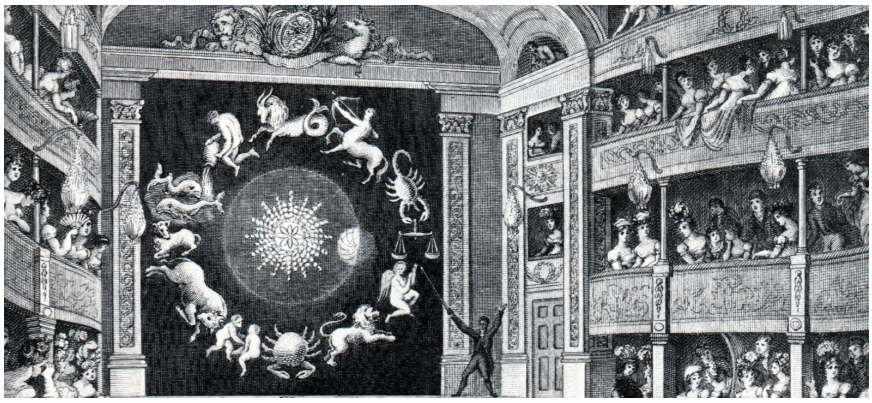
Sound Knowledge: Music and Science in London, 1800-1850
Study Days at King's College London
18-19 October 2013

Contributors: Ellen Lockhart (Princeton), James Davies (UCBerkeley), Sarah Hibberd (UNottingham), Nell Cloutier (UCBerkeley), Gavin Williams (Cambridge), Jonathan Hicks (KCL), Melissa Dickson (KCL), Myles Jackson (NYU), Flora Willson (Cambridge), Emily Dolan (UPenn), Deirdre Loughridge (UCBerkeley).

Consultants: James Chandler (UChicago), Alison Winter (UChicago), Katherine Hambridge (UWarwick), Arman Schwartz (UBirmingham), Heather Wiebe (King's College London), Roger Parker (KCL), Oscar Cox Jensen (KCL), James Grande (KCL), Ben Walton (Cambridge).

An initiative funded by the European Research Council.



(Edward Burney, detail from *Adam Walker at the English National Opera House*)

Friday 18 October
- 2:30 pm Welcome Tea
- 3-6 pm Round-Table I (Roger Parker, chair)
- Science on the Stage: Sarah Hibberd, Nell Cloutier
- Sound, Energy, and Conversion: Ellen Lockhart, Jonathan Hicks
- 6:30 pm Dinner at Sofra, Covent Garden

Saturday 19 October
- 10 am-12:30 pm Round-Table II (Ellen Lockhart, chair)
- Charles Wheatstone: Melissa Dickson, James Davies, Myles Jackson
- 2:30-5 pm Round-Table III (James Davies, chair)
- Music in the Order of Things: Emily Dolan, Deirdre Loughridge, Flora Willson
- 6 pm Dinner at Brasserie Blanc, Belvedere Road

All discussions will take place in the seminar room SWB20 at the Department of Music, King's College London, Strand.

ROUND TABLES

SCIENCE ON THE STAGE

Sarah Hibberd (UNottingham), Nell Cloutier (UCBerkeley)

Hibberd, "Good Vibrations: *Frankenstein* on the London Stage"

Vitalist speculation of the 1790s centred on the possibility of an animating power in nature, identical to, or analogous with, electricity. Gruesome experiments in London graduated from animal subjects and body parts (most famously Galvani's frog legs) to human corpses: in 1803, the Bolognese anatomy professor Giovanni Aldini attempted to revive the body of a recently executed murderer by applying electrical charges to his body: 'the jaw began to quiver, the adjoining muscles were horribly contorted, and the left eye actually opened … the fists clenched and beat violently … vitality might have been fully restored, if many ulterior circumstances had not rendered this – *inappropriate*'. Materialist-vitalist debates (and concerns about moral propriety) were reignited in 1816, when William Lawrence attacked John Abernethy's theories about a mysterious Life Force in a series of lectures at the Royal College of Surgeons.

