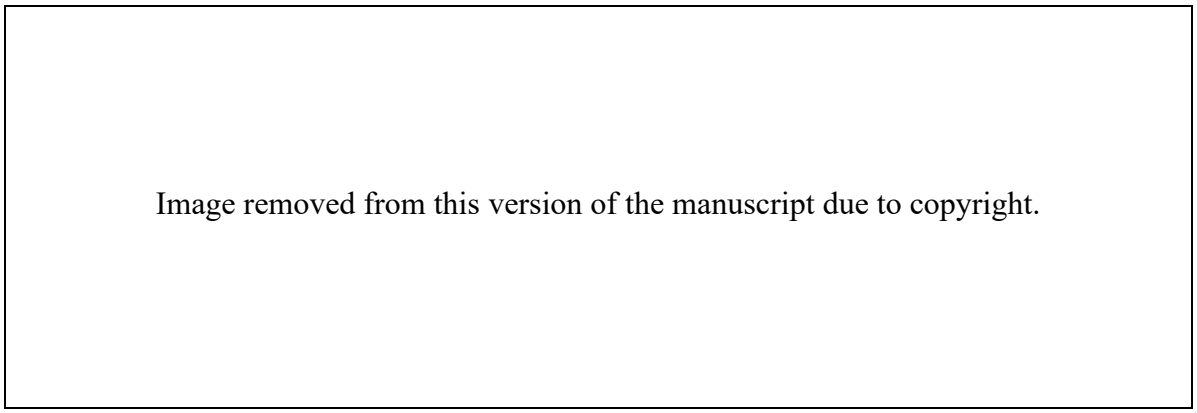

Fig. 2. Shelley's 1819–1821 Huntington Notebook No. 1. MS HM 2176, f. *1^{v} *reverso* (detail). CC-BY-NC 4.0. Photo © The Huntington Library, San Marino, California.
https://www.huntington.org/collections/lib-p16003coll18-52296?img=153

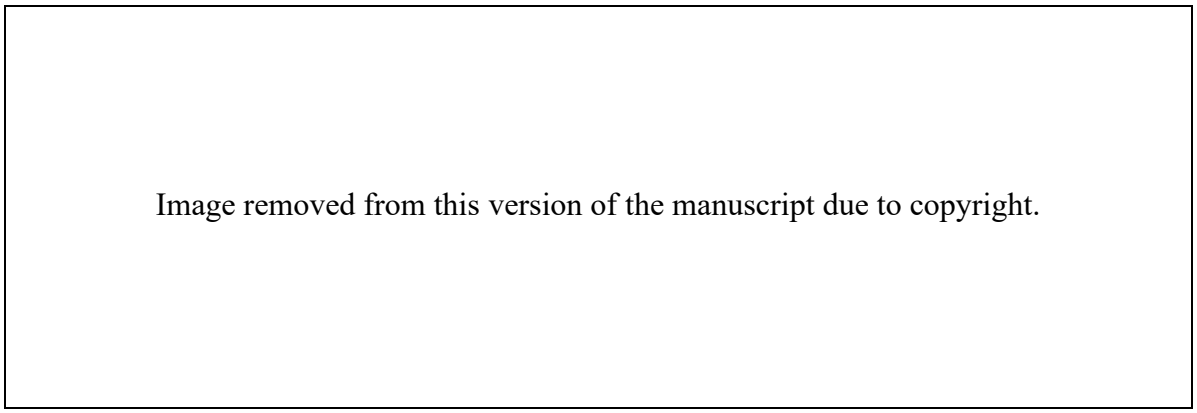

Fig. 3. Pforz. MS PBS 0283, f. 1^{r} (detail). Holograph poem (fragment), 'The Triumph of Life'. CC-BY-NC 4.0. Photo © The Carl H. Pforzheimer Collection of Shelley and His Circle, New York Public Library, Astor, Lenox, and Tilden Foundations.

View of Reform, the great political essay Shelley composed during the winter of 1819–1820.[16] Each reading in turn considers how numerical representation contributes to the essay's arguments. The numerals thus lead the discussion to offer new perspectives on Shelley's work and thought.

I. Approaching Shelley's Numerals

The strange power of large numbers was often noted by aestheticians in eighteenth-century Britain. Most agreed that such numbers compound our ideas concerning the awesome scale of large objects. For Edmund Burke, perceptions of 'vastness' or 'quantity' aroused by things like mountains excite a chain of physiological responses that generate a sense of terror or astonishment.[17] The awed mind then associates these objects with great importance. A vast 'army' evokes 'power' because 'great number is connected with other grand ideas', James Beattie suggests.[18] Such ideas could be reinforced by measuring the qualities of objects and representing them numerically. The longer the numerals the greater the sublime effect, until, like the largest objects, they conjure notions of infinity. 'Hence infinite space, endless numbers, and eternal duration, fill the mind with great ideas', Hugh Blair records.[19] Yet there were exceptions. 'Very large numbers' such as 'a *hundred thousand*, present great and sublime ideas', Joseph Priestley concedes, but 'the arithmetician' remains 'conscious of no sublime idea' as they 'decompose the largest numbers'.[20] The sublimity of large numbers thus depends on each mind's incapacity (fleeting or lasting) to apprehend constitutive units; the power associated with vast armies exceeding the sum of the powers of each soldier. The arithmetical conundrum of the sublime thus suggested a rift in our responses to quantifiable qualities (e.g. size) and abstract attributes (e.g. strength). This rift shaped Immanuel Kant's well-known distinction between the mathematical and dynamical sublime in *Kritik der Urteilskraft* (*Critique of Judgment*) (1790), ideas Shelley may have encountered by 1813.[21] The crucial point, however, is that large numerals can intimate abstract ideas that resonate beyond the particular phenomena they represent. In such instances, these unbound numerals are a form of figurative language.

Discussions of the sublime offer one way to approach the largest numerals that Shelley published during his life, which appear in *Queen Mab; a Philosophical Poem: With Notes* (1813).[22] The poem itself does not contain any numerals (except those numbering the cantos) but it does contain seven references to the idea of a 'million', used to convey the scale of

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[16] Transcribed in *SC*, VI, ed. Donald H. Reiman (Cambridge, MA, 1973), 945-1066. Hereafter *PVR*.
[17] Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (London, 1757), 51.
[18] James Beattie, *Dissertations Moral and Critical* (London, 1783), 610.
[19] Hugh Blair, *Lectures on Rhetoric and Belles Lettres*, 3 vols (Dublin, 1783), I, 56.
[20] Joseph Priestley, *A Course of Lectures on Oratory and Criticism* (London, 1777), 153.
[21] Shelley ordered 'Kant' from Thomas Hookham in December 1812, probably Friedrich Gottlob Born's Latin edition, containing sections on 'DE SVBLIMI MATHEMATICO' and 'DYNAMICO'. See Immanvelis Kantii, *Opera ad philosophiam criticam*, tr. Fredericvs Gottlob Born, 4 vols (Lipsiae, 1796–1798), III, 259-93; *Letters*, I, 342; and *The Poems of Shelley, Volume Six: 1822*, ed. Michael Rossington et al. (Abingdon, 2024), 415.
[22] Cian Duffy overlooks numerals in *Shelley and the Revolutionary Sublime* (Cambridge, 2009).

galaxies ('million constellations'), population ('millions lay'), and warfare ('million horrors').[23] However, numerals *do* appear in the opening two prose notes and are crucial to their effect. The notes connect to stanzas in Canto I, where Mab and the spirit of Ianthe traverse space. The first discusses light. '[I]n one year light travels 5,422,400,000,000 miles', Shelley explains, 'a distance 5,707,600 times greater than that of the sun from the earth' ('95,000,000 miles'), whose solar light takes '8' minutes and '7' seconds to reach us.[24] The second note discusses stars. Given 'the velocity of light, Sirius' is '54,224,000,000,000 miles from the earth', he continues, citing his source as the article on 'Light' in William Nicholson's *British Encyclopedia* (1807–1809).[25] These facts and figures indicate the poet's knowledge of contemporary astronomical theory. They also provide a gloss of cool scientific rigour to the fiery claim that such theory dispels 'the falsehoods of religious systems'.[26]

The notes do contain some arithmetical ambiguities. In Nicholson's article on 'Light', the velocity of light per second (VLS) is presented as 'about 195,000 miles': i.e. '95,000,000' miles ÷ 487, the seconds in 8 minutes 7 seconds.[27] Shelley cites the same dividend and divisor but presumes a lower VLS of 171,829 miles: i.e. 5,422,400,000,000, his velocity of light per year (VLY) ÷ 31,556,952, the total seconds in an average year.[28] Another ambiguity concerns the distance between Earth and Sirius. The *Encyclopedia* cites two quantifications of the distance – two trillion miles by Christiaan Huygens (1629–1695) and 19.4 trillion by William Herschel (1738–1822) – leaving Nicholson to comment vaguely that light from Sirius 'takes up many years to' reach us.[29] In contrast, Shelley's 54,224,000,000,000 miles (his VLY x 10) states firmly that Sirius is precisely 10 light years from Earth. A final ambiguity is Shelley's claim that the VLY is the product of 95,000,000 x 5,707,600, perhaps the result of mis-transcribing a draft calculation, such as 95,000,000 x 57,076 = 5,422,220,000,000. In any case, the figures in the notes are arithmetically incompatible.

One explanation for this mystery is that Shelley conjoins data from different sources. The only figures in the two notes that appear in Nicholson's *Encyclopedia* concern the Sun–Earth distance (95,000,000 miles) and the sunlight-to-Earth duration (8 minutes 7 seconds).[30] So where did Shelley derive his VLS and VLY? One candidate is *The Economy of Nature* (1798), a three-volume compendium on the natural sciences by George Gregory (1754–1808). Shelley acquired the third edition of the book (1804) in 1810, and his annotated copies of volumes I and II are now held in the NYPL.[31] Five of the 18 notations in volume I appear in Book III, on light. One note responds to Gregory's praise of Isaac Newton's elucidation of nature 'upon fewer and simpler principles', where Shelley underlines the adjectives and jots

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[23] *The Poems of Shelley, Volume One: 1804–1817*, ed. Kelvin Everest and Geoffrey Matthews (Harlow, 1989), 265-423 (Canto I, line 233; IV, line 85; V, line 256).
[24] *Poems*, I, 360.
[25] *Poems*, I, 361.
[26] *Poems*, I, 360.
[27] 'Light', *The British Encyclopedia*, ed. William Nicholson, 6 vols (London, 1809), IV [unpaginated]. Edition hereafter *Encyclopedia*.
[28] See *The Complete Poetry of Percy Bysshe Shelley*, vol. 2, ed. Donald H. Reiman and Neil Fraistat (Baltimore, 2004), 596. Edition hereafter *CPPBS*.
[29] 'Stars', *Encyclopedia*, VI; 'Sun', *Encyclopedia*, VI; 'Light', *Encyclopedia*, IV. See *CPPBS*, II, 597.
[30] 'Light', *Encyclopedia*, IV.
[31] New York, NYPL, Pforzheimer Collection, MS 557R 03.

