Principles of Geology and Sensory Experience at London's Cyclorama

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> To the Coliseum, some years before its final fall, was added the Cyclorama—an extraordinarily realistic representation of the earthquake of Lisbon. The manner in which the earth heaved and was rent, the buildings toppled over, and the sea rose, was most cleverly contrived, and had a most terrifying effect upon the spectators; frightful rumblings, proceeding apparently from under your feet, increased the horror, which was anything but diminished by accompanying musical performances on that awful instrument, the apollonicon. Never was better value in fright given for money.
>
> —Edmund Yates

Natural disasters were routinely incorporated into theater pieces and other entertainments in the first half of the nineteenth century. In December 1848 the London Colosseum's Cyclorama produced a notable instance with its representation of the 1755 Lisbon earthquake, which featured an array of complex machinery, music, lighting, and sound effects.[1] Londoners seem to have appreciated it in metaphorical relation to the revolutions spreading across Europe in 1848–49, as a warning or perhaps as cathartic relief at what had been averted in England following the Chartist petition and demonstrations earlier that year.[2]

The Cyclorama can also be understood in the context of the scientific revolutions of the period, as a site where one's fears about the external world might be confronted. During the first half of the nineteenth century, Londoners had been coming to terms with the rapid succession of advances in scientific thought that were overturning long-held beliefs and assumptions, often explaining natural events in ways that were no longer comprehensible within the framework of religion.

Geology was among the most contentious of the new sciences. Charles Lyell had recently explained earthquakes and volcanic activity in a manner that fundamentally changed public un-

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[1]For more on this conjunction in London, see Nicholas Daly, "Volcanic Disaster Narrative: From Pleasure Garden to Canvas, Page, and Stage," *Victorian Studies* 53/2 (2011): 255–85, 260.

[2]Theatrical cataclysms, in a tradition that stretched back through French operas of the 1790s to the classical disasters of Baroque opera, were routinely read as signs of divine judgment on human actions. The Chartists were working-class political reformers in Britain, and they presented their third petition to the Commons in April 1848 following a rally on Kennington Common of some 150,000 people; see David Goodway, *London Chartism 1838–1848* (Cambridge: Cambridge University Press, 1982). Lawrence Kramer also points to the cathartic effect of the Cyclorama in a short discussion in *Why Classical Music Still Matters* (Berkeley: University of California Press, 2007), 180.

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derstanding of the history of the earth, in his three-volume study, *Principles of Geology* (1830–33). Rather than resulting from diluvian catastrophes of the distant past, dramatic geological features such as mountain ranges were now increasingly understood to have resulted from the gradual, incremental process of convulsions through millions—rather than just thousands—of years, and continuing into modern times. The Cyclorama offers an example of how Victorian society assimilated the implications of scientific discovery into the affective and emotional as well as the intellectual structures with which it understood external reality—and its place within that reality.[3] The Cyclorama invited the spectator to confront the power of nature in light of this new scientific model, in a darkened and claustrophobic auditorium that magnified the horror. As we will see, the role of the accompanying music, which consisted of excerpts from familiar pieces on "that awful instrument, the apollonicon," was crucial to the shaping of the spectator's understanding, both heightening the visceral experience and offering reassurance, mediating between knowledge, experience, and the imagination.

Geology vs. Religion

During the first half of the nineteenth century, new sciences such as geology, astronomy, and evolutionary biology were beginning to challenge the tenets of natural theology. The result was reconstructions of the past that both transformed perceptions of man's place in the world and defied the usual interpretations of scripture.[4] As a number of scholars have noted, it was possible to detect a crisis of faith among the intelligentsia at this time. People found they could no longer believe what they had formerly believed (or what, in retrospect, they discovered they had never really believed in the first place).[5] However, the new narrative had to compete with the book of Genesis and with centuries of sacred-historical tradition in seizing the public imagination. Far from being impeded by the contradictions between these worlds, many writers cultivated them as creative tensions within their writing, taking inspiration from the wider world of entertainment, and fashioning persuasive new stories that mingled science with religion in order to instruct their readers.[6]

It is in this context that Lyell's *Principles of Geology* should be understood. It was read widely, not only by geologists and naturalists but also by a large section of the general public.[7] Lyell received a knighthood in 1848, and the book went into its eighth edition in May 1850; it had sold more than 15,000 copies by the time of his death in 1875 (and been read by many more than that number). In an 1832 review of the second volume, William Whewell had coined the terms "catastrophist" and "uniformitarian" to define opposing geological camps.[8] Catastrophists (represented by William Conybeare, among others) believed that geological changes in the past had involved violent convulsions of the earth's surface on a scale that was far greater than that of the earthquakes and volcanic eruptions of the present. Such convulsions, part of biblical history, had raised sedimentary rock strata from beneath the sea into hills and mountains; in more recent times the earth had cooled and become a calmer environment. In contrast, Lyell's so-called uniformitarianism built on the work of William Hutton to claim that volcanic activity and the elevation of mountains had occurred through the past in the same slow, gradual, and intermittent fashion as they continued to oc-

[3]This relationship between the emotional and the intellectual implications of science is central to Susan Gliserman's "Early Victorian Science Writers and Tennyson's 'In Memoriam:' A Study in Cultural Exchange," *Victorian Studies,* Part I, 18/3 (March 1975): 277–308; Part I, 18/4 (June 1975): 437–59. (These articles were extracted from Gliserman's doctoral dissertation and prepared for publication by her advisors, Donald Jay and Martha Vicinus, after the author's sudden death.)

[4]John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), 307–08.

[5]Ibid., 367.

[6]Ralph O'Connor, *The Earth on Show: Fossils and the Poetics of Science, 1802–1856* (Chicago: University of Chicago Press, 2007), 2.

[7]Charles Lyell, *Principles of Geology, Being an Attempt to Explain the Former Changes of the Earth's Surface, by Reference to Causes Now in Operation,* 3 vols. (London: John Murray, 1830–33).

[8]William Whewell, review of Charles Lyell, *Principles of Geology,* vol. 2, in *Quarterly Review* 47 (1832): 103–32.

cur in the present.[9] The implications of Lyell's theory were that the earth was much older than previously believed—in order for these gradual changes to take place over time, the earth must be millions of years old—and that earthquakes were still continuing to shape the landscape. Modern scholars have tended to categorize the two camps as "new" (or "young") and "old" earth geologists.[10]

In Whewell's reading, Lyell's theory implied a move away from divine explanations of nature. The evoking of great catastrophic events to account for geological phenomena had previously circumvented the need for scientific inquiry. They were perceived simply as sources of wonder and usually reconciled, in England at least, with the biblical account of the Flood (caused by a catastrophic convulsion). Lyell's principle of uniformity, however, shifted the emphasis from destruction to its causes and encouraged further inquiry to explain such changes scientifically, thereby eroding belief in a divine guiding force.

Although Lyell has been portrayed as a secular hero of science who championed the uniformity of nature over divine catastrophes,[11] scholars including James Secord, Ralph O'Connor, and Adelene Buckland have challenged this binary opposition, demonstrating that the differences between geologists of the period were rather more subtle and complex than Whewell implied.[12] All of them were interested in catastrophes, as signs of providential intervention or as natural phenomena to be explained scientifically. Moreover, many geologists were clerics. According to O'Connor, the idea that Victorian geology was "inherently faith-shattering" has become so ingrained in our picture of the age that we risk missing the very real cultural anxieties about civilization and morality that the notion of "deep time" was employed to assuage more often than to exacerbate.[13]

The Cyclorama can be read as participating in this conflicted understanding of earth's history and its implications for humanity. Many scientific writers, dramatists, and members of the general public were drawn to the spectacle of catastrophe and to the biblical narratives that were, to a greater or a lesser extent, coopted to demonstrate new scientific thinking. After looking more closely at the entanglements of new- and old-earth views, I will examine how the multimedia realization of the Cyclorama played into the wider discourses about catastrophe and geohistory.