Mary Shelley's novel *Frankenstein, or the Modern Prometheus* (1818) is the best-known literary response to a scientific debate that seized the public imagination like no other before it. Electricity as a life-giving force became the topic of countless newspaper articles, short stories and minor stage works. And it infiltrated cultural discourse in a range of intersecting ways: reviewers described the 'charged' atmosphere and the 'electric effect' created by performers on their audiences; actors and singers adopted poses as if 'thunderstruck'; music came to be understood as a pathological, quasi-electrical stimulant that acted directly on the nerves.

This paper examines two adaptations of *Frankenstein* created for the London stage: Richard Brinsley Peake's *Presumption* (English Opera House,1823) and Henry Milner's *The Man and the Monster* (Royal Coburg Theatre, 1826). Important elements of the Creature's evolution from childlike innocent to socialised human in Shelley's novel are his highly articulate speech and his sensitivity to music. In these stage works he is rendered mute: he communicates through expressive pantomime and responds to extended passages of music. The creation scene in each work; the creatures' expressivity and sensibility; and the public and critical reception are each examined in the broader context of contemporaneous scientific debate. At a time when Lawrence was stripped of his chair at the Royal College of Surgeons for his presumptuous ideas, and when Shelley had to cut and rewrite her text in response to the moral hysteria following the Burke and Hare murders in Edinburgh (the bodies were sold on as dissection material for anatomy lectures), these works offer an alternative medium in which such ideas were kept alive – even tested and advanced – in the public domain, and shaping scientific writing at the end of the decade.

Cloutier: "Vernacular Science and Planché's *The New Planet* (1847)"

In April of 1847, a new extravaganza by James Planché opened at the Royal Theatre Haymarket to celebrate the discovery of Neptune the previous year. Advertised as "A Classical, Astronomical, Quizzical, Polytechnical, Experimental, Operatical, Pantomimical Extravaganza, IN ONE ACT," *The New Planet* featured the planets and stars, personified by their mythological namesakes, embarking on a whirling review of

all the competing entertainments the Earth (read: London) could offer. The celestial beings experiment with exploding gun cotton at the Polytechnic Institute, query a "Mysterious Lady" at the Egyptian Hall, encounter Wilis from all the different productions of Giselle, witness a battle royale between *La Favorita* (representing Her Majesty's) and *Norma* (representing Covent Garden), and finish with a series of tableaux vivants that culminates in the enthronement of the new planet, all while singing parodies of popular songs. The extravaganza blends science and spectacle until they are inseparable, coalescing into a mass of textual and musical in-jokes that required the audience, like the Planets, to have undertaken their own tour of the musical, magical and scientific spectacles of London.

I examine "The New Planet" within the context of representations of scientists and fashionable society that stressed their incompatibility. Songs depicted professional scientists as oddities incapable of functioning in daily life; for example, "The Scientific Man" (1843) lists the sufferings of poor Mrs. Crucible due to her scientist husband's explosions, fumes, and neglect. The faults in communication that delayed British discovery of Neptune came to light in a widely publicized meeting in November 1846 of the Royal Astronomical Society that emphasized scientists' lack of social skills, which on this occasion acted to the detriment of British science. However, while astronomical details and news of this scientific discovery were widely published in newspapers, caricatures depicted fashionable society as incapable of understanding serious science and only interested in fads, flocking to exhibitions only to gossip and never to learn.

"The New Planet" presented a popular alternative to this opposition of anti-social science and anti-scientific society. While Planché's extravaganza certainly made science the occasion for a spectacular social event, appreciating the humor of the piece required scientific knowledge in combination with a dilettante's knowledge of entertainments. The piece raises questions about the extent to which science could be entertainment, and professional science remained functionally separate from its vernacular cousin. How much and what kind of scientific knowledge was expected of a sociable public? How did these 'scientific' amusements shape the status of science in popular culture? By looking at the discovery of Neptune through newspaper accounts, the proceedings of the Royal Astronomical Society, and Planché's musical extravaganza, I explore the relationship of science and sociability in the 1840s and the place of popular science within the competitive world of London entertainment.