'one of which is the immateriality of light'.[32] Nearby, Gregory presents the VLS as '*one hundred and seventy thousand miles*' and the sunlight-to-Earth duration as 'eight minutes and twelve seconds', attributing the data to James Bradley (1692–1762).[33] Shelley's VLS (171,829) is closer to Gregory (170,000) than to Nicholson (c.195,000). Moreover, the percentage difference between the VLS of Shelley and Gregory is identical to that between the sunlight-to-Earth duration-in-seconds of Gregory (492) and Nicholson (487): 1.01 per cent. Did Shelley muddle up his figures when calculating the VLY? Maybe. Such arithmetical coincidences do suggest the challenges of summarising complex and contrasting astronomical data for general audiences.

Yet we miss something vital about the numerals if we focus solely on *Queen Mab*'s unusual arithmetic and citations. Many readers of the poem will not care whether the VLY is 5,422,400,000,000 or 5,422,220,000,000 miles. The point is that light is *very* fast. Nicholson describes astronomy as 'the most sublime of all the sciences' because it traces the 'amazing velocity' and 'magnitude' of celestial events.[34] Shelley too evokes the astronomical sublime when noting the 'awful' and 'indefinite immensity of the universe', whose 'millions of suns' urge us to resist 'deifying the principle of the universe'.[35] Numerical representation aids the effect. The distance to Sirius could be presented lexically as fifty-four trillion two hundred and twenty-four billion miles (in short scale form), but this is rather hard to grasp. Instead, '54,224,000,000,000' is a lucid vehicle for its tenor; the nine '0' digits suggesting a chain of planets strung across a solar system with delimiter commas as nimble tailed comets. It is a compelling visual metaphor that enhances the imagery of the verse. Indeed, Hindu-Arabic numerals are well suited to express 'indefinite immensity'; their capacity for endless extension by the assimilation of more and more digits soon exceeds our lexical expression of number.[36] In this way, numerals can articulate ideas beyond the ken of language in ways akin to the subtle intimations of poetry.

Shelley's published numerals can help us read the larger numerical notations in his manuscripts and notebooks. Let's consider the notations '44,000,000' and 'a thousand millions' in Bod. MS Shelley adds. e. 12, a notebook used between 1818–1821 to draft *Prometheus Unbound* (1820) and translate several Homeric Hymns (Figure 4).[37] The page on which these notations appear features a bricolage of materials: sketches of circles, winged orbs, and a head; other numerals; a note on economics; draft lines for 'The Sensitive Plant' (composed 1820). These materials are orientated vertically and horizontally on the page, sometimes overlapping, inscribed in both pencil and ink. To interpret the numerals, we might use the dating of nearby materials to indicate their bibliographical derivation. Plausible meanings thus emerge from Shelley's reading on economics (see Section IV) and demography (see Section VI). Each topic can be evidenced by pairing the notations with other materials, such as the economic note or the human head. However, the notations ultimately remain too

[32] George Gregory, *The Economy of Nature*, 3rd edn, 3 vols (London, 1804), I, 194.
[33] Gregory, *Economy*, I, 188.
[34] 'Astronomy', *Encyclopedia*, I.
[35] *Poems*, I, 360-1.
[36] Chrisomalis, *Numerical*, 22.
[37] Oxford, Bodleian Library, MS Shelley adds. e. 12; *Poems*, VI, xxix.

numerically indistinct to affirm their origins. Nor do they possess any obvious arithmetical relationship that might suggest the phenomena they quantify.

Nonetheless, the literary-numerical critical method considers the indeterminacy of a notation such as '44,000,000' as a quality that itself requires interpretation. This approach takes cues from Nancy Moore Goslee's *Shelley's Visual Imagination* (2011). Goslee traces the connections in the notebooks between 'poetic verbal texts' and 'graphic' materials such as 'sketches', the latter shaping 'images and themes' in finished poems but also revealing 'frictions between visual and verbal' representation.[38] One reason why Goslee overlooks Shelley's *numerals* might be that numerals sit between the 'poetic' and the 'graphic': they are signs in a notation system (like words) but are exterior to the verse texts (like sketches). In *BSM* XVIII, Goslee does suggest some kinship between numerals and sketches in Bod. MS Shelley adds. e. 12, observing how 'a set of zeros' in the pencil notation '300,000,000' are turned into '2 eggs' in dark ink (Figure 4), matching 'sun disks' on the same page.[39] But this indicates how the sketches themselves are ambiguous: the 'sun disks' might just as easily correlate to 'the wide-winged Moon' in 'To the Moon', a Homeric Hymn translated elsewhere in the notebook.[40] Like sketches, then, some of Shelley's numerals remain inscrutable too. They may signify notetaking, or musings on vastness, or dim impulses, or idle doodles. Such numerals appear to us as floating signifiers, irreducible to any single interpretation and as evocative as a metaphor. It is thus the task of the literary critic as much as the arithmetician to illuminate their meaning and significance.

II. 880,000

Shelley's enduring interest in the astronomical sublime is revealed by several notations in his notebooks. One example is accompanied by textual notes that indicate their origin. These appear in Bod. MS Shelley e. 2, the second intermediate fair copy notebook for *Prometheus Unbound*, used by Shelley between April and May 1819.[41] The front pastedown endpaper features three calculations. Two open with similar notations: '880,000 an hour' and '880,00,0 – in an hour' (Figure 5). In *BSM* IX, Neil Fraistat posits some connection to 'astronomical' phenomena, noting that the numeral is 'multiplied by 24 to find the rate per day' ('21120000') and 'divided by 60 to find the rate per minute' (rounded to '14600').[42] In the former calculation, Shelley partitions the multiplier (24) and multiplies '880,000' by each part (i.e. x 20 = '17600000'; x 4 = '3520000') then adds these figures to confirm the product ('21120000'). The multiplication is jotted in pencil and the division in neat ink. This could indicate they were written on separate occasions, the figures haunting Shelley's imagination.

The numeral '880,000' originates in *Astronomy Explained upon Sir Isaac Newton's Principles* (1756) by James Ferguson (1710–1776), where it relates to the velocity of the Great

[38] Nancy Moore Goslee, *Shelley's Visual Imagination* (Cambridge, 2011), 3-4, 13.
[39] *BSM*, XVIII, ed. Nancy Moore Goslee (New York, 1996), 53.
[40] Oxford, Bodleian Library, MS Shelley adds. e. 12, p. 230; *The Poems of Shelley, Volume Two: 1817–1819*, ed. Kelvin Everest and Geoffrey Matthews (Oxford, 2000), 340 (l.3).
[41] Oxford, Bodleian Library, MS Shelley e. 2; *Poems*, II, 458.
[42] *BSM*, IX, ed. Neil Fraistat (New York, 1991), 558.

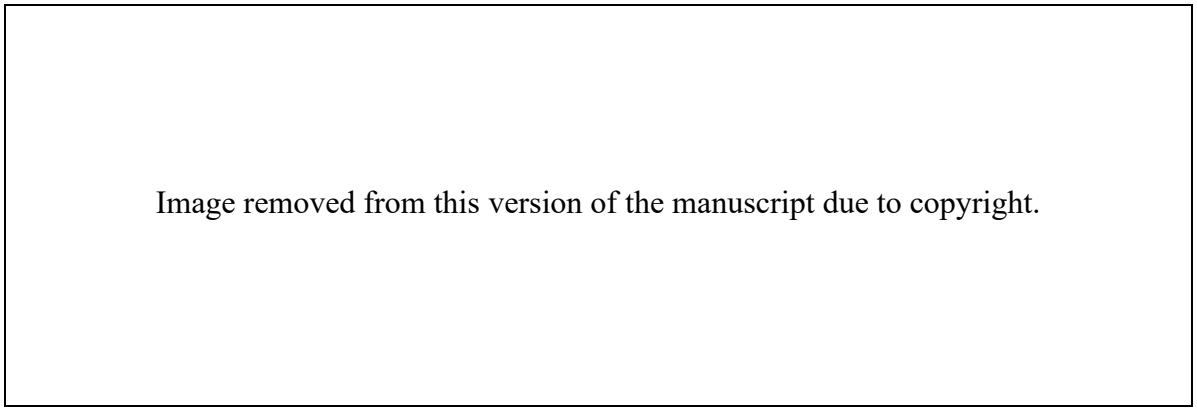

Fig. 4. Oxford, Bodleian Library, MS Shelley adds. e. 12, p. 48 (detail). CC-BY-NC 4.0. Photo © Bodleian Libraries, University of Oxford.
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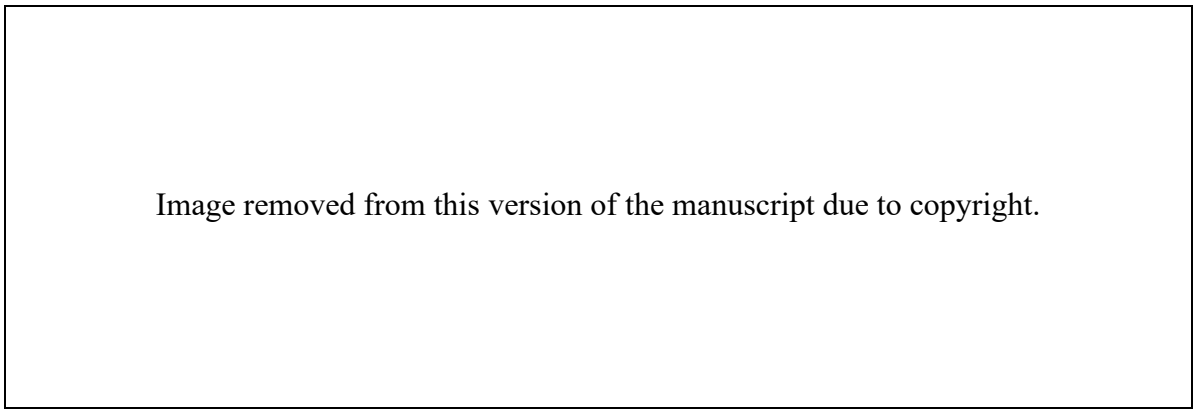