New vs. Old Earth

Commentary on the nineteenth-century debate between proponents of new- and old-earth geologies has traditionally been founded on an inherent opposition between "geologists" and "biblical literalists," as O'Connor has observed. Some of these literalists, however, saw themselves (and were acknowledged) as geologists, while many proponents of an old earth felt that their views did not violate their literal interpretations of Genesis 1.[14] Thus, we find old-earthers reconstructing biblical catastrophes in the light of the latest scientific research, drawing on apocalyptic and biblical images from painting (notably the work of John Martin), and deploying Miltonic rhetoric to meld geohistory with sacred history. In this way, they redirected biblical associations on a metaphorical rather

[9]He provided evidence from his trips to France, Italy, Spain, and Germany as well as from walking along the coast of Essex and Norfolk, observing modern-day convulsions and examining sedimentary strata.

[10]Other terminology was also in use. In a series of debates at the Geological Society in the late 1820s, the Rev. William Buckland and Conybeare styled themselves "Diluvialists" (viewing floods as agents of geological change), and Lyell, John Fleming, and Roderick Murchison as "Fluvialists" (for their belief that rivers and tides could carve out new landscapes if given enough time). These attributions playfully echoed those of the eighteenth-century "Neptunists" and "Vulcanists." See Adelene Buckland, *Novel Science: Fiction and the Invention of Nineteenth-Century Geology* (Chicago: University of Chicago Press, 2013), 115.

[11]Brooke, *Science and Religion*, 339.

[12]James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation* (Chicago: University of Chicago Press, 2000); O'Connor, *The Earth on Show*; Buckland, *Novel Science*.

[13]O'Connor, *The Earth on Show*, 427.

[14]Ibid., 19. The date 4004 BC was taught in schools and printed in the margins of bibles as marking the creation of the world. Although it was not necessarily believed by all, evidence points to the currency of young-earth views among a significant cross-section of Georgian and early Victorian society, rather than just a handful of reactionaries (16).

than literal level.[15] If—as James Secord has claimed—the vast majority of the public continued to believe that the Creation, the Fall, and the Flood were defining moments in the physical history of the world, geologists needed to find a compelling account of the earth to take their place.[16]

Lyell was heavily implicated in this debate. He was a radical, but realized that the opponents of his new ideas needed to be persuaded gently. *Principles* was a carefully constructed text that accommodated—up to a point—the conservative outlook of a large section of the public. The central argument had already appeared in more polemical terms, however, in a review that Lyell wrote for the Tory *Quarterly Review* in 1827.[17] He viewed adherence to the Genesis creation narrative as the chief obstacle to progress in geology and declared his intention to "free the science from Moses," employing the imagery of scriptural catastrophe to undermine "catastrophism" by emphasizing the continuing destructive power of nature.[18] He mocked his opponents, presenting them as stubbornly unimpressed spectators, as "those who can behold the fire of the volcano, and the shock of the earthquake, the waste of the torrent . . . who can look around them and be witness to all these signs of change, and still contrast the vicissitudes of former ages with the immutable stability of the present order of things."[19] The destructive power of the volcano that disturbs a picturesque tranquility is evoked as an apocalypse. The reader's astonishment is aroused in traditional biblical terms in order to heighten the spectacular revelations that only geology can offer.

> Would they have conceived it possible. . . . How incredible would that prophetic voice have sounded, which should have foretold . . . that the whole scene, the temperature of the air, the surface of the land, hill and valley, lake and river, with all the countless organic beings who then enjoyed the gift of life, were doomed, in the revolutions of futurity, like the heavens on the opening of the sixth seal, to "depart as a scroll when it is rolled together!"[20]

Seen from the geologist's expanded perspective, a new interpretation becomes possible: when multiplied, familiar agents such as volcanism become capable of apocalyptic transformations. Lyell's *Principles of Geology* elaborated this idea, though in less polemical terms. By this means, he gradually transformed geology's public profile to promote recognition of the vast antiquity of the earth and to confirm the discipline's independence from traditional biblical scholarship.[21]

The key to Lyell's strategy of persuasion seems in part to have been what O'Connor has termed his "rhetoric of spectacular display."[22] His argument for the effects of existing causes depended on exhaustive demonstration, for which he provided data on hundreds of recorded events. Numerous descriptions of rivers, tides, currents, and delta formations, of earthquakes, volcanic eruptions, and landslides, from English, French, German, and Italian sources combine to provide a resource with which to interpret the past. An entire chapter documents the devastation wrought by earthquakes in one year in a single region in Italy. Even those who disagreed with the central argument of the *Principles* admired its empirical richness. Moreover, the text brings each disaster story vividly to life with accompanying woodcuts, landscape engravings, maps, and anecdotes. We constantly enter and re-enter a dazzling array of perspectives.

Nevertheless, perhaps mindful of the need to persuade his opponents, Lyell organized the arguments of his book to highlight moments of relative security and stability amid the continually changing landscape. Ironically, given the reliance on destructive tableaux throughout the work, at such moments Lyell distances himself from the idea of catastrophism. Thus, "the mind was slowly and insensibly withdrawn from the imaginary pictures of catastrophe and

[15]Ibid., 159–61.
[16]Secord, *Victorian Sensation,* 57.
[17]O'Connor, *The Earth on Show,* 165–67.
[18]Lyell [anon.], review of George Poulett Scrope, *Geology of Central France,* in *Quarterly Review* 36 (1827): 472; cited in O'Connor, *The Earth on Show,* 165.
[19]O'Connor, *The Earth on Show,* 167.
[20]O'Connor, *The Earth on Show,* 168; the embedded quote comes from Revelation 6:14.
[21]Ibid., 171.
[22]Ibid., 172–74.

chaotic confusion, such as haunted the imagination of the early cosmogonists. Numerous proofs were discovered of the tranquil deposition of sedimentary matter and the slow development of organic life."[23] In spite of this theoretical resolution, however, Lyell does not really address for his readers the emotional consequences of learning about this violent environment, and he offers little to promote the idea that the world is centered on the identity and needs of human beings.[24] Indeed, the expanded sense of time that Lyell proposes verges on being imaginatively beyond his reader's grasp.

Crucially, the overwhelming emotional effect of the text is countered by Lyell's dispassionate narration, which O'Connor suggests situates both author and reader at a lofty philosophical height and thus transcends the local quality of each particular event. Thus, for example, Lyell first observes, "at Lyme Regis, in Dorsetshire, the 'Church Cliffs,' as they are called, consisting of about one hundred feet in height, gradually fell away at the rate of one yard a year, from 1800 to 1829," then moves on to describe a landslip a bit further along the coast in 1839 (with a cross-section diagram of the geology and an artist's impression of the view of the landslip), and finally progresses to a description of the crumbling cliffs of Torbay.[25] In this way, claims O'Connor, Lyell's examples "resolve into a panoramic view of the fluctuating economy of nature."[26]

This shift in perspective, carrying the reader aloft, depends on sleight of hand. A quotation from Byron's *Childe Harold* familiarizes the leap of imagination Lyell wants his readers to make: "Time writes no wrinkle on thy azure brow; / Such as creation's dawn beheld, thou rollest now."[27] Thus guided, readers may leap out and see the "boundless, endless, and sublime" reality of deep time, looking through Byron's eyes to see through Lyell's. Since his panoramic viewpoint shows "true" geology transcending the traditional imagery of biblical apocalypse, it "frees" the geologist from Genesis, enabling him to piece together a more "just," if fragmentary, narrative.[28] According to Gliserman, Lyell serves the same end by his insistence that emotional reassurance comes not from God, but from an ability to conceive the complexity of interactions that constitute the present world and to project these ideas into the past and into the future.

This double-vision—immersion in overwhelming detail and the panoramic overview—is fundamental to the Cyclorama too, a work that similarly tries to navigate between the implications of the new science and the familiarity of biblical narratives. However, its multisensory approach offered something altogether more immersive—and potentially more troubling.