Sound, Energy, and Conversion

Gavin Williams (Cambridge), Jonathan Hicks (KCL), Ellen Lockhart (Princeton)

Lockhart, "Transparent Music and the Unified Physics of Thomas Young"

This paper argues for a link between two simultaneous developments in London in the early 1800s: one is the pursuit of a unified physics, which posited a fundamental analogy between light waves and sound waves, between color and pitch; and the other is the birth of English program music, which sought to match descriptive tones to specific images or scenes. I begin by considering the experiments in sound-light analogy of the London-based polymath Thomas Young (1772-1829). Young – who was a celebrated linguist, Egyptologist and music-theorist in addition to being a scientist – claimed that all his diverse pursuits stemmed from a medical interest in the organs of perception: particularly the mouth, eyes, and ears. He devoted the first part of his career to the science of acoustics, developing a universal alphabet cataloguing all the sounds produced by the human mouth; during this time he became "forcibly

impressed" by the similar behaviors of sound waves and light. Subsequently (and more importantly for our purposes) he turned his efforts toward proving what Oliver Darrigol has called a "mediumnist" concept of light – in other words, that light functioned as a wave, like sound, rather than as a particle as Newton had suggested.

With these experiments Young, who was a devoted Laplacean, pursued what he called a "unified physics," in which sights and sounds came from a single ether, whose behavior was determined by a single principle of wave-based movement. In a unified physics – whose existence Young believed was proven by recent advancements in electrical science – vibrations functioned as something like a lingua franca, uniting the "vernaculars" of the individual organs. One result of Young's highly publicized work was a series of early breakthroughs in what is now called cross-modal perception, by which the nervous system could compensate for missing organs. For instance, simple elastic instruments like the thin rod provided a means of music-listening for the deaf, attaching from the sound source to the teeth of the hearing-impaired. Another result was a newly scientific basis for sound-light analogies. I will focus here on the output of Nicola Sampieri, a composer and pianist who gave Londoners among the first "native" pieces of instrumental music with dedicated programs. Of particular relevance are his 1798 "concert on an entire new plan," with transparencies displayed alongside representative music, and the series of pianoforte pieces he published in the first decade of the nineteenth century, with dedicated engravings and detailed instructions for matching sounds to images. Sampieri's particular interest in rendering wave shapes, colored light, and the "transparent" image within sound suggest his musical experiments drew directly upon Young's optical and acoustic ones. Ultimately, this case study aims to provide further evidence for the mutual relevance of scientific experiment and aesthetic thought in the years around 1800, and relate a new epistemology of sense-perception to the changing fortunes of instrumental music during this period.

Williams, "Engine Noise" (NB: Williams' paper will not be circulated for the Oct 18-19 study days)

This contribution will interrogate attitudes towards machinery, and their sounds, in nineteenth-century London, as revealed through close examination of Charles Babbage's Difference Engine. Funded by the British government, this device was supposed to be the world's most powerful mechanical calculator, able quickly to produce tables of numerical solutions for relatively high-order polynomial equations. Thus the Difference Engine would serve (or so Babbage hoped) to eliminate human error from the process of numerical calculation, providing vital stimulus both to science and to British industry. Babbage's ambitious designs for the machine were never fully realized—eventually leading to high profile attacks on its inventor in the British press—but in 1832 a substantial portion was completed. Soon afterwards, this partial yet operational Engine was being exhibited in the drawing rooms of London's high society: its audiences included Lady Byron, who became an passionate advocate of the machine, and an enthusiastic Duke of Wellington, who was then Prime Minister.