Fig. 5. Oxford, Bodleian Library, MS Shelley e. 2, front pastedown endpaper (detail). CC-BY-NC 4.0. Photo © Bodleian Libraries, University of Oxford.
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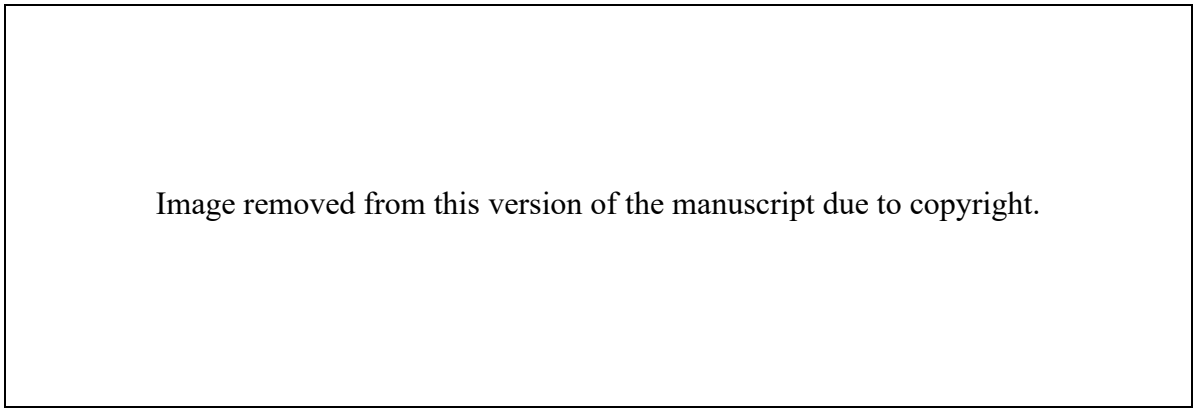

Fig. 6. Shelley's 1819–1821 Huntington Notebook No.1. MS HM 2176, f. *1[r] (a) *reverso* (detail). CC-BY-NC 4.0. Photo © The Huntington Library, San Marino, California.
https://www.huntington.org/collections/lib-p16003coll18-52296?img=155

Comet of 1680. Ferguson's popular book offers a lucid English language introduction to Newton's *Philosophiæ Naturalis Principia Mathematica* (1687). In Book III Proposition XLI of the *Principia*, Newton calculated the velocity and parabolic solar orbit of the 1680 comet using the ecliptic coordinate system, with associated illustrations and tables of data substantiating his theory of universal gravitation.[43] Ferguson restates all this in livelier terms. His opening chapter ('A Brief Description of the Solar System') describes the 'chaotic state' of comets as 'hells to punish the damned with perpetual vicissitudes of heat and cold'.[44] Of the 21 comets observed traversing our solar system, the 1680 comet was one of only three to have a computed orbit and perihelion. 'In that part of its Orbit which is nearest the Sun', Ferguson explains, 'it flies with the amazing swiftness of 880,000 miles in an hour'.[45] The key numeral is not presented directly in the *Principia* but is attributed to Newton all the same.

There is no evidence that Shelley read *Astronomy*. However, Ferguson's compelling descriptions were soon absorbed into other publications. One example is *Geographical, Historical, and Commercial Grammar* (1770), a popular compendium assembled by the historian William Guthrie (1708–1770). From the third edition onwards (1771), Ferguson is cited as the author of the opening chapter on 'Astronomical Geography', which records the 1680 comet's 'amazing velocity of 880,000 miles in an hour'.[46] 'Gutheries Geography' appears in the 'Marlow List' (f. 6^{v}). Shelley thus possessed the book in February 1818 but did not transport it when he moved to Italy the following month. However, he did consult it in 1822 (see Section VI). He may thus have re-acquired it by April 1819, perhaps in one of the parcels sent 'quarterly' by Thomas Love Peacock and Charles Ollier, or instead browsed a copy in Italy, perhaps borrowed from John and Maria Gisborne whom he met in May 1818.[47] Ferguson's book was also used as a base text for the article on 'Astronomy' in the first edition of the *Encyclopædia Britannica* (1771).[48] It was probably the fifth edition of the *Encyclopædia* (1814–1817) that Shelley borrowed from Maria Gisborne's son, Henry Reveley, in May 1820, from which he read the now-expanded 'Astronomy'.[49] Both versions of the article present the 1680 comet's velocity as '880,000 miles' an hour.[50] The *Encyclopædia* is a plausible source for other notations too. In the Huntington notebook MS HM 2176 (used 1819–1821), one page features the notations '240,000' and '33000,000' near the verse fragment 'And like a dying lady lean and pale' (1819).[51] Echoing the poem's lunar

[43] Isaac Newton, *Philosophiæ Naturalis Principia Mathematica* (London, 1687), 487-509.
[44] James Ferguson, *Astronomy Explained upon Sir Isaac Newton's Principles* (London, 1756), 29-30.
[45] Ferguson, *Astronomy*, 28-9.
[46] William Guthrie, *A New Geographical, Historical, and Commercial Grammar*, 20th edn (London, 1806), 6.
[47] *Letters*, II, 17n, 23, 31.
[48] Patricia Rothman, 'James Ferguson (1710–1776)', *Oxford Dictionary of National Biography* (pubd online Sept. 2004) <https://doi.org/10.1093/ref:odnb/9320> accessed 2 Mar 2026.
[49] *The Letters of Mary Wollstonecraft Shelley*, ed. Betty T. Bennett, 3 vols (Baltimore; London, 1980–1988), I, 142; *The Journals of Mary Shelley 1814–1844*, ed. Paula R. Feldman and Diana Scott-Kilvert, 2 vols (Oxford, 1987), I, 318-9. Hereafter *MWSL* and *MWSJ* respectively.
[50] 'Astronomy', *Encyclopædia Britannica*, 5th edn, 20 vols (Edinburgh, 1814–1817), III, 9-189 (104).
[51] San Marino, Huntington Library, Shelley's 1819–1821 Huntington Notebook No.1. MS HM 2176, f. *2^{r} *reverso*. See *The Poems of Shelley, Volume Three: 1819–1820*, ed. Jack Donovan et al. (Oxford, 2011), 19; *MYRS*, VI, lxxxiv-lxxxvi.

imagery, the former numeral matches the *Encyclopædia*'s figure for the distance in miles between the Earth and Moon.[52]

Comets recur in Shelley's verse like their cousins in the night sky, auguries of personal and social disruption. In early poems such as 'The Wandering Jew' (c.1809–1810), the 'sulphurous glare / Of comets' witness Paulo and Rosa's doomed affair, and in 'Zeinab and Kathema' (c.1811) the heroine's fall turns a 'sweetly-beaming star' into 'a comet horrible'.[53] Comets in *Prometheus Unbound* herald social change. In Act I, Earth explains their genesis to Prometheus, where 'fire / From earthquake-rifted mountains' is 'portentous hair'.[54] The lines evoke the Greek root of comet, *κομήτης*, or 'long-haired star'.[55] The image recurs in Act II scene iv, where Asia perceives in 'the purple night' (l.129) some 'rainbow-winged steeds' (l.30) whose 'locks / Stream like a comet's flashing hair' (ll.138-9) driven (as Demogorgon notes) by 'the immortal Hours' (l.140). Another appears in Act IV, where Panthea censures 'some God / Whose throne was in a comet' that 'passed' and 'were no more' (ll.316-8). The lustre and pace of these comets convey the poem's dream that the glare of tyranny will itself soon pass and fade. Shelley's calculations on the 1680 comet express the same wish. They are arithmetical metaphors of hope, comparable to the comets in the poem he was perfecting in the same notebook.

Each of Shelley's plausible sources quantify other qualities of the 1680 comet, including its temperature, apsis, and size. His focus on the comet's *velocity* suggests a specific anxiety about the pace of social change. A recurring theme in his writings of 1819–1820 is the need to balance swift reform with grander transformation. The *Philosophical View* thus places Britain's immediate socio-economic challenges in their geopolitical context. Part I of the essay outlines why the failed revolution in France was rash: 'the oppressed', 'rendered brutal' by 'institutions', had enacted a 'desire' for 'revenge' that 'arose from the same source as their other miseries' (*PVR*, 978-9). For Shelley, only 'the exercise of the highest powers' of humankind could ensure lasting change (979-80). These powers could be stimulated and nurtured by our greatest writers. John Milton's works are thus 'ominous comets […] perplexing monarchs with fear of change' (986). But until such works can generate the enlightened conditions for 'successful insurrection', revolution and reform must coalesce (985). Shelley's calculations express this duality. He transforms the numeral '880,000' (miles per hour) into two figures absent from his sources: '21120000' (miles per day) and '14600' (miles per minute). The comet's speed remains unchanged, but its numerical expression is altered into distinct figures. Likewise, Shelley's radical impulse remains unchanged whether promoting grander transformations or modest reforms. The calculations thus symbolise his preferred political praxis.

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[52] 'Astronomy', *Britannica*, III, 36, 139. The notation '33,000,000' may concern the '33 millions of miles' presented as the length of the tail of the Great Comet of 1811 in 'Astronomy', *Encyclopedia*, I. Shelley plausibly possessed Nicholson's *Encyclopedia* in Italy. See *Letters*, II, 295.
[53] *Poems*, I, 48 (Canto I, lines 205-6); 177 (lines 171, 173).
[54] *Poems*, I, 487n.
[55] *Poems*, II, 487 (I, lines 166-8).

III. 1,444,000,000

Shelley's political thought was shaped by his reading of economic history. One indication of this interest might be the notation '1444000,000' in Bod. MS Shelley adds. e. 19, a notebook used in April 1817 to draft Cantos I and II of *Laon and Cythna* (Figure 1).[56] The numeral follows a crease in the top-left corner of a page that features the opening of 'Frail clouds arrayed in sunlight lose the glory', a draft prelude to the longer poem. The notation is written neatly in dark ink, contrasting with the light ink of the verse but matching the ink of several edits. This suggests it was written after the verse and perhaps transcribed directly from a source. But what source? Bryan Shelley suggests Revelation 7:4, where 144,000 Israelites receive the holy seal.[57] Another possibility is the 144,000,000 miles distance between the Sun and Mars, the 'blood-red Comet' in Canto I. This figure appears in Nicholson's *Encyclopedia* and in *An Introduction to Astronomy* (1786) by John Bonnycastle (c.1751–1821), a work itemised as 'Bonnycastles Astronomy' in the 'Marlow List' (f. 3^{r}).[58] Yet neither figure matches the notation and comparable numerical misreadings can probably be found.