The Earthquake of Lisbon

In 1848 a new theater was added to the Colosseum in Regent's Park to house a Cyclorama.[29] The auditorium had eighteen benches and a tier of boxes arranged to suggest "the vestibule of a noble mansion, fitted up for the perfor-

[23]Lyell, *Principles of Geology,* I, 72; cited in Gliserman, "Early Victorian Science Writers and Tennyson's 'In Memoriam,'" 302.
[24]This argument is made by Gliserman. The core text of the period was William Paley's *Natural Theology* (1802). For Paley, the only way we understand creation is in terms of individual will; we need not be overwhelmed by the complexity of the universe if we imagine an intelligence "surpassing ours in degree only." Whewell, cited by Gliserman, "Early Victorian Science Writers and Tennyson's 'In Memoriam,'" 297. See also Aileen Fyfe, "Publishing and the Classics: Paley's Natural Theology and the Nineteenth-Century Scientific Canon," *Studies in the History and Philosophy of Science* 33 (2002): 729–51.
[25]Lyell, *Principles of Geology,* 11th edn. (London: John Murray, 1872), I, 540–42.
[26]O'Connor, *The Earth on Show,* 174.
[27]Byron's *Childe Harold* (canto iv, stanza 182). Lyell, *Principles of Geology,* I, 459; glossed by O'Connor, *The Earth on Show,* 175.
[28]O'Connor, *The Earth on Show,* 176, 183.
[29]The Colosseum had been built in 1827, to a design inspired by the Pantheon in Rome, in order to house Thomas Hornor's panorama of London. Hornor experienced financial difficulties, and it fell into decline as a place of entertainment, but was sold in 1843 and remodeled by William Bradwell, and it reopened in 1845. The "Grand Panorama of London" was repainted, and panoramas of London and (from 1848) Paris by night were added to the repertoire. For more information, see *A Description of The Royal Colosseum; re-opened 1845 under the patronage of Her Majesty the Queen, and his Royal Highness Prince Albert. Re-embellished in 1851. With numerous illustrations, and eight sections of The Grand Panorama of Paris by Night* (London: Chisman, 1851).

Plate 1: New theater, erector for the exhibition of the Cyclorama at the Colosseum, London. *The Illustrated London News,* 30 December 1848 © Look and Learn / Peter Jackson Collection.

mance of a masque, or play" (see plate 1).[30] When the Earthquake of Lisbon opened, a "new Grand Apollonicon" had been installed in an adjoining room to provide a musical accompaniment for the rolling panorama of images depicting the catastrophe.[31]

The Cyclorama was one among a large array of nature and landscape spectacles that attracted Londoners during this period.[32] Some viewed it as a sort of enlarged version of the eighteenth-century Eidophusikon (Philippe de Louther-

[30]*Description of The Royal Cyclorama, or Music Hall: Albany Street, Regent's Park. Opened in 1848. Under the Patronage of Her Majesty the Queen, and His Royal Highness Prince Albert. With numerous illustrations of The Cyclorama of Lisbon, before and after the earthquake in 1755. Projected and designed by Mr. W. Bradwell* (London: Chisman, 1851), 5. The hall doubled as a "Concert Room for Vocal and Instrumental Music."

[31]It was so described in the advert that appeared in the press—see, for example, the *Morning Post* (25 December 1848). This was not the same Apollonicon built by Flight & Robson, which had become famous in the 1820s (for more on this, see Rachel Cowgill, "The London Apollonicon Recitals, 1817–32: A Case-Study in Bach, Mozart and Haydn Reception," *Journal of the Royal Musical Association* 123/2 [1998]: 190–228). Arthur W. J. G. Ord-Hume, *Barrel Organ: The Story of the Mechanical Organ and Its Repair* (South Brunswick, NJ: A.S. Barnes, 1978), 136.

[32]There were two afternoon and two evening shows each day, admission was two shillings, and so we can assume that it was a fairly elite audience, though according to adverts in the press, reduced prices were available for children, families, and schools. As Bernard Lightman has established, by mid-century the Colosseum was not merely a place of entertainment, but stood alongside other important science museums of the period. I am grateful for a copy of his unpublished paper, "Science in Regent's Park: The Colosseum," delivered at the Cain Conference on "Curators, Popularizers and Showmen: Science in Nineteenth-Century Anglo-American Exhibitions and Museums," Chemical Heritage Foundation, Philadelphia, May 21–23, 2015.

bourg's miniature mechanical theater): lighting and sound effects heightened the sense of terror suggested by the representation of nature's power. For others it was a rival to the Panorama in Leicester Square, which was currently showing a view of the ruins of Pompeii, or the Diorama in Regent's Park, showing Etna erupting.[33] For some it recalled the moving panoramas that had figured in the Christmas pantomimes at Covent Garden and Drury Lane,[34] or John Banvard's more recent import showing concurrently at the Egyptian Hall: a "rolling" panorama of the shores of the Mississippi—supposedly three miles of canvas covering one thousand miles of country from New Orleans to St Louis.[35] One might also recall outdoor events such as the volcanic eruptions at the Surrey Gardens[36] and the firework shows at the Vauxhall Gardens through the 1840s.[37]

What seems to have been distinctive about the Cyclorama was, first, its compression of effects on a grand scale into the intimate space of a small auditorium. One spectator noted, "It wants the depth which the mind has learned to associate with such a structure," suggesting that the unfamiliar confined space was unsettling and the unusual proximity of the display to the audience a key source of the overall experience.[38] Second, there was the equal part played by visual effects and music in an entertainment that was not a drama. I will return to these distinctive qualities after a brief description of the show.

A published brochure enables us to imagine in some detail what the Cyclorama looked like and how audiences were encouraged to interpret what they saw and heard. O'Connor has pointed to the hierarchy of words over imagery reflected in urban visual culture at this time. Viewers "read" pictures with reference to well-known poems or novels. The brochure offers ample evidence of the literary and scientific sources with which the audience would have been familiar.[39] After a brief description of the auditorium, the text presents a two-page account of the earthquake, in informative, Lyellesque language: "Thirty-five minutes after nine, without the least warning, excepting a rumbling noise underground, like distant thunder, a most dreadful earthquake shook by quick but short vibrations, the foundations of the City, and many buildings instantly fell. Then with a pause scarcely perceptible, the nature of the motion was changed, and a second shock laid almost the whole City in ruins, with a prodigious loss of life!"[40] Engravings of the ten "frames" of the rolling panorama follow (see plates 2 and 3); then a six-page description, frame-by-frame, suggests the anticipated emotional effect (see Table 1). Short quotations from Milton, Byron, and Coleridge interspersed through the text capture the events in poetic form as the earthquake strikes and the aftermath appears. O'Connor describes these quotations as "virtual curtain-raisers" announcing each new image.[41] More broadly, the role of Providence is underlined in the move from Creation, with an excerpt from *Paradise Lost,* toward Apocalypse, with this evocative stanza

[33]See, for example, a review of the Cyclorama and adverts for the Diorama and Panorama in *The Athenaeum* (30 December 1848), and a memory of the Cyclorama by John Timbs, *Curiosities of London: Exhibiting the most rare and remarkable objects of interest in the metropolis; with nearly sixty years personal recollections* (London: J.C. Hotten, 1867); cited at http://www.victorianlondon.org/entertainment/colosseum.htm [accessed 7 January 2015]. The panorama was a landscape painted on the inside of a rotunda, viewed as if from afar from a central viewing platform. The diorama involved a play of light across a painted landscape to suggest the passing of time.

[34]*Morning Post* (25 December 1848).

[35]The showing of the Mississippi panorama took two hours. For the reviewer of *The Standard* (27 December 1848), however, its effect derived from "broad washes of colour made luminously brilliant by concealed light," rather than the quality of the painting, and from the variety of locations suggested. It was viewed through an enormous aperture, the rollers hidden from view. Mr. Banvard gave a running commentary, and there was an accompanying pamphlet.