In contemporary accounts of the Difference Engine, the device emerges as an object of wonderment and excitement, but also as the occasion for anxiety: the machine seemed to be capable of substituting for human labor and even human thought. Above all, commentators expressed its mysterious powers in sonic terms: the click of a hand crank, the whir of silver rings displaying numbers, the ring of a bell at the end of the calculation—all these noises were read as signs of intelligent activity, but, disturbingly, in the absence of a human agent. I argue that these unsettling sounds, emerging from

the internal mechanism, distill an enduring political issue to do with replacing human labor with machines. (Along similar lines, and invoking Babbage, Karl Marx famously argued against the economic effectiveness of prioritizing of machines over people.) What is more, the Difference Engine's internal sound world can be put into productive dialog with the noisy cityscape of early-nineteenth-century London—a volubly disruptive environment that Babbage himself deplored and actively campaigned against. Indeed, the noises of the urban environment and those of the Difference Engine provide an illuminating contrast, presenting diverse aspects on the problematic of noise and the human-machine interface within what was at the time the world's most industrialized city.

Hicks, "Orchestrating the City Scientifically"

In the early decades of the nineteenth-century much of scientific London looked to Paris, and Berlin, for the latest standards of experiment and expertise. In the field of medicine, for instance, Morus et al (1992) record how Parisian comparative anatomy "would serve [in 1820s London] as the mark of a new middle-class professional elite" (132). By the start of the next decade many of the seventeen private medical schools operating in London "advocated developmental materialist anatomies, drawing on the classic works of the French Enlightenment" (133). Even those London-based bodies that expressly opposed this approach, such as the Royal College of Surgeons, were aware of the need to show that their own versions of science "could meet the highest standards of Berlin and Paris without serving utilitarian or materialist ends" (133). In other disciplines we see a similar picture: the wealthy Ordnance Survey geologist Henry de la Beche "hoped to model London institutions on Parisian ones. The Geological Survey (f.1835), the Museum of Economic Geology (f.1839) and the Royal School of Mines (f.1851) closely imitated their French counterparts" (133). Meanwhile, the suburban astronomers at Campden Hill Observatory, built in the 1830s, paid the price for a £1000 refracting lens that inconveniently broke in transit from Paris (139). This last, unfortunate incident serves as an example for Morus et al of a broader early-nineteenth-century trend by which "London makers [of scientific instruments] were losing out to French and German competitors" (139).

It is in light of this international economy of goods and knowledge that the historical study of London's sound and science must proceed. Far from a self-sufficient area of musical-technical activity, the British capital figures in my essay as one node in a would-be global network encompassing colonial and utopian geographies as well more immediate intra-European rivalries. In the first instance this model is informed by the recent "spatial turn" in the history of science, which has given fresh impetus to questions of scale, locality, and urban context as they relate to the production and display of scientific knowledge. My focus on "the city" as a prominent feature of the musical-technical imagination, as well as the specifics of the French connection outlined below, are the result of this concern with the historical *geography* of music and science. However, by resolving to study the placing of scientific activity one is inevitably drawn to consider the reflexive, scientific construction of place. The mutuality of these two terms, and their mediation by musical means is the subject of my essay, which is structured around three orchestrations, between 1844 and 1857, of a futuristic city, a North-African desert, and the street cries of Paris, respectively. Each of these examples offers a different perspective on the music-city-science nexus, and collectively they demonstrate the co-existence, even inter-dependence, of multiple forms of sound knowledge in early-nineteenth-century Paris and London.

The outlying dates of my survey are somewhat arbitrary—1844 is the year that Berlioz wrote his urban revenge fantasy *Euphonia*, and 1857 is the publication date of Jean Georges Kastner's *Grande symphonie humoristique vocale et instrumentale Les Cris de Paris*. But the intervening years—in which Félicien David's "ode-symphonie" *Le Désert* (1844) brought him international acclaim and large-scale London performances—can be characterised as a period of intense speculation about the nature and shape of urban experience. The last great embellishments of Regency era London were already growing old, but Haussmann's "lignes droites" were yet to overwrite the medieval riddles of *vieux Paris.* The very idea of the city was the subject of a politically-charged debate that drew both music and science into its orbit. Each of the musical examples I discuss occupied a different position in this force-field of urban ideologies. Rather than proposing any linear chronology from one example to the next I choose instead to present some of the tensions and textures that sustained this distinctive "moment": Berlioz's imaginary techno-autocracy provides a valuable inter-text for his contemporary orchestration treatise (1843), which can be read as a metaphoric arsenal for the conquest of harmonic and acoustic space; Kastner also published a treatise on orchestration, six years before Berlioz, but rather than offering his technical-instrumental services to a city of the future, the assimilated Frenchman advocated a "scientific" observation of the voices of Paris as a monument to their inevitable disappearance; David's quasi-melodramatic *Désert* offers a similarly ambiguous relationship to urban modernity, though in this instance his interest was less with the past and more with the Orient as imagined in the industrial utopianism of the Saint-Simonian prophets.