If the numeral is an accurate transcription, then it may originate in *Théorie du Crédit Public* (1816) by Albert-Joseph-Ulpien Hennet (1758–1828). Chevalier Hennet worked for decades in France's Department of Finance, first at the Treasury under Jacques Necker in 1777 and later as Commissaire Royal at the ministerial Cadastre.[59] His major work of economics mines the state archives to offer an original history of French finance. It also examines Britain's finances via translated extracts of recent works by writers such as Robert Hamilton (1743–1829). The numeral itself appears in Book III section VI, covering the late reign of Louis XIV during the War of the Spanish Succession (1701–1714). The section compares France's historical wartime economy to the dire conditions of the 1810s. 'France se trouvait encore au milieu de cette guerre […] contre presque toute l'Europe' (France was still in the midst of this war […] against almost all of Europe), Hennet notes, 'les finances étaient dans une situation déplorable' (the finances were in a deplorable state).[60] In 1707, Michel Chamillard (then Contrôleur Général des Finances) tried to ease the crisis by circulating 'billets de la banque', a new form of 'papier-monnaie' that anticipated the notorious innovations of John Law (Contrôleur in 1720).[61] Expanding the money supply in this way sought to bolster tax revenues and reduce the nation's deficit. It did not work, and by 1708, France had amassed an enormous debt of '1,444,000,000' livres.[62]

There is no evidence that Shelley read *Théorie*. The book appeared in France in early November 1816, two months after the poet returned to Britain from a tour of Switzerland.[63] Domestic reviews only appeared in May 1819, over a year after his later move to Italy. The reviews praised the book's 'excellent history of the French finances' and deemed it 'the best

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[56] *BSM*, XIII, xxviii-xxix; and *Poems*, II, 3.
[57] Bryan Shelley, *Shelley and Scripture: The Interpreting Angel* (Oxford, 1994), 64.
[58] John Bonnycastle, *An Introduction to Astronomy* (London, 1786), 39; 'Astronomy', *Encyclopedia*, I.
[59] William Playfair, *France as it Is, Not Lady Morgan's France*, 2 vols (London, 1819), I, 137.
[60] Chevalier [Albert-Joseph-Ulpien] Hennet, *Théorie du Crédit Public* (Paris, 1816), 148.
[61] Hennet, *Théorie*, 144.
[62] Hennet, *Théorie*, 148.
[63] *Bibliographie de la France* 45 (9 November 1816), 492.

history of the causes of the French Revolution'.[64] They also praised Hennet's warnings over the excessive circulation of fiat currency, i.e. money sanctioned by the state with no intrinsic value nor backed by a material commodity (such as gold). Shelley probably missed these reviews, but he may have encountered Hennet's pamphlet *Essai d'un Plan de Finances* (published in February 1816) during his summer tour.[65] This may have prompted him to seek out *Théorie*. For instance, his now-unlocated letter dated 9 November 1816 to Genevan publisher J. J. Paschoud requests several books, perhaps the 'continental packet' he eagerly awaited in May 1817.[66] Yet there is no mention of Hennet in Shelley's surviving works, despite Mary Shelley's journal recording several French publications on comparable themes he *did* read in 1816, such as Jean-Charles-Dominique de Lacretelle's *Précis Historique de la Révolution Française* (1801–1806).[67]

Did Shelley find Hennet's debt figure elsewhere? The numeral appears in at least two newspaper articles published outside Britain between 1818–1819. The first is a review of *Théorie* in *Le Moniteur Universel*, France's concise newspaper of record, on 14 March 1818. This was two days after Shelley arrived in France on route to Italy and the day after a stay in a 'magnificent hotel' in Saint-Omer.[68] If Shelley browsed the paper that morning, he may have jotted the only large numeral in the review: 'En 1708 […] la dette était de 1,444,000,000'.[69] If so, the notebook joins those containing materials composed before *and* after March 1818 and also transcriptions from French publications.[70] The second article appeared in *Galignani's Messenger*. Published daily in Paris and circulated across Europe, *Galignani's* reprinted articles from Britain's ministerial press within days of home publication. Shelley was a regular reader in Italy.[71] During the winter of 1818–1819, a series of 11 articles on 'Public Loans' outlined the financial histories of several nations. The article on 4 January 1819 notes that France's 1708 'Debt amounted to 1,444,000,000' and cites 'Hennet' as its authority.[72] If this was Shelley's source, then the numeral could have been jotted any time after this date, as the Shelleys sometimes retained copies of newspapers.[73]

Whatever the notation's origin, the publication of Hennet's book coincides with Shelley's earliest discussions of Britain's own national debt. These appear in a letter to Lord Byron on 20 November 1816 and the following autumn in *An Address to the People on the Death of the Princess Charlotte* (1817).[74] Like Hennet, the pamphlet aligns public debt with

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[64] *The Literary Chronicle and Weekly Review* 1 (22 May 1819), 9-10; *The Monthly Magazine* 330 (1 September 1819), 143.
[65] *Bibliographie de la France* 5 (3 February 1816), 45. Hennet's publications would appeal to Shelley: *Du Divorce* (1789) censures marriage and *Poétique Anglaise* (1806) praises republicanism.
[66] *Letters*, I, 512, 541.
[67] *MWSJ*, I, 138.
[68] *MWSJ*, I, 197-8.
[69] *Le Moniteur Universel* 73 (14 Mars 1818), 326.
[70] These notebooks include Oxford, Bodleian Library, MS Shelley adds. e. 4; and e. 12. See *BSM*, III, ed. P. M. S. Dawson (New York, 1987), xiii; *BSM*, XVIII, xvii; and *CPPBS*, vol. 3, ed. Donald H. Reiman et al. (Baltimore, 2012), 480.
[71] See *Letters*, II, 188-93.
[72] *Galignani's Messenger* 1213 (4 January 1819), 4. See also 1219 (11 January 1819), 4.
[73] *MWSL*, I, 168, 183, 185, 188.
[74] *Letters*, I, 513.

martial pursuits. The debt was 'invented by the ministers of William III' during the 1690s as a 'method of anticipating […] taxes by loans', Shelley explains, monies used to finance the Nine Years War (1688–1697).[75] Later in *Philosophical View*, the debt is seen as 'chiefly contracted in two liberticide wars', i.e. the Revolutionary Wars in America (1775–1783) and France (1792–1802) (*PVR*, 1028). It had also generated a 'double aristocracy', the old landed gentry now joined by a new class of 'public creditors'.[76] This connected the debt to the issue of fiat currency. In Britain, the circulating value of fiat currency had risen sharply since William Pitt's Bank Restriction Act 1797. The Act suspended the convertibility of representative money for specie to protect Britain's bullion reserves during its wars with France. Shelley insisted that fiat currency was fraud. '[I]n substituting a currency of paper' for 'gold', the government now circulates 'fabricated pieces of paper' (1013). This caused several problems: inflation; tax rises; devaluation. The list went on. The 'scheme of public credit' is a 'contrivance of misrule' that replaced traditional 'rule by force' with 'rule by fraud' (1003, 1010). Shelley cites William Cobbett's *Paper Against Gold* (1815) as a source for these ideas, but they also echo Hennet in associating the debt, fiat currency, and war.[77]

If the notation '1444000,000' represents Hennet's figure, then it correlates with Shelley's historical contextualisation of Britain's recent woes. It also foregrounds the slipperiness of monetary quantification. Central to *Philosophical View* is the claim that public credit is merely a modern manifestation of the timeless 'spirit of fraud & tyranny' (*PVR*, 967). This alone is hard to prove. Yet the claim foregrounds how the numerical representation of financial phenomena itself morphs over space and time. Consider historical exchange rates. In *France as It Is* (1819), William Playfair cites Hennet's debt figures for 1661 (545,000,000 livres) and 1720 (2,696,000,000 livres) and presents their sterling equivalents (£22,300,000 and £110,000,000) using a fixed exchange rate of 1:0.041.[78] This helped readers in Britain to comprehend the scale of France's historical debts. But the figures remain approximate; the rate would have fluctuated during these decades, and the sterling figures are not adjusted for inflation. Using Playfair's rate, the 1708 debt of 1,444,000,000 livres would equate to £59,204,000 and thus to c.£151,158,000 in 1819.[79] These are vastly different numerals that represent the same referent using the same notation system of digits. Such numerical synonyms demonstrate how quantification depends on context, and how numerals, like most words, require careful translation.

IV. 216,000,000,000

The ambiguities of financial quantification are the subject of other calculations in Shelley's manuscripts. Good examples appear in the Huntington notebook MS HM 2176 near the lunar fragment 'And like a dying lady lean and pale'. One is the notation '216000000000' and its

[75] *The Prose Works of Percy Bysshe Shelley*, Vol. 1, ed. E. B. Murray (Oxford, 1993), 229-39 (235). Hereafter *Charlotte*.
[76] *Charlotte*, 235.
[77] Shelley urges us to 'read Cobbets Paper against gold' (*PVR*, 1014).
[78] Playfair, *France*, I, 131-3; Hennet, *Théorie*, 124, 173.
[79] Bank of England, *Inflation Calculator* (pubd online Feb. 2026) <https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator> accessed 23 Mar 2026.

description as ‘pense’ (Figure 2). The numeral reappears in two nearby calculations. One in light ink multiplies ‘900,000,000’ by ‘24’. Here, Shelley partitions the multiplier, then adds the products ‘1800000,000’ (missing a ‘0’) and ‘3600,000,000’ to generate ‘21,600,000,000’ (f. *1^{r}(a) *reverso*). Another in dark ink divides ‘216000,000,000’ by ‘12’ to produce ‘18000,000,000’ then divides this by ‘20’ to produce ‘900,000,000’ (Figure 6). The divisors ‘20’ and ‘12’ indicate that the second calculation relates to British sterling (£1 = 20 shillings; 1 shilling = 12 pence) and that £900 million equals 216 billion pennies.[80] But why would anyone wish to know this?