[36]Richard Altick, *The Shows of London* (Boston: Harvard University Press, 1978), 323–25.

[37]Freestanding models were set in the gardens to take advantage of the lake (as a stand-in for the Bay of Naples, for example, as well as to reflect the fireworks). For an illustration, see Altick, *The Shows of London,* 324. These spectacles in the Surrey Gardens were created under the direction of J. Southby. For more on firework shows, see Simon Werrett, *Fireworks: Pyrotechnic Arts and Sciences in European History* (Chicago: University of Chicago Press, 2010).

[38]*Morning Post* (25 December 1848).

[39]*Description of The Royal Cyclorama,* 6–7.

[40]O'Connor, *The Earth on Show,* 4.

[41]Ibid., 301.

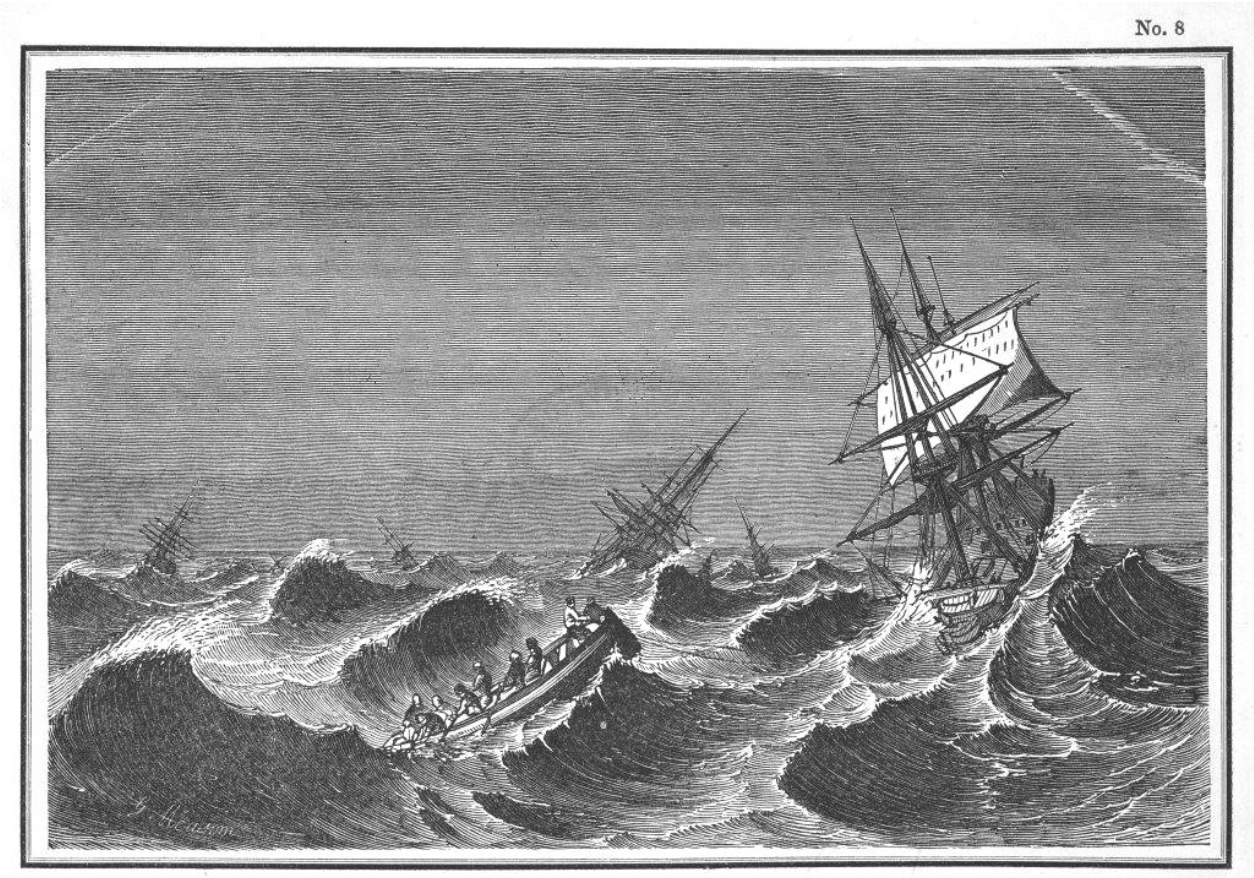

Plate 2: Image No. 8, from *Description of The Royal Cyclorama, or Music Hall.*
© The British Library Board, General Reference Collection RB.31.a.23.(2.).

from the second canto of Byron's *Prophecy of Dante:*

> The storms yet sleep, the clouds still keep their station,
> The unborn earthquake yet is in the womb,
> The bloody chaos yet expects creation,
> But all things are disposing for thy doom;
> The elements await but for the word,
> "Let there be darkness!" and thou growest a tomb![42]

Such enmeshing of geology with epic poetry, a tactic found in other writing of the period too, helped to root the new science in culturally authoritative narratives and to provide it with intellectual respectability. Finally, the brochure details the human suffering wrought by the event and brings the last image to life with descriptions of people "in despair, seeking those beloved relatives who had perished in the mighty shock."[43]

The ambition of the Cyclorama was impressive. The individual images were created by George Danson, a painter for several theaters, and for the productions at the Surrey Gardens and the "Paris by Night" panorama at the Colosseum.[44] The lighting was by one Henry Jones of Covent Garden.[45] The machinery and scenic effects were devised by William Bradwell, one-time chief machinist at Covent Garden who

[42]*Description of the Royal Cyclorama, or Music Hall,* 12.

[43]Ibid., 13. For more on this idea of new science, see Buckland, *Novel Science,* 17, 19.
[44]Altick, *The Shows of London,* 325.
[45]According to the *Morning Chronicle* (21 August 1849).