From the point of view of London, Kastner's polyphonic setting of the cries of Paris, which were never published in English, could easily seem remote. Yet his positivist approach to musical enquiry bears comparison with Henry Mayhew's proto-social science of the London poor, including their many musicians and entertainers. Berlioz, of course, made a considerable impression on London's musical public, with huge, disciplined orchestral displays at Exeter Hall during this period, as well as an invitation to perform in the relatively intimate, courtly setting of Buckingham Palace. He was also an official judge of instrumental innovation at the 1851 exhibition—an experience that influenced the subsequent enlargement of his orchestration treatise in 1855. David likewise enjoyed a period of success in the British capital, not least because of Berlioz's (initial) enthusiastic support and programming. Like his mentor, David was singled out for his apparent mastery of large forces and skilful handling of orchestral effects. But there is more to identify in *Désert* than technical facility (which, in any case, was quickly found wanting by Berlioz and other critics). If *Euphonia* is a useful touchstone for science-as-control, and Kastner's collecting impulse embodies science-as-observation, then David's colonial fantasy invited his audience to partake in a cohesive symphonic experience that effectively sacralised the science of music. In each of these scenarios "science" is inseparable from broader nineteenth-century preoccupations and anxieties with industry, progress, and transformative political systems. Urban orchestration—both in terms of imagining a city musically and tailoring orchestral forces to fit the changing spaces of London performance—opens a valuable window onto the scientific shaping of real and imaginary spaces.

CHARLES WHEATSTONE

Melissa Dickson (KCL), James Davies (UCBerkeley), Myles Jackson (NYU)

Dickson, “Wheatstone’s Harp and the Disembodied Musical Performance”

In September 1821, a young Charles Wheatstone caused a sensation by exhibiting an enchanted lyre, or ‘Aconcryptophone’ at his father’s music shop on Pall Mall. It consisted of a small, hand-held harp that was placed in the centre of the room where his audiences gathered. The harp was hung from brass wires which passed through the ceiling and were connected to instruments in the room above. When these unseen instruments were played, the vibrations they made travelled down the wires and caused the harp to ‘play’ as if by magic. This ordinary harp thus became an early scientific experiment in the way that sound travels – one of a number of experiments that inspired Michael Faraday’s electricity generator – as well as a simple trick designed to bemuse. This article considers the significance of Wheatstone’s harp in the context of the increasing separation of the body from music in the early part of the nineteenth century. Situated at the intersection between the material and the immaterial, the operation of this instrument/technology was clearly dependent on the hidden bodies that performed on unseen instruments and Wheatstone’s exhibition paradoxically reinforced music’s connection to the body and to the physical activity required to produce abstract and intangible musical sounds. This disembodied musical performance was, I will argue, severed from, and therefore strangely reflective of, the material.

Davies, “Instruments of Empire”

This chapter links the island of Java, metropolitan London and rural South Africa. It reflects on the space of Empire, and nineteenth-century musical instruments conceived to play into that space, or to “annihilate distance,” particularly in the work of Charles Wheatstone, instrument inventor and Chair of Experimental Philosophy at King’s College, London. I’m interested in connections between landscapes of British “Dominion,” Wheatstone’s experiments on sound conductance, his telegraphic/telephonic fantasies, popular science, the dissemination of useful knowledge, and the imperial search for a truly global instrument – one tuned to the “scale of Nature” and capable of “speaking” a Universal Musical Language.