The probable answer is that £900 million was the approximate official book value of Britain’s national debt for 1819. The formal statement of the debt was prepared by the Treasury at the start of each year. *The Finance Accounts of The United Kingdom of Great Britain and Ireland, I–VIII, for the Year Ended Fifth January 1819* appeared in March 1819 and soon after in Hansard’s *Parliamentary Debates* (1819). The *Finance Accounts* itemised the two main portions of the debt payable in Britain. The *funded* debt was chiefly composed of the gross capital balance of long-term bonds and perpetual annuities (£900,212,132).[81] From this was deducted life annuities granted by the Commissioners for the Reduction of the National Debt, leaving a net funded debt of £797,401,119.[82] The *unfunded* debt was composed of short-term exchequer and treasury bills (£51,992,095).[83] The two portions generated an annual interest charge of £44,648,738.[84] However, each portion was serviced differently. The unfunded debt was expected to be redeemed each year through tax receipts. This could be achieved by increasing taxes or broadening the tax base through commercial expansion. For the funded debt, only the interest it generated required payment. This was manageable if the growing debt was proportionate to the growing economy.

Britain’s recession of 1819 prompted fierce parliamentary debates over the debt accounts. Most agreed that the debt was too large but disputed which portion was most important. On 26 January, Whig MP Robert Wilson declared that ‘the people of this country’ cannot ‘pay the taxes necessary’ in ‘discharging a debt of 800,000,000l.’ (the net funded debt).[85] On 18 May, Whig MP (and Leader of the Opposition) George Tierney observed that ‘the whole amount of the funded and unfunded debt was 845,000,000’, raised to ‘900 millions’ by Irish Whig MP Christopher Hely-Hutchinson.[86] Others claimed that the real issue was the annual interest of £40–45 million.[87] Each figure was used to stress the Tory government’s fiscal incompetence. In December, a new Treasury report sought to bring some clarity by contrasting the 1819 accounts with the annual data since 1786.[88] The newspapers swiftly

[80] It is unclear why ‘900,000,000’ is multiplied by ‘24’ if the multiplicand does relate to sterling.
[81] *The Parliamentary Debates from the Year 1803 to the Present Time*, ed. T. C. Hansard (London, 1819), XL [3 May to 13 July 1819], Appendix, xxvii-lxxiv (xlix-l). Figures rounded to the nearest pound.
[82] Hansard (ed.), *Debates*, xlix-l.
[83] Hansard (ed.), *Debates*, lix-x.
[84] Hansard (ed.), *Debates*, xlv-xlvi.
[85] *Galignani’s* 1236 (1 February 1819), 2.
[86] *Galignani’s* 1329 (24 May 1819), 3; Hansard (ed.), *Debates*, 1498.
[87] *Galignani’s* 1246 (12 February 1819), 1; *Examiner* 621 (21 November 1819), 741.
[88] *Accounts of the Funded and Unfunded Debt of the United Kingdom of Great Britain and Ireland; 1786–1819* (London, 1819), 7-8.

trumpeted the findings: the gross funded debt was now £1,181,504,362 with interest of £45,749,296.[89] It would continue to grow if *ceteris paribus* there were annual shortfalls between the interest and the revenues. Shelley almost certainly read the transcriptions of these ongoing debates in *Galignani's* and Leigh Hunt's liberal *Examiner*. The notebook notations '44,000,000' and 'a thousand millions' in Bod. MS Shelley adds. e. 12 may thus approximate key figures drawn from these articles (Figure 4).

Shelley's economic writings repeatedly quantify the interest on the debt. In *Charlotte* the interest is 'an annuity of forty-four millions a year levied upon the English nation'.[90] In *Philosophical View* it is 'forty four millions', '45000,000', and '~~forty six millions~~' (*PVR*, 1029, 1031, 1038). Whatever the amount, the interest was troublesome because it was used to justify tax increases. This occurred in June 1819, when the government introduced a new indirect tax to raise £3 million.[91] The tax was disproportionately borne by the poor in their consumption of subsistence goods, compounding the effects of high corn prices inflated by the Importation Act 1815. '[T]he *mere interest* of the public debt' is 'more than twice as much as the lavish expenditure of the public treasure', Shelley records.[92] It was 'an \eternal/ rent charge' generating 'an unequal distribution of the means of living' (*PVR*, 1029). Others agreed. In *An Essay on the Reduction of the Interest of the National Debt* (1816), John Ramsay McCulloch explained that new taxes (and even the Corn Laws) were unnecessary if state spending was curbed. Retrenchment could be achieved by reducing the rate of interest on the debt, which since 1794 had grown by 'five hundred millions' to generate '45 or 46 millions' of interest.[93] McCulloch believed that most would welcome lower taxes and tariffs, and that cordial stockholders would accept a reduction from 10 to 5 per cent on yields.[94] Comparable ideas appear in Shelley's letters to the Gisbornes in November 1819, where he argues the case to 'reduce the interest of the national debt'.[95]

Shelley's interest figures demonstrate his careful research. It is therefore curious that he never quantifies the debt itself in his works for publication. Instead, *Charlotte* and *Philosophical View* merely discuss an 'enormous debt' 'contracted \in an overwhelming emergency/' to fund 'a vast standing army' and other excessive costs.[96] If the notebook numeral '900,000,000' *does* concern the debt of 1819, then it indicates that Shelley chooses to omit known debt figures from the latter essay. Why? Perhaps pinning a figure on the debt might somehow dim the potent notion that it manifests the spirit of Tyranny. The debt thus remains an obscure spectre haunting the poor, unquantified but terrifying in size and power.

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[89] *Examiner* 627 (2 January 1820), 9; *Galignani's* 1523 (7 January 1820), 2.
[90] *Charlotte*, 236.
[91] Tierney decried the 'additional burden of three millions' and denied 'a debt of 8,600,000l. could be redeemed by a Sinking Fund of 5,000,000l.' Shelley alludes to these figures in a letter to the Gisbornes on 6 November 1819. See *Examiner* 598 (13 June 1819), 373; *Letters*, II, 149.
[92] *Charlotte*, 235.
[93] J. R. McCulloch, *An Essay on the Reduction of the Interest of the National Debt* (London, 1816), 44-5. McCulloch's figures match Shelley's notations '45000,000' and '500,000,000' (twice) in Oxford, Bodleian Library, MS Shelley adds. e. 12, p. 211. The numerals appear near materials dating from January 1818. See *Poems*, II, 338.
[94] McCulloch, *Essay*, 53.
[95] *Letters*, II, 149, 157.
[96] *Charlotte*, 235, 238; *PVR*, 1038.

Such evocations of the financial sublime were not uncommon. Thomas Bernard's noted image of '[t]he national debt, with all its magnitude of terror' was quoted in works by Thomas Robert Malthus and William Godwin that Shelley knew well (see Section VI).[97] Calculating the pence value of the 1819 debt (216,000,000,000) indicates the poet's arithmetic engagement with this same aesthetic discourse. Like stars in the night sky, a debt of billions (of pennies) is so vast it staggers the mind, it's 0 digits intimating an endless stack of coins. Or maybe the figure was ascertained for fun. Either way, it was rather unnerving.

V. 350,000,000

Despite the absence of a quantified debt in *Philosophical View*, the essay's arguments are shaped by Shelley's close reading of contemporary financial news. This is confirmed by notations in two separate manuscripts held in the NYPL. The first appears on the envelope wrapper of a letter to Charles Ollier dated 23 December 1819.[98] The letter discusses the printing of *Prometheus Unbound* and *Julian and Maddalo* (composed 1818–1819) and a fair copy of *Athanase* (composed 1817). On the envelope is a calculation: '1,151,556' x '4' = '4,606,224', from which '3.2' (3.2 million) is subtracted to generate '1,406,224' (Figure 7). The letter and figures appear in the same ink and pen and are probably contemporaneous.[99] A related numeral appears in the vellum notebook used to draft *Philosophical View*.[100] The back pastedown endpaper features six sketches of faces and 32 numerals. One calculation in dark ink, '20,000,000' ÷ '500' = '40,000', relates to the essay's discussion of electoral reform.[101] Another numeral sits alone in pencil: '350,000,000' (Figure 8).

The envelope multiplicand (1,151,556) originates in the United Kingdom's Quarterly Revenue Report for 10 October 1819. Prepared by the Commissioners of the Treasury, such quarterly reports presented the net produce of government revenues, including customs, excise, and assessed taxes. The data is then compared to the same quarter in the previous year. The October report was critical. It was the first since the passing of the Resumption of Cash Payments Act 1819 (on 2 July) that commenced the repeal of the Bank Restriction Act 1797. During the intervening Restriction Period (1797–1819), calls to reinstate Britain's *de facto* gold standard were common. They intensified in June 1810 after a Select Committee report into the rising price of bullion. The ensuing Bullion Controversy culminated in a new Select Committee chaired by Robert Peel MP, who circulated their proposal to resume cash payments in March 1819. Peel's Bill succeeded after heated opposition. But was the market spooked? During the 12-months to 10 October, net revenue totalled £47,920,367, a small decrease from the same figure in the preceding 12-month period. However, the quarterly report suggested that the growth of this deficit was accelerating. Between 11 July and 10 October, the revenue

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[97] T. R. Malthus, *An Essay on the Principle of Population*, 4th edn, 2 vols (London, 1807), II, 317; William Godwin, *Of Population* (London, 1820), 521.

[98] New York, NYPL, Pforzheimer Collection, MS PBS 0203. See *SC*, VI, 1100-06.

[99] An earlier envelope, for a letter to Elizabeth Hitchener dated 18 February 1812, features '6', '8', '92' and '250' (twice), the multiplication '32' x '6' = '192', and the monetary sum '6"5' + '9"12' = '15"17'. London, British Library, Add. MS 37496, f. 93v.

[100] New York, NYPL, Pforzheimer Collection, MS 559R 06.

[101] Shelley proposes a 500-strong assembly representing 20,000,000 persons (*PVR*, 1046). The same calculation appears in Oxford, Bodleian Library, MS Shelley adds. e. 9, p. 374.