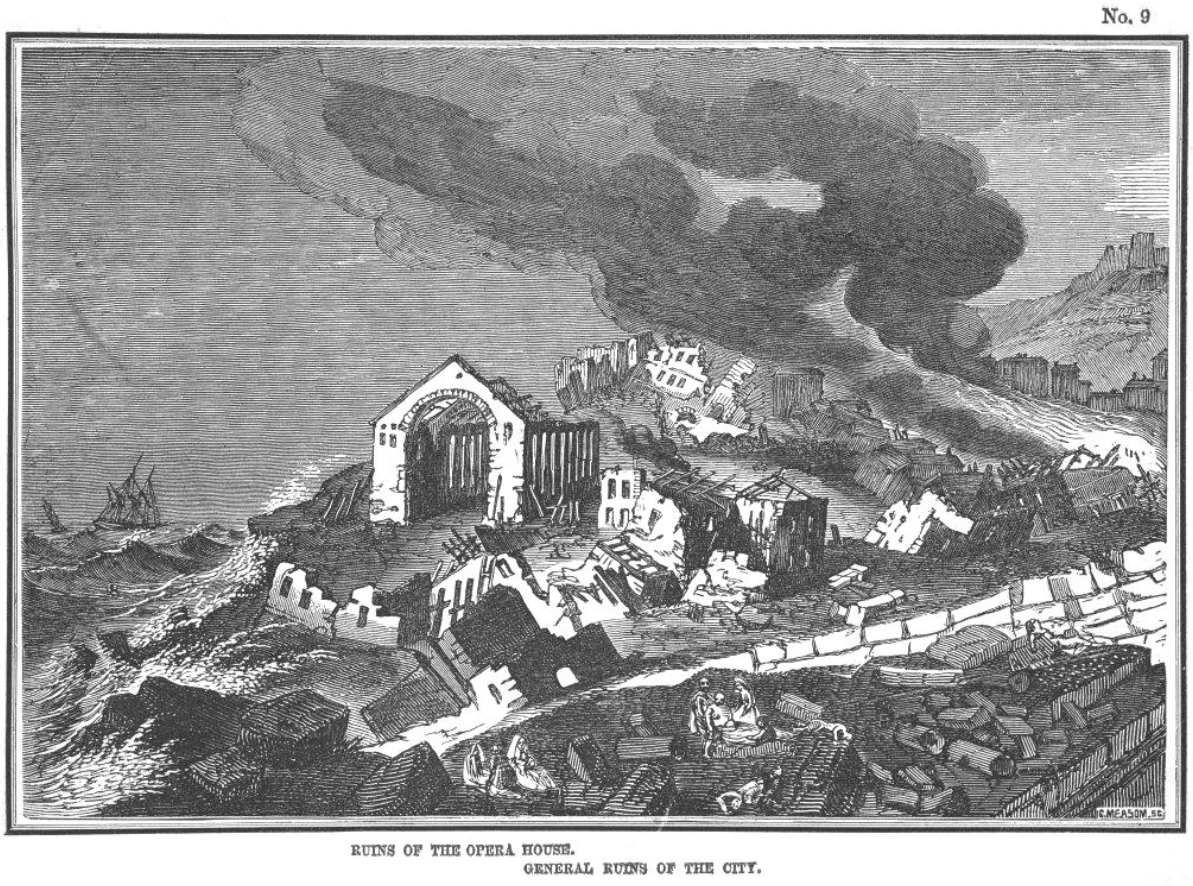

Plate 3: Image No. 9, from *Description of The Royal Cyclorama, or Music Hall.*
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also created some dazzling extravaganzas for the Lyceum from 1847, and who constructed the Colosseum and Cyclorama buildings.[46] The machinery employed signals the seriousness with which the visual and aural effects were approached:

> One back frame, 160 ft by 43—Three Telescope Frames, 190 ft varying in height from 20 to 40 feet—One frame, 70 ft by 43—Truck with sea, 80 ft long and 4 ft wide, running on twelve 22-inch wheels, containing working machinery for ships and waves.—One large Feluca. —One Life Boat—One double-purchase Crab with long shaft and 4 barrels—Levers to throw in and out of gear—Two single-purchase Crabs—Two Wood Barrels—and 1520 feet of iron rails and sleepers for working same.[47]

Such detail confirms reviewers' remarks that in place of the usual cutouts, more substantial boats and waves were moved by machinery in front of the unfurling landscape. One reviewer made a point of noting (in order to emphasize its superiority to Banvard's American import) that "the machinery is so contrived that no portion of the picture is rolled upon drums or cylinders, but is moved on and off the stage by means of apparatus by which it is kept con-

[46]For the playwright James Robinson Planché, Bradwell was an "unequalled machinist"; see Donald Roy, *Plays by James Robinson Planché: The Vampire, the Garrick Fever, Beauty and the Beast* (Cambridge: Cambridge University Press, 1986), 17.

[47]Catalogue prepared for auction sale, 1868, copy at Guildhall Library; cited in Altick, *The Shows of London,* 161.

Table 1
Summary of the Lisbon Earthquake at the Cyclorama

Image	Description, Incorporating Wording from the Brochure
1	The curtain rises to reveal a calm and beautiful sea at the mouth of the Tagus. It is hazy, the mist gradually lifts and the sun rises, sparkling on the water. Some boats are bobbing and drifting in the foreground.
2, 3, 4	Buildings come gradually into view: Saint Jerome's Convent, under which stores were formerly kept for the use of the British Navy, forms a most prominent, beautiful, and interesting feature . . . churches, convents, castles, public buildings, the dwellings of the proud grandees and the humblest citizen, all mingled as in one vast amphitheatre.
5	This is the final division of this portion of the panorama: we come to rest on the Grand Square. Gorgeous palaces and magnificent ranges of streets, the dwellings of the great and the powerful.
6, 7, 8	The tremendous effect of that devastating agency, the fearful earthquake is felt upon the mighty waters. The sky is obscured, the sea hurled bodily in all directions. A magnificent vessel is borne with terrific violence to the summit of the mighty and crested pyramid of water, thence hurled to destruction in the fearful depths below.
9, 10	The effect of this dire calamity on the devoted city . . . now breaks upon the startled sight of the spectator . . . a mass of ruins . . . the inhabitant of a princely palace and the meanest hovel rushing for safety to the altar.

tinually extended, so that no bending or collapsing takes place on the canvass, and nothing, as heretofore at exhibitions of this class, occurs to destroy the pictorial illusion and discover the artificial effects."[48]

The music and sound effects drew on similarly pioneering technology. The apollonicon was what Richard Altick has termed "one of the most monstrous products of the nineteenth-century penchant for replacing men, in this case musicians, with machinery."[49] One critic reported hearing "either as solo or combined," the following instruments: "trombones, cornet-à-pistons, trumpets, French horns, ophicleides, flutes, hautboys, clarinets, violins, cello, contra-basse, drums, cymbals, and triangle."[50] Another explained, "It has four distinct organs, and has nine composition pedals with three coupling movements, sixteen pedals, fifty-three stops, and two thousand four hundred and seven pipes."[51] It was operated by one man—the church and theater organist Mr. Pittman—who also deployed the apollonicon's "set of Kettle Drums, Triangle, and Effects for the Storm," and machinery to trigger a drum roll.[52] Perhaps most astonishing of all was the fact that this extensive "orchestra" was out of sight in a separate room, filling the auditorium with sound, as if from beneath the ground.[53]

[48]*The Times* (25 December 1848).
[49]Altick, *The Shows of London,* 158. Ord-Hume concludes that it "was nothing more than a concert organ with possibly a claim to being the precursor of the theater organ with its percussion and effects department"; moreover it was played by one organist (i.e., not the five of the Flight & Robson Apollonicon). It was not intended for mechanical performance, although there has been confusion between the two instruments over the years: the word "apollonicon" became the generic term for a large barrel and finger organ. Ord-Hume, *Barrel Organ,* 136.

[50]*London Journal* (20 January 1849).
[51]*The Illustrated London News* (20 December 1848).
[52]According to *Hamilton's Catechism of the Organ* (1850); cited in Ord-Hume, *Barrel Organ,* 139. Mr. Pittman was a lecturer at the London Institution; organist of churches at Sydenham, Tooting, Spitalfields, and Lincoln's Inn; and accompanist at Her Majesty's Theatre and Covent Garden. He subsequently (in 1865) became accompanist at Her Majesty's Opera, and from 1868 until his death he had the same position at Covent Garden, composing music for operas, and assisting in the translation of librettos.
[53]"[The Apollonicon] is of enormous dimensions, being thirty feet in height and in depth, and fifteen in width, and

There comes a point where any allegorical significance or admiration of the technology in such entertainments is subsumed into the thrill of the moment, the purely sensory—what Nicholas Daly has called the "sublime moment of devastation."[54] But in the context of Lyell's theories was there a danger that the experience for the spectator, confronted by such a nihilistic spectacle underpinned by materialist theories rather than by reassuring divine cosmologies, would be too much? The rest of this article will focus on the tension between the immersive, overwhelming quality of the spectacle and its countervailing narrative reassurance, together with how visual and aural components contributed to this negotiation.

Immersion

Secord reminds us that in the eighteenth century "sensation" had been part of the culture of sensibility.[55] In the new century, however, the term took on new meanings and became more specifically associated with immediate nervous stimuli; the mind's consciousness of these stimuli was defined as perception. In cases of heightened feeling, the senses could overwhelm reason, contemplation, and the other faculties. These passions could engulf crowds too: a "sensation" came to mean an excited or violent emotion felt by an entire community and produced by a common experience. There were few more thrilling sensations to be had in mid-century London, if contemporary accounts are to be believed, than that of the Cyclorama.

