Note from the Guest Editor

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A LECTURE on the popular subject of the ELECTRIC LIGHT, by Dr Bachhoffner, on Tuesday, Thursday, and Saturday Evenings. Popular Lectures on CHEMISTRY, with brilliant Experiments, by Dr Ryan, daily, and on the Evenings of Monday, Wednesday, and Friday. First Exhibition of an entirely New Series of DISSOLVING VIEWS in MEXICO and SWITZERLAND, with historical descriptions. CHILDE'S PHANTASMAGORIA, with very curious New Effects, Mornings and Evenings. MICROSCOPE at One o'clock daily. New CHROMATROPE. DIVER and DIVING-BELL. WORKING MODELS explained. Music directed by Dr. Wallis.–Admission, 1s.; Schools, Half-price.[1]

The public appetite for scientific knowledge in the first half of the nineteenth century is exemplified by this advertisement for the London Royal Polytechnic Institution, in which scientific lectures and demonstrations sit alongside other forms of entertainment. The close relationship between the worlds of science and the arts during this period has been the topic of recent scholarship, particularly in literary studies. Richard Holmes's *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science* (London, 2008) demonstrates how scientists were steeped in literature, art, and music (as illustrated by the astronomer William Herschel, who was a flutist, composer, and friend of Charles Burney), and conversely how writers were influenced by the latest scientific thinking across a range of fields (exemplified by Percy and Mary Shelley).

Scientific metaphors and imagery infused much literature and entertainment of the period, pointing toward mystery and enchantment on the one hand, and to the unassailable laws of nature and truth on the other.[2] John Tresch's *The Romantic Machine: Utopian Science and*

[1] *Morning Post* (25 December 1848), the same advertisement appears in a number of dailies during the holiday season.

[2] A century or so later, C. P. Snow was to point to the contrasting division of "the intellectual life of the whole of western society" into the "two cultures" of sciences and humanities in his influential Rede Lecture (1959). The Rede Lecture was published as *The Two Cultures and the Scientific Revolution* (Cambridge: Cambridge University Press, 1962). Subsequent commentators suggested that Snow overstated this cultural divide, although the contrast with the intellectual life of the early nineteenth century remains; see, for example, F. R. Leavis, *Two Cultures? The Significance of C. P. Snow*, with an introduction by Stefan Collini (Cambridge: Cambridge University Press, 2013).

19th-Century Music, vol. 39, no. 2, pp. 83–86 ISSN: 0148-2076, electronic ISSN 1533-8606. DOI: 10.1525/ncm.2015.39.2.83.

Technology after Napoleon (Chicago, 2012) argues that Romantic aspiration shaped the mechanical sciences and industry in France during the second quarter of the nineteenth century. A new image of science, as a theory of nature and knowing rather than as a practice of measurement and classification, appeared at the same time as a new type of machine—the steam engine, the battery, and a variety of electrical and atmospheric instruments—began to challenge the primacy of the balance, lever, and clock. This development led in turn to a new understanding of nature as growing and modifiable, and of knowledge as active and transformative. In other words, Tresch argues, scientific truth was understood in relation to human consciousness. Balzac—whose novels were enmeshed in scientific, artistic, technological, and political currents—and his "fellow travelers" become the means by which to explore this idea.

Music has not often featured in such narratives of the relationship between science and the arts during this period, although a number of conference panels and recent (and imminent) publications suggest that this situation is changing rapidly.[3] Musicologists have for some decades been seeking alternative objects of enchantment to the music itself. Witness the fascination with visual culture and its methodologies as a tool with which to understand opera and film music, as well as performance more broadly. Science in many ways responds to this new desire, as well as to the ever-increasing interest in the contexts in which music was produced and received. Conversely, historians of science have been moving away from disembodied ideas toward the recovery of materially embodied practice, associated with the construction and dissemination of scientific cultures and extending methodologically to the reconstruction and restaging—the performance—of scientific experiments. This special issue brings together scholars from both disciplines, with a view to exploring ways in which music and science, broadly defined in both cases, mediated, responded to, and transformed each other in a period when both were being brought uncompromisingly into the public—and popular—sphere.[4]

The sciences under consideration include instrument technology, phrenology, geology, and telegraphy.[5] Consideration of the music embraces both its production, via composition, performance, and notation, and its reception: as noise as well as artistic expression, as an elite as well as a popular phenomenon, as a tool of control as well as a source of pleasure. These articles together discover fascination with scientific and musical instruments, their technologies and the metaphorical resonances they hold for each other; with music and communication, whether physical or invisible; and with music's role in the assimilation and development of scientific findings. A theme that runs through all of these articles is the tension between mystification and explanation, and the strong desire to keep both in play.