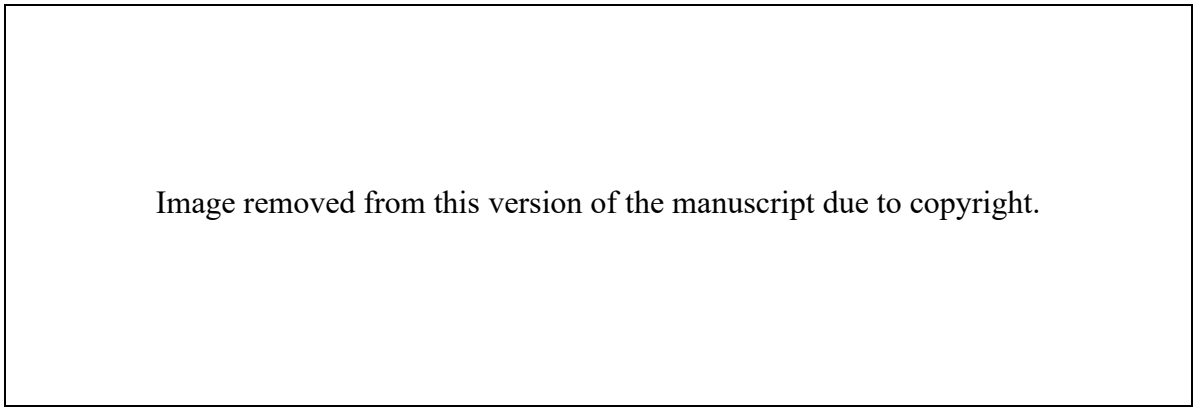

Fig. 7. Pforz. MS PBS 0203, f. 2^{v} (detail). Letter to Charles Ollier, 23 December 1819. CC-BY-NC 4.0. Photo © The Carl H. Pforzheimer Collection of Shelley and His Circle, New York Public Library, Astor, Lenox, and Tilden Foundations. https://archives.nypl.org/cps/19614#detailed

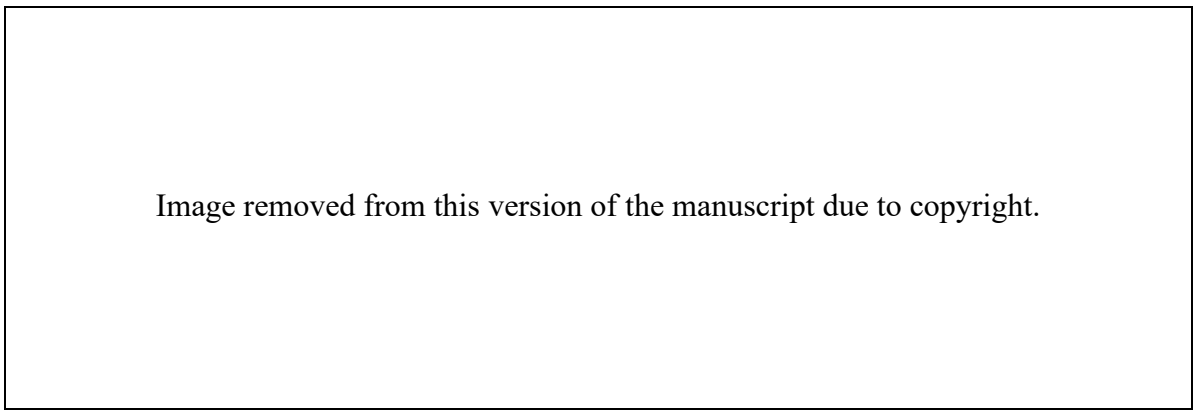

Fig. 8. Pforz. MS 559R 06, back pastedown endpaper (detail). CC-BY-NC 4.0. Photo © The Carl H. Pforzheimer Collection of Shelley and His Circle, New York Public Library, Astor, Lenox, and Tilden Foundations. https://archives.nypl.org/cps/19614#detailed

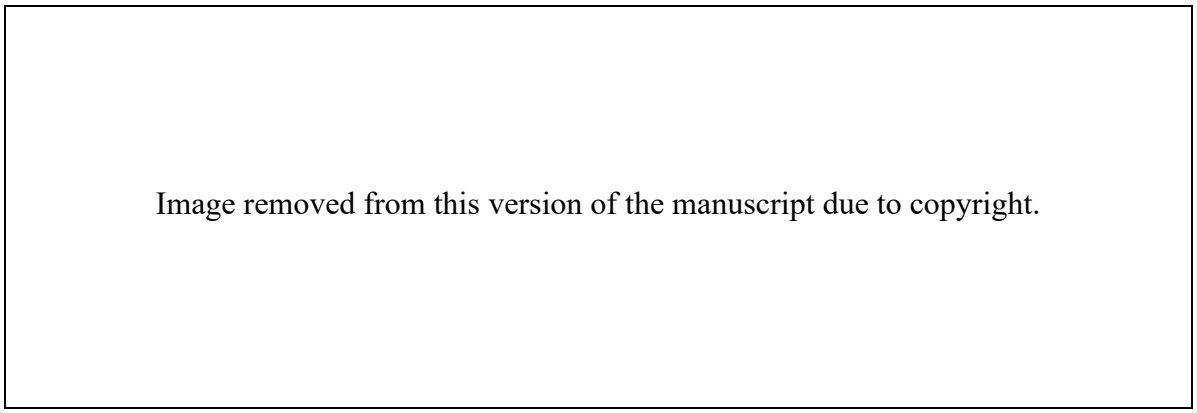

Fig. 9. Oxford, Bodleian Library, MS Shelley adds. e. 12, p. 1 (detail). CC-BY-NC 4.0. Photo © Bodleian Libraries, University of Oxford. https://digital.bodleian.ox.ac.uk/objects/d9637bea-2db8-4a5f-9374-d55f2a5960c9/

totalled £11,435,544. When compared to the same quarter in 1818 (£12,587,100), this indicated a worrying reduction of £1,151,556.[102]

Tables summarising the quarterly report appeared in *Galignani's* on 16 October and the *Examiner* on 17 October 1819.[103] The latter was probably Shelley's source. Writing to Hunt on 23 December (the same day as his letter to Ollier), Shelley confirms having 'just received all your *Examiners* up to October 27th'.[104] Jotting down the quarterly deficit figure (£1,151,556), he multiplies it by '4' to forecast the decrease in revenue over the next 12 months (£4,606,224) and then subtracts 3.2 million to approximate the deficit for the remainder of the calendar year (£1,406,224). The calculations produce new information beyond Shelley's source material. They also express his ambivalence over the 1819 Act and its aim to curb the circulation of fiat currency. In *Philosophical View*, he firmly states that 'fictitious paper currency' serves only 'to obtain an unfair ~~distinction~~ power over labour' (*PVR*, 1036). But the 1819 Act also threatened to devalue the investments of his friends. On 6 November, Shelley had warned the Gisbornes that their holdings in the British funds were now unstable. If the government's new tax of '£3000,000' was uncollectable due to 'insurrection' – a mounting fear since news of the Peterloo Massacre in August – the yield 'income' of 'the public creditor' might fall 'from £210 to £150 & then to £100'.[105] This alarming forecast is calculated on the front pastedown endpaper of a notebook that Shelley would later use to draft *Charles the First* (composed 1822).[106]

Something needed to be done. The notation '350,000,000' in the *Philosophical View* notebook may thus originate in *Elements of a Plan for the Liquidation of the Public Debt of the United Kingdom* by accountant Richard Heathfield (c.1775–1859). Published in November 1819, Heathfield's pamphlet is unjustly overlooked.[107] It explains how the debt (and interest) could be reduced by imposing a capital levy of 15 per cent on the nominal value of all private property. The basic idea was nothing new. But Heathfield revived it by grounding his argument in the figures from the *Finance Accounts* (1819). To do so, he adds the assessed value of property (£2,500,000,000) to the total of the net funded and unfunded debt (£849,393,214) and subtracts the holdings of expatriates (£15,000,000). Charging the levy on the total yields £500,158,982. Applying this against the total net debt thus reduces it to £349,234,232.[108] Heathfield accepted that 'opinion may vary' on 'the expediency' of the scheme, and some considered his heterodoxies quite impractical.[109] Yet he insisted that the levy could diminish the debt to 'the amount of 350 millions'.[110]

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[102] *Journals of the House of Common* 75 (London, 1820), 686-9.
[103] *Galignani's* 1453 (16 October 1819), 1; *Examiner* 616 (17 October 1819), 665.
[104] *Letters*, II, 166.
[105] *Letters*, II, 149.
[106] Oxford, Bodleian Library, MS Shelley adds. e. 17, front pastedown endpaper. Identified in *BSM*, XII, ed. Nora Crook (New York, 1991), 126.
[107] *La Belle Assemblée* 129 (November 1819), 236.
[108] Richard Heathfield, *Elements of a Plan for the Liquidation of the Public Debt of the United Kingdom* (London, 1819), 16. Figures rounded to the nearest pound. Shelley values aristocratic property at a minimum of 'two thousand millions' (*PVR*, 1029).
[109] *Blackwood's Edinburgh Magazine* 6:XXXIV (January 1820), 441-8.
[110] Heathfield, *Elements*, 19.

It is plausible that Shelley acquired Heathfield's pamphlet from Hunt alongside the copies of the *Examiner* in December 1819. It is more likely that he read *about* the pamphlet in the lead-article review that appeared in *Galignani's* on 29 December. The review outlines Heathfield's calculations and proposal to allow 'ten years to the Land-owners and other proprietors to pay' the levy 'by instalments' to 'reduce the Debt to about 350 millions'.[111] The review also notes how the pamphlet clarifies 'Ricardo's declaration' on how 'the National Debt could be extinguished'.[112] This alludes to recent parliamentary speeches on 16 and 24 December by David Ricardo MP, who promoted the levy over the sinking fund as the best way to diminish the debt. The economist agreed that the 'debt was chargeable upon all the capital of the country' but felt that stockholders should receive more favourable terms.[113] Each speech was transcribed in *Galignani's* and the *Examiner* in December and analysed in January 1820.[114] Ricardo's fiscal credibility undoubtedly lent weight to Heathfield's figures, but the scheme was ultimately seen as the odd quirk of a sage mind. With its large scrawl and prime placement in the *Philosophical View* notebook, Shelley's numeral '350,000,000' may thus be a memorandum note for these crucial newspaper discussions.

If Shelley read these articles as he drafted *Philosophical View*, then it may explain why the essay promotes the levy scheme at all. The scheme is certainly distinct from his prior demands to merely curb the debt interest.[115] It is also more radical. For Shelley, the debt was 'not contracted by the whole nation' but between the two wings of the double aristocracy, whose property (land, capital, and luxury goods) were 'mortgaged' to the principal (*PVR*, 1029). The 'money wrung' in taxes from the disenfranchised poor to pay 'the perpetual interest' was unjust (1028, 1031). The levy scheme is thus 'a mere transfer among persons of property' that would 'end' the 'system of ~~finance~~ paper finance' and liberate the poor from excessive taxation (1030-1). 'The settlement of the national debt' is 'an affair of mere arithmetical ~~&~~ proportions', he concludes, whereby 'a gentleman must lose a third of his estate' or 'a fourth of his money in the funds', but that '\deciding/ who was to pay, at what time, & how much' were 'problems readily to be determined' (1030, 1032-3, 1064). Sidestepping the fiscal rigour of Heathfield and Ricardo, Shelley emphasizes instead the levy's grand showdown with Tyranny. Yet each writer shared the same moral imperative. The 'public happiness is the substance & the end of political institutions', Shelley observes, echoing Heathfield's aim to achieve 'the increase of public happiness'.[116] Can numerals be moral? The notation '350,000,000' may signify Shelley's consequentialist goal to maximize happiness across the populace.