The most commonly reported effect was the impression of "being there": "The spectator can with difficulty divest himself of the idea that it is the thing itself, and not a mere representation, on which he is gazing."[56] Film scholar Alison Griffiths has suggested that modern IMAX cinema draws on the particularities of nineteenth-century bourgeois perception exemplified by the panorama—spectatorial primacy as a form of knowledge—and shares its "illusion of material presence," inviting the spectator to play a perceptual game.[57] Such film scholarship can help us analyze the processes at work in the nineteenth century and explain how establishing a sense of depth perspective and breaking the fourth wall together created the immersive effect we find in the Cyclorama. Griffiths points to the importance of layering: the more visual cues for foreground, middleground, and background, the more effective the 3D effect.[58] We have seen how the machinery of the Cyclorama not only produced a smooth unfurling of the canvas, without distracting technological malfunctions, but also facilitated the placing of objects (boats, waves) in different planes. We find the same technique in some panoramas, where fixed "faux terrain" was used to increase the sense of depth and to cover the edges of the canvas.

On this last point, the reviewer in the *Daily News* notes how, during the Cyclorama, the Princess's Palace in the fourth frame "almost obtrudes itself within the imaginary portion of the theatre with remarkable force and dignity."[59] The boundary between "here" and "there" is eroded through the choice of architectural design in the panorama ("Mooorish, Gothic, and old Norman mannerisms"), which merges with the eclectic design of the auditorium (see plate 1). The use of lighting also helped to disguise the divide represented by the proscenium. The darkness that accompanied the most dramatic moment (the start of the earthquake) removed the visual delineation at a stroke and helped to enact travel through time and space, with the added benefit of disorientating the spectator. The reviewer of the *Morning Post* complained rather crossly, "There are many persons who cannot endure noise or darkness, especially when some idea of terror is present to the mind. The absence of all light was not necessitated."[60]

in its loudest tones it is so deafening that the proprietors of the Colosseum have found it incumbent to place it in a room seventy feet in length," *London Journal* (20 January 1849).

[54]Daly, "Volcanic Disaster Narrative," 280.

[55]Secord, *Victorian Sensation,* 11–12.

[56]*The Observer* (26 December 1848).

[57]Alison Griffiths, *Shivers Down Your Spine: Cinema, Museums, and the Immersive View* (New York: Columbia University Press, 2013), 84; she is building on Charles R. Acland, "IMAX Technology and the Tourist Gaze," *Cultural Studies* 12/3 (1998): 429–45, here 431.

[58]Griffiths, *Shivers Down Your Spine,* 104.

[59]*Daily News* (25 December 1848).

[60]*Morning Post* (25 December 1848).

In other words, the final, emotional leap across the boundary from objective representation to subjective experience seems to have been achieved by a powerful attack on the senses, perhaps enhanced by the shared experience of an audience willing themselves— at least initially—to be thrilled and terrified.

Familiarity with the Burkean sublime may have further enhanced the experience.[61] For Burke, "Whatever is fitted in any sort to excite the ideas of pain, and danger, that is to say, whatever is in any sort terrible . . . is a sources of the *sublime;* that is, it is productive of the strongest emotion which the mind is capable of feeling."[62] Whether or not audiences were familiar with the details of Burke's theories, the Cyclorama does seems to have deployed almost every quality that for Burke forms the emotional basis of sublime aesthetic experience: astonishment, terror, obscurity, power, vastness, infinity, magnificence, light. The implied vastness and obscurity of the panorama at the Cyclorama seem to have been the most striking qualities, because their effect went beyond that usually encountered in a theater.

Sound was a crucial ingredient in this experience; it helped to create depth and to break the proscenium divide more subtly. The use of diegetic sounds was extensive. Reviewers noted the thunder of the approaching storm, the underground rumbling of the quake, the deafening collapse of buildings, the "roar of the foaming element"—all originating offstage.[63] A common technique of sound design for modern film involves implying the size and the proximity of threat by using dense layers of low-frequency sound effects in conjunction with patterns of rhythmic thrumming, filling the cinema with rumbles and reverberations that expand the offscreen space of diegesis, envelop the audience, and undermine the possibility of critical detachment.[64] One can imagine similar effects being created with the apollonicon. There are plenty of accounts of its low and disorientating rumbling, which added sheer noise and vibration as well as music to the spectacle. The visceral impact seems to have triggered a virtually automatic sense of terror in the spectator.

The disembodied nature of the sound also appears to have been crucial to its quasi-transcendental effect. Brian Kane has argued that sound heard in isolation underdetermines its source and cause, and in so doing encourages imaginative supplementation.[65] Acousmatic listening is thus often deployed to promote auditory access to essence, truth, profundity, ineffability, or interiority.[66] In 1838 Alexandre-Etienne Choron anticipated Wagner in arguing that "the attitudes and the movements required for instrumental execution are among those most contrary to [theatrical] illusion," and that "the presence of the orchestra, playing in full view . . . is every bit as disturbing as would be the sight of the backstage machinery and the stage-hands working away on it."[67] To overcome this interference, Choron proposed a theater in which the orchestra is no longer placed in front of the proscenium, but is situated in a space built into the frame of the theater's structure. This solution is remarkably similar to the concealment of the apollonicon at the Cyclorama. Given the already blurred boundaries between representation and experience in the auditorium, such phantasmagorically veiled sound would not only have intensified the listening experience in the ways that Kane suggests, but would also have encouraged specific engagement with real and imagined sources (the apollonicon; the earthquake).

[61]This claim is made by Daly, in connection with similar entertainments, "The Volcanic Disaster Narrative," 261–62.
[62]Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (London, 1757), VII: "Of the Sublime"; discussed in the context of Victorian London in Nicholas Taylor, "The Awful Sublimity of the Victorian City: Its Aesthetic and Architectural Origins," in *The Victorian City: Images and Realities,* ed. H. J. Dyos and Michael Wolff (London: Routledge, 1973), II, 431–47, 434–35.
[63]*The Observer* (26 December 1848).
[64]William Whittington, "Lost in Sensation: Reevaluating the Role of Cinematic Sound in the Digital Age," in *Oxford Handbook of Sound and Image in Digital Media,* ed. Carol Vernallis et al. (New York: Oxford University Press, 2014), 61–62. Whittington is referring to the score for Jurassic Park here, and the approaching T-Rex.
[65]Brian Kane, *Sound Unseen: Acousmatic Sound in Theory and Practice* (Oxford: Oxford University Press, 2014), 8–9.
[66]Ibid., 102.
[67]Quoted from Saint-Saëns, *Harmonie et Mélodie* (Paris: Calmann Lévy, 1885), 52–53; cited in Kane, *Sound Unseen,* 102–03.

Reports of the show suggest as much. Richard Altick recounts how Bradwell's nephew, who had assisted his uncle in renovating the Colosseum, reminisced that at the 25 December performance, "the earthquake was proceeding with every sort of contrivance for thunder and lightning, and in the midst of the din, there came suddenly a tremendous crash, which shook the visitors in their seats. They thought that was the finest effect of all." However, it turned out that this crash was the explosion of illuminating gas in a Berlin wool merchant's house, which had devastated a portion of Albany Street—an event that had actually occurred five months earlier and was only subsequently folded into the mythology of the Cyclorama's realistic effects. This mistaken reminiscence nevertheless demonstrates the dominant response to the Cyclorama: it was terrifyingly realistic.[68]

We might conclude, then, that the immersive effect of the Cyclorama derived from its ability to break down the boundary between representation and reality by assaulting and confusing the senses, prompting an instinctive reaction of fear. But in the light of Lyell's scientific findings and their potential to undermine public assurance of a divine universe with humanity at its center, would such a shocking spectacle have overwhelmed some spectators altogether?

Narrative

One might imagine that the Cyclorama's musical soundtrack would have helped to link the images together in the manner of a film score, providing continuity and encouraging the audience to remain immersed in the story. Instead, as we will see, Mr. Pittman played a series of familiar pieces of music on the apollonicon, supplying a sequence of narrative fragments to accompany the images. This episodic approach to plot is strikingly similar to that of science writers of the period.