Some of the questions we are concerned with include: what were the spaces in which music and science came together—the geographies and

[3]Recent work includes: Myles Jackson, *Harmonious Triads: Physicists, Musicians, and Instrument Makers in Nineteenth-Century Germany* (Cambridge, MA: MIT, 2006); David Pantalony, *Altered Sensations: Rudolph Koenig's Acoustical Workshop in Nineteenth-Century Paris* (New York: Springer, 2009); Deirdre Loughridge, *Technologies of the Invisible: Optical Instruments and Musical Romanticism* (PhD, University of Pennsylvania, 2011); James Kennaway, *Bad Vibrations: The History of the Idea of Music as a Cause of Disease* (Aldershot: Ashgate, 2012); Emily Dolan, *The Orchestral Revolution: Haydn and the Technologies of Timbre* (Cambridge: Cambridge University Press, 2013); James Q. Davies, *Romantic Anatomies of Performance* (Berkeley: University of California Press, 2014); and *Sound Knowledge: Music and Science in London,* 1800–50, ed. James Q. Davies and Ellen Lockhart (Chicago: Chicago University Press, forthcoming).

[4]A conference was convened at King's College London, under the auspices of Roger Parker's European Research Council-funded *Music in London, 1800–51* project, in order to discuss draft versions of these papers. I am very grateful to the participants (Katherine Hambridge, Jonathan Hicks, Gundula Kreuzer, Ben Marsden, Laura Protano-Biggs, Wiebke Thormählen, Flora Willson), to the coordinator Angela Waplington, and especially to the respondents, Cormac Newark, Roger Parker, and John Tresch, who helped us to develop our ideas. In addition, I am grateful to Roger for his continuing support during the preparation of this issue.

[5]The term "scientist" was not coined in English until 1833 (by William Whewell, and then published in his anonymous review of Mary Sommerville's *On the Connexion of the Physical Sciences* in 1834). Whewell's deployment of the term seems to have been satirical, marking the evolution of science as a discipline: as specialisms began to proliferate "natural philosopher" became an inadequate descriptor.

ecologies, concrete and conceptual, social and material? How were the tensions between unifying and universalizing on the one hand and specialization and individuality on the other disciplined? How were the binaries of mind/body, spirit/matter, subject/object reinscribed or broken down through this relationship? What were the mechanisms of delight—for music and for science? To what extent is our modern, interdisciplinary fascination with the relationship between music and science an extension of that of the early nineteenth century? London and Paris provide particularly interesting sites of exploration: each was a world city of culture and science in its own right, with imperial reach, but the exchange of ideas and people across the Channel enriched this relationship.

Our opening article considers some of the ways in which musical and scientific instruments articulated their relationship with each other. Simon Werrett examines the Woolwich Warren, Britain's imperial artillery hub in this period, which served multiple roles as a site of ordnance production and testing, scientific education and experimentation, pomp and spectacle—and tourism. Military music is considered here through the lens of scientific transformations of the period, exemplified in practices involving the pendulum as an instrument of regulation. Olinthus Gregory's experiments in standardization and the determination of the velocity of sound brought together the military, musical, and scientific cultures of the period, though music is revealed as a cause of ruination as well as a valuable resource in such arenas.

While the centrality of mathematics to the development of scientific and musical instruments is self-evident, we might today question the status of such "pseudo-sciences" as astrology, alchemy, or magnetism. However, it is clear that they had an influence on scientific developments as well as on the cultural world around them, and they help us to challenge too-neat narratives of progress and standardization, as our two articles on phrenology demonstrate. Musicians provided a privileged field of observation for Franz Joseph Gall and his followers, who sought to read on the surface of skulls the developments of cerebral zones, corresponding to instincts and affective and intellectual faculties. David Trippett examines the fraught discourse around music and materialism in this light. The cost of a material mind was a perceived loss of contact with the "gifts of nature" (Carlyle), but the concept of machine was also invested with magical potential to transform matter. These conflicting ideas are examined through music pedagogy of the second quarter of the century in London, with particular reference to amateur musicians and the popular appeal of phrenological "exercise." Céline Frigau Manning turns her attention to French phrenological texts that identify the "conditions" necessary to become an opera singer. In order to prove the truth of their assertions, these writers deferred to examples: catalogues of remarkable characters in which past and contemporary singers are cited and detailed phrenological studies devoted to specific artists together fueled specific discursive models of observation and critique that contributed to singers' public images.

The sheer speed of scientific developments during the first half of the century challenged the emotional as well as the intellectual capacities of the public. The relationship between science and religious belief in the years before publication of Charles Darwin's *Origin of Species* (1859) was a particularly charged area. Sarah Hibberd's article examines this tension through the lens of the Cyclorama at the London Colosseum in 1848. The geologist Charles Lyell's recent writing on earthquakes and volcanic activity had 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's representation of the 1755 Lisbon earthquake invited the spectator to confront such destruction in this new light, with a musical accompaniment that both intensified the immersive experience and the horror, and conversely offered a narrative of reassuring cosmic certainty. The resulting psychic configuration answered both to knowledge and desire, the emotional as well as the imaginative and intellectual responses that Lyell's theory provoked.

Communication is the theme of our final article: Inge van Rij listens for the sounds of the telegraph in music of the mid-nineteenth century, demonstrating how telegraphic dis-

course interacted with significant transformations not only in the creation and understanding of sound but also in fundamental concepts of art music. While the apparent disembodiment of the telegraph carried threatening implications for those social or ethnic groups aligned with the body, including performers, electricity was also primarily a tactile medium, and sensitivity to the telegraphic signals in art music also entailed a new appreciation of the powerful role of embodied performers. Van Rij thus offers new perspectives on the fraught negotiations between art and science, embodiment and transcendence, which underpin the ideas explored more broadly in this special issue.