[111] *Galignani's* 1515 (29 December 1819), 1.
[112] *Galignani's* 1515, 1.
[113] *Galignani's* 1517 (31 December 1819), 2.
[114] *Galignani's* 1512 (25 December 1819), 4; 1521 (5 January 1820), 1; *Examiner* 625 (18 December 1819), 809; 626 (26 December 1819), 823; 627 (2 January 1820), 2-3.
[115] *Letters*, II, 149.
[116] *PVR*, 1022; Heathfield, *Elements*, 2.

VI. 23,040,000

The numerals in Shelley's final manuscripts offer poignant clues about the works he never lived to write. Several indicate an enduring interest in demography. Clear examples are the calculations on a loose leaf of draft lines for 'The Triumph of Life', composed in May 1822 (Figure 3). The calculations appear in the outer margin perpendicular to lines 26-42.[117] One multiplies '9400' by '280'. To do so, Shelley partitions the multiplier to generate '18800' (i.e. 1,880,000) and '752000', adding these to produce '2632000' (f. 1^{r}). The second multiplies '180,000' by '128'. Again, the multiplier is partitioned to generate '180000' (i.e. 18,000,000), '360000' (i.e. 3,600,000), and '1440000', adding these to produce '23,040,000' (f. 1^{r}). The figures and verse appear in the same nib and ink and are probably contemporaneous. Their specificity in turn indicates that they are transcribed from a source rather than the result of jottings from memory or arithmetical play.

The multiplicand and multiplier numerals originate in the 20th edition of Guthrie's *Geographical Grammar* (1806). Part III of the book contains multiple sections on the geopolitics of selected nations. Many open with a note on population. Two successive sections describe 'Holland' as '9400 square miles, with 280 inhabitants to each', and 'Germany' as '180,000 square miles, with 128 inhabitants to each'.[118] These figures are notable for several reasons. Firstly, they were revised in new editions of the *Geographical Grammar* to reflect changes across Europe. Since the first edition of 1770, for instance, the Dutch Republic (1588–1795) had been reformed into the Batavian Republic (1795–1806) and then into the Kingdom of Holland (1806–1810). Secondly, the smaller numerals are extrapolated from tables of data for the provinces or states of each region. Readers are thus tasked with using them to calculate national populations (2,632,000 and 23,040,000). Finally, only the 20th (1806) and 21st (1808) editions of *Geographical Grammar* in Britain contain all four numerals *and* the velocity of the 1680 comet. It was surely one of these editions that Shelley owned in February 1818 and consulted in May 1822, perhaps obtained from a box of books sent by Peacock in early March.[119] Single-volume compendiums would be suitable for postage and useful to acquire basic information on various subjects.

Shelley's mature interest in demography accords with his enduring engagement with Malthusian debates. These debates often used arithmetic to bolster arguments. In *An Essay on the Principle of Population* (1798), Malthus argues that the tendency for populations to grow geometrically ('1, 2, 4, 8') will always (if unchecked) outstrip the tendency of food production to grow arithmetically ('1, 2, 3, 4').[120] These simple digits provided a veneer of mathematical neutrality that turned Malthus's musings into iron laws.[121] He used them to justify legislative proposals to combat the spectre of penury, such as curbing poor relief to dissuade its recipients from procreation. The 'sophisms' of Malthus are 'calculated to lull the oppressors of mankind

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[117] *Poems*, VI, 465-8.
[118] Guthrie, *Grammar*, 432, 444. Shelley visited each nation in 1814. See [Mary Wollstonecraft Shelley and Percy Bysshe Shelley], *History of a Six Weeks' Tour through a part of France, Switzerland, Germany, and Holland* (London, 1817).
[119] *Letters*, II, 373; *The Letters of Thomas Love Peacock. Vol. 1, 1792–1827*, ed. Nicholas A. Joukovsky (Oxford, 2001), 185. Hereafter *TLPL*.
[120] [Thomas Robert Malthus], *An Essay on the Principle of Population* (London, 1798), 25.
[121] Markovits, *Number*, 1; Poovey, *Fact*, 239-40.

into a security of everlasting triumph', Shelley argues in the preface to *Laon and Cythna*, adding in *Philosophical View* that 'his doctrines are those of a eunuch'.[122] Yet there was something about compound growth that haunted the economic imagination. In *The Decline and Fall of the English System of Finance* (1796), Thomas Paine presented the same strings of digits to lament the 'geometrical progression' of the national debt.[123] Financial calculations on compound growth recur in Shelley's notebooks too, including those noted above in Bod. MS Shelley adds. e. 8.[124] Such growth was unnerving because its tendency to spiral necessitates perpetual responses. It is certainly one way that the spirit of Tyranny might be seen to manifest in the social world.

If Malthusian policies relied on arithmetic then they might be countered in the same way. This aim drives Shelley's notebook memoranda and calculations on population and crop yields in Bod. MS Shelley adds. e. 6. The calculations are grounded in data drawn from William Cobbett's *A Year's Residence, in the United States of America* (1818–1819), a book Shelley acquired from Peacock in June 1819.[125] From Cobbett, Shelley records that '10 tons' ('22400 lbs') of 'Potatoes can [be] produce[d] per acre' and that 'a man' can 'eat 5lbs of po.t a day'.[126] In *BSM* V, Carlene A. Adamson does not identify Cobbett as Shelley's source but clarifies the poet's calculations based on the same data. This includes the square footage in an acre ('600' x '73'), each person's annual consumption of potatoes ('365' x '5' = '1825' lbs), the persons sustainable annually on one acre ('22400' ÷ '1825' = '12'), and the square footage each person requires ('43,600' ÷ '12' = '3633') (pp. 2-3, 6).[127] Facts established, Shelley concludes that population might increase far beyond Malthus's gloomy forecasts. 'If the people of England ate nothing but Ruta Baga, \& potatoes/', 'they might multiply to the amount of 625000,000' ('25000,000' x '25'), whilst China's population could grow from '300,000,000' to '6000,000,000' (pp. 3-5).[128] All these new persons would then augment future crop yields by producing 'dung' to 'manure' 'the soil' (p. 4). Such pointed claims implied that arithmetic could uphold any absurd conclusion, Malthusian or otherwise.

Despite this, Shelley continually returns to Malthus as a source of credible data. In October 1818, he informed Peacock that he had 'just read' *Essai sur le Principe de Population* (1809), a three-volume abridged translation of the fourth edition of Malthus's *Essay* (1807).[129] The *Essai* (1809) is the probable source for a set of numerals in Bod. MS Shelley adds. e. 12. The notebook's opening page features the multiplication '540589' x '50' = '27,029450' and the lone numeral '58' (Figure 9). The multiplicand derives from the penultimate page of the first volume of the *Essai* (1809), where '540,389' is presented as the death rate in Russia in 1799 (Shelley mis-transcribes the '3' as '5').[130] Malthus himself drew the figure from the

[122] *Poems*, II, 37-8; *PVR*, 1023.
[123] Thomas Paine, *The Decline and Fall of the English System of Finance* (London, 1796), 4.
[124] Oxford, Bodleian Library, MS Shelley adds. e. 8, pp. 127-8.
[125] *TLPL*, 156; *Letters*, II, 98.
[126] Oxford, Bodleian Library, MS Shelley adds. e. 6, p. 6. See William Cobbett, *A Year's Residence, in the United States of America*, 3 vols (London, 1818–1819), I, 300.
[127] *BSM*, V, 364-6.
[128] China's population appears in 'Asia', *Britannica* (1817), II, 782.
[129] *Letters*, II, 43.
[130] T. R. Malthus, *Essai sur le Principe de Population*, tr. Pierre Prevost, 3 vols (Paris; Geneva, 1809), I, 423. Malthus added the figure in the third edition of the *Essay* (1806).

second edition of *View of the Russian Empire* (1800) by William Tooke (1744–1820), citing it to critique the historian's method of ascertaining population from death-rate statistics. 'Pour estimer la population' of Russia, 'Tooke multiplie les morts par 58' (To estimate the population of Russia, Tooke multiplies the deaths by 58), Malthus explains, but '58 est trop grand pour être employé ici comme multiplicateur' (58 is too large to be used here as a multiplier).[131] Reading this, Shelley thus replaces '58' with '50' to estimate a lower population figure. The *Essai* (1809) may also be the source for the nearby notations '44,000,000' and 'a thousand millions' (Figure 4). The figures appear in a passage from the book's opening chapter, where global population is sized at 'à mille millions' (one billion) and Britain's population in 50 years 'quarante-quatre millions' (44 million), despite the scope to support only 'trente-trois' (33) million.[132] Indeed, Shelley elsewhere presents a 'thousand million' as 'the entire population of the globe' in an untitled prose fragment composed 1820–1821.[133] These numerical citations demonstrate Shelley's efforts to use Malthus's data to counter the parson on his own arithmetical terms.