While geologists were happy enough to reveal a loosely chronological series of events traversing the history of the earth, they were wary about offering a single explanatory mechanism, such as evolution or progressive development, by which all events could be understood and related.[69] Buckland has explained how they tended to leave plots implicit or unarticulated, or threaded narratives together in episodic or deliberately disjointed fashion. Such writing resisted the plotting that was so essential to cosmology and instead presented earth history as a discontinuous succession of scenes.

Hugh Miller, for example, had famously conjured up "geologic dioramas" in his writings, bringing landscapes to life in imaginary guided tours. In his 1848 essay on the Bass Rock (an island off the east coast of Scotland), he separates each "scene" from its predecessor by descriptions of the formation and dissipation of mist or darkness.[70] His description of an earthquake in many ways anticipates the sensory environment of the Cyclorama. It emphasizes sounds from below and a proximate heaving landscape and boiling sea as darkness descends:

> We may hear, too, from the abyss, the growlings, as of a subterranean thunder, loud enough to drown the nearer sounds of both wave and current. . . . The whole region around, far as the eye can reach, heaves wildly in the throes of Plutonic convulsion. . . . The platform of sedimentary rock over an area of many square miles is fractured. . . . Waves of translation, produced at once in numerous centres by the sudden upheaval of the bottom, meet and conflict under canopies of smoke and ashes . . . and, amid the loud patter of the ejected stones and pumice, as they descend upon the sea,—the roaring of the flames,—the rending of the rocks,—the dash of waves,—and the hollow internal grumblings of earthquakes,—dark night comes down upon the deep.

Then we move to the next scene: "Vastly extended periods pass away; there are alternate pauses and paroxysms of convulsion . . . and

[68] *Notes & Queries,* 10th ser. 3 (1905): 189–90; cited in Altick, *The Shows of London,* 160.

[69] Buckland, *Novel Science,* 20.

[70] Edited by Thomas McCrie. Also published as Hugh Miller, *Edinburgh and Its Neighbourhood, Geological and Historical; with the Geology of the Bass Rock,* 5th edn. (Edinburgh: Nimmo, 1873); see O'Connor, *The Earth on Show,* 402. See also Miller's *Footprints of the Creator,* 2nd edn. (London: John Johnstone and Hunter, 1849), 201–03; *Edinburgh and Its Neighbourhood,* 3rd edn. (Edinburgh: Nimmo, 1869), 80–82.

the curtain again rises, the entire scene is changed."[71] By this means, O'Connor argues, the "theatrical agency of mist" set between the powerfully evocative descriptions of different periods in geological history highlighted the lack of current knowledge about the mechanisms and causes that might link them. The geologist could thus construct a chronological sequence or narrative of earth history without requiring an underlying plot to explain it.

Although it is unclear whether Mr. Pittman paused between each piece of music as the imaginary curtain rose on each new scene of the Earthquake of Lisbon, or improvised transitions to minimize the junctions and prepare the audience for the next view, the sequence of unrelated musical episodes seems to have encouraged spectators to experience the panorama in a fashion similar to Miller's "geological dioramas": as a series of episodes rather than as an unfurling plot.[72] The avoidance of continuous plot was in part motivated by the practical demands of compressing a real-time event into theatrical time, which involved focusing on representative moments from the earthquake rather than detailing the whole. But the effect remained, and the music facilitated it.

Most of Miller's imaginary voyages constructed the narrator and reader as disembodied, invisible presences within or before the landscape (as in the diorama's darkened auditorium). While the effect is in many ways similar to that of Lyell's panoramic views of geological landscape, Miller had very different aims. The vivid imagery mingles sacred history with geohistory and, as O'Connor has suggested, the two become allegories of each other. In this way, Miller used science to enrich the received narrative of sacred history and to "justify the ways of God to man."[73] Thus, he asks rhetorically, "May there not be a time coming . . . when the world which we inhabit, wrapped round with the holiest associations . . . shall be regarded . . . with reverence and respect as the *Bass* [the Bass Rock] of the universe, and its history be deemed perhaps the most precious record in the archives of heaven?"[74]

A similar combination of religious and scientific approaches occurs in the Cyclorama. As we have seen, poetic quotations invoking Providence punctuate the brochure text. In a more thoroughgoing way, the music offers reassurance about divine power through its own status as "quotations" at the same time as it directs the spectator's emotional experience. An eyewitness remembered many years later how the music surpassed anything that a writer could achieve on the page:

> First, very pleasant music prepared the audience for the raising of the curtain. Calmness and repose. We saw the bosom of the Tagus and a lovely sunrise. Calamity was far off. The sky began to darken, the music changed and its quality became agitated. At last a horrible black darkness closed in upon us. The whole building and we trembled, the Apollonicon screamed, raved and bellowed. The music changed and became more comforting, the light increased, and we saw before us the terrible picture of Lisbon in ruins. Whilst this miserable scene was still before us the music was skillfully changed in its quality: a calm was spread over the audience and there was conveyed to the mind that strange sense that, while poor little mankind may be utterly overthrown, the great calm of Nature resumes its sway.[75]

Accounts differ—or are unhelpfully vague—about what music accompanied each frame in the panorama, but they agree that the first shows included the overture, market chorus, and march from Auber's *La Muette de Portici* (1828; known in London as *Masaniello*); the second (Andante) movement from Beethoven's Pastoral Symphony (1808); and the prayer from Rossini's *Mosè in Egitto* (1818). It is not clear what was played as the earthquake struck, though music is mentioned in several of the

[71]Miller, *Geology of the Bass Rock,* 338–39.
[72]For more on the idea of music as curtain-raiser in a rather different context, see Gundula Kreuzer, *Wagnerian Technologies: On 19th-Century Opera as Production* (Berkeley: University of California Press, forthcoming).
[73]O'Connor, *The Earth on Show,* 413.
[74]Miller, *Geology of the Bass Rock,* 258.
[75]Mr. Somers Clarke to *The Organ* in 1933; cited in Ord-Hume, *The Barrel-Organ,* 131. Given that this witness must have been just a small boy when he visited the Cyclorama, some eighty years earlier, we should treat his testament with some caution. Nevertheless, the impression made by the whole spectacle, notably the power of the music, seems plausible and consonant with (if more detailed than) most contemporary accounts.

accounts as being crucial to the effect, and the *Musical World* includes in its list of pieces "a storm scene," which could have been the one from the Pastoral but, since it was not announced as such, is more likely to have been a newly written piece using similar topoi.[76]

Following the *Masaniello* overture, "played with much taste and feeling," "the lights are suddenly withdrawn and on their restoration the sea . . . is observed calm and serene."[77] The *London Journal* identifies the Pastoral as the curtain raiser. As the panorama unfolds, although various historically significant buildings appear in the foreground, "the eye roams beyond them delightedly, far over the inland prospect . . . up the sides and along the very summits of the hills and mountains. . . . The mind, the while, drinking in sensations of repose—of rural peace, leisure, and tranquility." This response to the images confirms the probable accompaniment of the second movement of the Pastoral at this point, and when the reviewer's attention then turns to Lisbon as the boat arrives at the port—"the city bursts upon the view"—one might imagine the market chorus (and perhaps the march too) from *Masaniello* peopling the streets, on which small silhouetted figures can just be seen in images 4, 5, and 6. Various sources mention a "prayer" accompanying the final frames, and Rossini's piece seems a fitting conclusion to events. (See Table 2 for an overview of the relationship between image and music.)