So why did Shelley calculate the populations of Holland and Germany in May 1822? One explanation is that he was planning a longer response to Malthus than already presented in *Philosophical View*.[134] A notation in Bod. MS Shelley adds. e. 12 from the autumn of 1818 suggests a working title: 'An Inquiry into \in/ what degree the principle of population can affect the future hopes of mankind's Equality— Republicanism—' (p. 36). The note coincides with Shelley's reading of *Essai* (1809) and knowledge of Godwin's work on his own response to Malthus.[135] Another note – 'If peace should ever return to me' (p. 36) – may indicate he saw this as a crucial future project. Shelley received *Of Population* (1820) from Godwin in June 1821 and deemed it 'decisive', although its censure in the *Edinburgh Review* certainly left room for new anti-Malthusian tracts.[136] Another explanation for the May 1822 calculations is the aim to update *Philosophical View* itself.[137] In Part I of the essay, Shelley aligns Russia and Germany as 'civilized' and forecasts the latter's 'maturing revolution' (*PVR*, 981-2). In February 1821, he requested from Ollier 'Books' on 'Russia' and 'Accounts of the present state of Germany'.[138] The outbreak of the Greek Revolution the following month prompted a wish for new uprisings in nations recently liberated from Napoleonic rule,

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[131] Malthus, *Essai* (1809), I, 423; *Essay* (1807), I, 372.
[132] Malthus, *Essai* (1809), I, 13-4; *Essay* (1807), I, 13. Neighbouring numerals in faint pencil might relate to 33 million, including '300,000,000' (twice) and '330' (four times).
[133] Quoted in Frederick L. Jones, 'Unpublished Fragments by Shelley and Mary', *Studies in Philology*, 45 (1948), 472-6 (474). See *BSM*, XXI, ed. E. B. Murray (New York, 1995), 513-4. The manuscript is now affixed inside a notebook shared by the Shelley household between 1814–1818: Washington, Library of Congress, MSS. 13,290. On the back pastedown endpaper, Claire Clairmont writes 'Petty wars—2000,000', 'Punic—3000,000', 'Mithridatic—1000,000', and 'Julius Caesar—1,200,000' (totalling '7,200,000'), war casualty figures drawn from Edmund Burke, *A Vindication of Natural Society*, 3rd edn (London, 1780), 24-7.
[134] See *PVR*, 1023-6.
[135] *Letters*, II, 22, 22n.
[136] *Letters*, II, 261n, 303, 364.
[137] Shelley's last direct reference to *Philosophical View* occurs in a letter to Ollier dated 27 August 1820. See Northumberland Archives, Brooks Collection, SANT/BEQ/4/10/238A.
[138] *Letters*, II, 269.

foremost Holland and Germany.[139] Like Holland, Germany had undergone its own recent reforms with the dissolution of the Holy Roman Empire (1806) and the founding of the Confederation (1815). Shelley's calculations in May 1822 thus suggest a renewed focus on major reform across Europe. But it is curious that his chosen data concerns obsolete social formations. Perhaps Guthrie's *Geographical Grammar* was simply close to hand. Or maybe the book has an overlooked significance to the poet's intellectual growth, a trusted source he orbited like an amazing comet.

VII. Coda

The larger numerical notations in Shelley's manuscripts and notebooks demonstrate the poet's awareness that arithmetic can aid the generation of useful political knowledge. He also perceives that quantification can promote narrow views of the social world. In *Queen Mab*, for instance, Shelley suggests that 'arithmetic cannot enumerate' the 'multitudinous sources of disease in civilized life'.[140] This basic claim would culminate in the well-known distinction between the calculating and creative faculties of cognition in *A Defence of Poetry* (composed 1821). The 'calculating faculty' drives 'scientific and œconomical knowledge' marked by 'facts and calculating processes'.[141] It also shapes the moral calculus of those using arithmetic to promote ideas that enlarge the gulf between 'rich' and 'poor' (*DP*, 539). The 'creative faculty' counterbalances all this by urging us 'to imagine that which we know' and to perceive the 'poetry' obscured in calculating 'systems of thought' (530). The best practitioners of the creative faculty are poets. Poets combine the qualities of 'prophets' and 'legislators' across various fields of creativity to produce 'new materials of knowledge' unbound by 'time and place and number' (513).

Shelley nonetheless understood that calculation and creativity could operate in harmony. Under the respective stewardship of reason and the imagination, they were linked-but-distinct ways of seeing the world and its problems. These ideas are explained in two prose fragments contained in notebook Bod. MS Shelley d. 1, composed in late 1820.[142] One counters those who question the ethical drive to 'promote the happiness of mankind'.[143] Their 'scepticism' is no better than requesting 'mathematical or metaphysical reason[s] for a moral action', an 'absurdity' comparable to '~~exacting~~' '~~a~~ moral reason for a mathematical \or metaphysical/ fact' (f. 3^{v}). The second fragment indicates Shelley's epistemological commitment to indirect realism. 'It is an axiom in mental philosophy, that we can think of nothing which we have not perceived', he muses, 'we can imagine nothing, we can reason of nothing'. Thus, the 'astonishing combinations of poetry' and the 'deductions of logic & mathematics' are both 'combinations' of ideas that 'the intellect makes of sensations according to its own laws' (f. 113^{v} *reverso*). So, the epistemic fruits of poetry and mathematics

[139] The preface to *Hellas* (composed 1821) forecasts 'revolution of Germany'. See *The Poems of Shelley, Volume Five: 1821–1822*, ed. Michael Rossington et al. (Abingdon, 2024), 8, 55.
[140] *Poems*, I, 415.
[141] *Shelley's Poetry and Prose*, ed. Donald H. Reiman and Neil Fraistat, 2nd edn (Norton, 2002), 509-35 (530). Hereafter *DP*.
[142] *BSM*, IV, ed. E. B. Murray, 2 vols (New York, 1988), I, xvi-xx.
[143] Oxford, Bodleian Library, MS Shelley d. 1, f. 3^{v}.

retain their distinct character but grow in the same cognitive soil. In the Poet's mind, each counterbalances the other to generate the best forms of benevolent knowledge. 'Mary & I are going to study Mathematics', Shelley thus informed the Gisbornes on 9 February 1820, 'your right angled Triangle will contain the solution of the problem of how to proceed'.[144] With humour he saw that poets might be expected to struggle with sums like geometricians with enjambment. He also saw that numeracy could enhance the moral imagination to promote egalitarian ends. This partially explains his drive to engineer a steamship with Henry Reveley in 1819–1820, an ambition explored in 'Letter to Maria Gisborne' (composed 1820).[145] Here, the poet's 'mathematical / Instruments, for plans nautical' sit by the 'books' of the mathematicians Pierre-Simon 'Laplace' (1749–1827), Nicholas 'Saunderson' (1682–1739), and Robert 'Sims[on]' (1687–1768), all in 'harmonious disarray' but circumscribed by 'bills and calculations'.[146]

For Shelley, the use of arithmetic encourages us to apprehend the epistemological foundations and ethical outcomes of how and why and when we calculate. But what of the metaphysical questions raised by calculation, such as the relationship between numerals and the phenomena they quantify? One ancient debate in the history of mathematics concerns the objects of mathematical knowledge (such as numbers) and whether they exist independent of human cognition. For mathematical Platonists, numbers are abstract 'non-spatiotemporal' objects, and the task of maths is to grasp them.[147] This idea evolved from Plato, for whom numerals are things that help us apprehend and articulate truths about the abstract nature of reality. In the *Republic* (c.375 BCE), Socrates explains that pure maths 'compels' us to perceive 'numbers that can be grasped only in thought' and 'discuss' them to attain 'truth'.[148] This 'knowing' is quite distinct from the use of maths for practical purposes, such as the grubby ways that 'traders' apply numerals to 'tangible bodies' to aid 'buying and selling'.[149] Shelley's own austere scorn of narrow calculation originates here. In contrast, the branches of mathematical *anti*-Platonism consider numbers (like most things) to be *non*-abstract objects. The primary task of maths is to interpret its own 'theories' rather than worry about ontological matters.[150] This is maths as the beautiful and intellectual end-in-itself. The crucial point is that numerals may presume or convey things about the nature of the phenomena they quantify and the methods used to formulate this knowledge.

Such metaphysical speculations may seem remote from the numerical notations we have examined; the complexities of pure mathematics distinct from the basic operations of arithmetic and the ordinal numerals denoting sequence or rank. Population figures no more relate to algebra and calculus than sketched moons do. As Stephen Chrisomalis reminds us, 'most numerical notation is nonmathematical'.[151] Yet Shelley's aim to 'study Mathematics' in early 1820 belies how his prior work is shaped by mathematical ideas. Marilyn Gaull and

[144] *Letters*, II, 172.
[145] John Gardner, 'Shelley's Steamship', *Keats-Shelley Journal*, 71 (2022), 87-113.
[146] *Poems*, III, 425-61 (ll.79, 82-3, 93, 95-6).
[147] Mark Balaguer, *Platonism and Anti-Platonism in Mathematics* (Oxford, 1998), 5.
[148] Plato, *Republic*, tr. G. M. A. Grube, ed. C. D. C. Reeve (Hackett, 1992), 198.
[149] Plato, *Republic*, 197-8.
[150] Balaguer, *Mathematics*, 5.
[151] Chrisomalis, *Numerical*, 5.

Richard C. Sha each note how Euclidian and Pythagorean geometry influence Shelley's thinking about the natural sciences and the creative imagination.[152] These ideas accord with his defence of geometry in *A Discourse on the Manners of the Ancient Greeks*, in sections of the essay drafted in July 1818. 'The astonishing invention of geometry' has 'enabled man to command the elements & foresee future events' by unlocking 'the doors of the mysteries of nature'.[153] These are the precise qualities of the Poet, who 'beholds the future in the present' and whose 'Poetry lifts the veil from the hidden beauty of the world' (*DP*, 513, 517). In this way, mathematics contains and combines with poetry to create knowledge 'reflecting the mind of the perceiver as much as the world perceived', Gaull summarises.[154] Arithmetic may well contribute to flawed or partisan forms of economic knowledge, but it can also illuminate our apprehension of mind and world.

The numerical notations in Shelley's manuscripts and notebooks are thus important because of what they represent and *because* they represent. Examining the numerals reveals new sources for Shelley's ideas and suggests how numerals shape the arguments in which they appear. Numerals can imitate solar systems or stacks of coins. They can be synonyms that emphasize the mutability of the phenomena they quantify. They also foreground how they might constitute such phenomena. Measuring the velocity of comets affixes numerals that are arbitrary, insofar as different units of distance or duration can represent the same event, and our choice of units has no bearing on celestial flight (probably). In contrast, monetary phenomena suggest how numerical representation might, to some extent, *be* the phenomena itself. Do national debts exist in the same way that mountains or moons do, free of our quantifications of their qualities? Perhaps such debts only exist *as* numerals, as figures in the ledgers and legislative papers that orchestrate our lives. Playing with numerals invites us to consider how some things are contingent upon how they are represented and thus how easily they could be changed. 'All things exist as they are perceived: at least in relation to the percipient', Shelley outlines in *Defence* (*DP*, 513). Shelley believes that poetry can reform the world by reforming how we perceive the world. Numerals mirror poetry's appeal to the imagination by providing conspicuous signifiers of *what* they represent and *how* they do so. We could even transform the signified by simply omitting a digit.

[152] Marilyn Gaull, 'Shelley's Sciences', in Michael O'Neill et al. (eds.), *The Oxford Handbook of Percy Bysshe Shelley* (Oxford, 2013), 577-93 (587-8); Richard C. Sha, *Imagination and Science in Romanticism* (Baltimore, 2021), 39-40.
[153] Oxford, Bodleian Library, MS Shelley adds. e. 11, pp. 24-5. See *BSM*, XV, ed. Steven E. Jones (New York 1990), xiv.
[154] Gaull, 'Numeracy', 126.