In whatever sequence the music might have been heard in relation to the images, it offered various layers of potential narrative and symbolic associations. Auber's opera—and the devastation of Portici by the eruption of Vesuvius in the final tableau—was surely familiar to the spectators at the Cyclorama. English adaptations of the opera were still running in 1848, and it had found new relevance in the wake of the recent revolutions.[78] The Pastoral, as James Q. Davies has shown, was probably the best-known piece of instrumental music in 1830s London (and presumably into the 40s too), and the Andante instantly recognizable as a symbol for (threatened) pastoral calm.[79] Rossini's *Mosè,* based on the Exodus from Egypt, concluded with the parting of the Red Sea, the escape of the Israelites, and the drowning of the Egyptians. The prayer ("Dal tu stellato soglio"), added to the opera in 1819 to precede the escape, became a popular concert favorite with London audiences. The messages suggested by such choices of music above all concerned the power of nature, linked inextricably with divine judgment. The music offered the spectator the reassurance of a divine plan with humanity at its heart to soften the impact of nature in its raw state. The relationship between the panoramic "frames" and musical excerpts in this unfolding narrative arguably balanced the thrill of immersion in the diegetic present with the pleasures of heterodiegetic knowledge, each heightening the effect of the other.

But the music could also be experienced in a looser relationship to its narrative context. Nicholas Mathew has pointed to the "tableau aesthetic" in the Pastoral, and one can extend this idea to the other music in the Cyclorama. Meaning and narrative are compressed into moments that "attracted, arrested, and enthralled the viewer" and aligned with the visual distillations of action.[80] Thus the second movement of the Pastoral, which probably accompanied the unfurling images of distant countryside, eschews harmonic dynamism, drawing out its melodic content, as Mathews observes,

[76]Some accounts mention *Don Giovanni* in later performances, and music from the finale could have been an ideal introduction to the storm and earthquake, but in the original performances an original piece of music—perhaps even composed by Mr. Pitman—seems most likely.

[77]*London Journal* (20 January 1849).

[78]See, for example, reference to the ballet version at the King's Theatre, which commanded the stage from 1829 to 1848 and beyond, in Burwick, "Masaniello on the London Stage," ed. Frederick Burwick and Paul Douglass, *Dante and Italy in British Romanticism* (London: Macmillan, 2011).

[79]J. Q. Davies, "Dancing the Symphonic: Beethoven-Bochsa's *Symphonie Pastorale,* 1829," this journal 27 (2003): 25–47. The Pastoral enjoyed twenty-two performances in London before 1830: it was the most popular instrumental piece in England—mentioned in sources in the 1830s and 40s too. Davies claims it was the filter through which all orchestral music was read, as pastoral, and points to the emerging taste for "noise" in London concert halls and theaters, with their larger orchestras and sound effects. See also Kramer, *Why Classical Music Still Matters,* 179–80.

[80]Nicholas Mathew, *Political Beethoven* (Cambridge: Cambridge University Press, 2012), 91–93.

Table 2
Music and images for the Earthquake of Lisbon

Music	Image
Overture (Auber, *La Muette de Portici*)	
Andante (Beethoven, Pastoral Symphony)	1. Sunrise
	2. Journey upriver
	3.
Market chorus (Auber, *La Muette de Portici*)	4.
March (Auber, *La Muette de Portici*)	5. Grand Square, Lisbon
Storm music (composer unknown)	6. Earthquake (at sea)
	7.
	8.
Prayer ("Dal tu stellato soglio," from Rossini, *Mosè in Egitto*)	9. Earthquake (aftermath, Lisbon)
	10.

"via a combination of cyclical repetition and paratactic intensification." In other words—and the same can be said of Auber's almost obsessive but harmonically static repetition and sequencing in the market chorus—the moment is intensified rather than driven forward. The music accompanies painted images that similarly capture over-determined snapshots. The images do not represent a smooth unfurling of real time and space, but rather intensify the overall effect by freeze-framing its most significant moments. One might take this a step further, and conclude that such musical stasis and intensification underwrites the visual sublime—gesturing through repetition and uniformity toward the infinite, as in Banvard's three-mile representation of one thousand miles of the Mississippi. The moving panorama and music worked together to strengthen the snapshot images in the moment, rather than to create the specificity of a single plot. These musico-visual fragments could readily be enjoyed in relation to new- or old-earth theories as well as to the historical narrative or to more generalized anxieties over the idea of providence.

Conclusion

Lyell encouraged his readers to visualize the disasters he enumerated. By multiplying example upon example of Martinian apocalypses, he aimed to satisfy his readers' appetite for catastrophe, removing their imaginative need for one vast cataclysm to explain geological changes. The problem of striking a balance between inductive proof and historical imagination, and the charge of skepticism that this effort could lead to, preoccupied him.[81] Adapting epic rhetoric to geology offered him (and other writers, such as Miller) a parodic language through which to distance his own project from plot, but also a language that allowed him to present his geology as consonant with the traditions he was criticizing.[82] One might point to a similar tactic in the Cyclorama. The visceral impact of the powerful apollonicon threatened to destroy critical distance and immerse the audience in the full horror of the earthquake, but the use of preexisting music (a form of parody) in the performance, and classical quotations in the brochure, offered spiritual support.

But what did spectators do with the aural cues? Did they really add specific and reassuring programmatic depth and narrative to the images, rooting them in divine cosmology? Al-

[81]Ibid., 119.
[82]Ibid., 125.

though the findings of geologists such as Lyell challenged some biblical interpretations, they were often regarded as compatible with them, filling the gap said to occur after the first verse of Genesis, the six days of which could be understood as referring only to the last creation, not to the earlier ones studied by geologists. The Cyclorama similarly accommodated diverse views about earth history. Spectators were free to choose religious, radical scientific, and/or political interpretations of the earthquake, and to experience a range of emotional and affective responses to the destruction. The power of such an approach lay in the accumulation of events and effects.

The project of Lyell and other geologists was not to plot the history of the earth, but rather to find a method for speculating on the unknown worlds that must have existed in an unobservable past by analogy with known events. The approach was statistical rather than teleological, predicated on the idea of a universe that may not ultimately be assimilable to human needs. The music in the Cyclorama similarly did not prescribe a single narrative interpretation of the sequence of events unfolding on the panorama, but rather offered the spectator a series of moments in a sequence that was chronological but not necessarily teleological.

Wolfgang Schivelbusch has explained how mid-nineteenth-century rail travel presented the public with a panoramic perspective on the modernizing world. Access to changing vistas, and movement through them, contributed to a detached and distant spectatorial relation.[83] It is clear that the panoramic vision of the Cyclorama was intended to create a much more immersive experience. Movement backwards and forwards through time and landscape—visually and musically—had the effect of drawing spectators into the scene, in order to appreciate the full power of nature's destructive force. But at the same time, the implicit narratives offered by the brochure and the musical accompaniment offered a range of religious and scientific points of reference. The resulting psychic configuration answered to both knowledge and desire, the emotional as well as the imaginative and intellectual responses that Lyell's theory provoked.

Abstract.
The Cyclorama opened in London in 1848 with a representation of the 1755 Lisbon earthquake that reportedly terrified audiences with its realistic aural and visual effects. During the first half of the century Londoners had been confronted with a rapid succession of revolutions in scientific thought, which needed to be assimilated into the emotional as well as the intellectual structures of public life. The geologist Charles Lyell had recently explained earthquakes and volcanic activity in a manner that fundamentally changed public understanding of the history of the earth, and in so doing challenged the religious narratives that had formerly underpinned it. The Cyclorama invited the spectator to confront such destruction in this new light: the frighteningly immersive visual and aural effects and the comforting narratives offered by accompanying musical excerpts (from works by Auber, Beethoven, and Rossini) were crucial to the shaping of the experience, and can be understood in the context of other artistic and poetic responses to Lyell's proposals. The music helped to articulate something of the competing perspectives on the crisis of faith that was exercising the intelligentsia at mid-century and offered a conduit for both emotional and intellectual responses.
Keywords: Cyclorama, Charles Lyell, geology, London, earthquake of Lisbon

[83]Wolfgang Schivelbusch, *The Railway Journey: The Industrialization and Perception of Time and Space* (Berkeley: University of California Press, 1986), 434.