This chapter will focus on the sixth of Wheatstone’s “Lectures on Sound” presented in 1835 at King’s College, London. Wheatstone laid before the London public a free-reed talking machine or vowel synthesizer, a Chinese sheng, Chladni figures, and an oversized Javanese gendèr, which Sir Thomas Raffles, "Father of Singapore" and former Lieutenant-General of Java, had brought back from the East. In these performances, sound was figured as an enigmatic force for propagation, a way of collapsing space – extolled as an annihilator, or (more benignly) as a political force for global intercommunication and understanding. Not all of Wheatstone’s instruments conducted sound through wires. But even these would eventually have the effect of acting as transportable technologies important to networking the imperial landscape.

One was the Wheatstone concertina, a laboratory prototype of which appeared as an acoustic demonstration device during the 1835 lectures. Later versions of Wheatstone’s multi-“tongued” reed instrument would be advertised as the sound of “British dominions and Colonies.” They were taken to the Antarctic by Shackleton, Central Africa by Livingstone, and were instruments of choice for colonial missionaries. In South Africa, the concertina had many names: the squashbox, izibambo zika Satan (“Satan’s handles”), or as Zulu migrant workers named it, after a cheaper Italian derivative, the Ibastari. This chapter will reflect on the political reach of such

technologies, addressing issues of migration, temperament, portability, and expropriation. It will draw on insights from sound studies, cultural geography, the history of science, organology, and music studies.

Jackson, "Charles Wheatstone: Musical Instrument Making, Natural Philosophy, and Acoustics in Nineteenth-century London"

Charles Wheatstone's early work on acoustics was rather typical of the early nineteenth century. As an instrument maker- a profession with which he closely identified, even after being appointed Professor of Experimental Philosophy of King's College, London in 1834, he had a penchant for producing exhibitions, which showed off his inventions and scientific acumen and which appealed to wealthy and curious Londoners. His experiments did much to contribute to the popularization of science, as evinced by his Musical Museum and Faraday's lectures at the Royal Institution, which were based on his work. Wheatstone's career in a very sense was a nodal point itself at the intersection of numerous vibrant cultures, including musical instrument making, experimental natural philosophy, speaking machines, and the public spectacle of science.

MUSIC IN THE ORDER OF THINGS

Emily Dolan (UPenn), Flora Willson (Cambridge), Deirdre Loughridge (UCBerkeley)

Dolan, "Music as an Object of Natural History"

In this essay, I explore Charles Burney's *General History of Music* (1776-1789), in particular considering what sort of thing—what sort of object of knowledge—music was understood to be. Burney, I argue, positions music within his history in ways that are distinct from other histories of the period. For example, Padre Martini's *Storia della musica* (1757-1781), emphasized the science of harmony, which then had different manifestations in different epochs of musical history. Giorgio Vasari's *Lives of the Painters*, as the title suggests, was organized, first and foremost, around the lives of the individual artists. Burney's history, by contrast, focused on neither theory nor biography. To understand Burney's organization, I turn to natural history, which served as a "universal donor" to various facets of eighteenth-century culture. I examine the ways in which Burney explicitly equated music with the natural world and the implication of this connection. Importantly, natural history provided a system of organization that was based on sensible, observable attributes of its objects. In treating music as a natural object—one that grew and changed through time and place—Burney created a space between abstract theory and personal narrative in which music could become independent, classifiable, and living.

Loughridge: "Instruments of Popular Astronomy: Adam Walker's *Eidouranion* and *Celestina*"

From the 1780s to the 1820s, Londoners could learn about the motions of the earth, the phases of the moon, eclipses, comets and other astronomical phenomena by attending a lecture by Adam Walker or one of his sons, William or Dean Franklin. The success of the family's public astronomy lectures owed not only to their frequently praised oratorical skills, but also to Adam Walker's "sister inventions": the eidouranion, a large vertical orrery for displaying planetary motions in a theater; and the celestina, a harpsichord with added mechanism for producing sustained tones by means of a

rotating band of silk. This paper examines the eighteenth-century conditions that enabled Adam Walker to invent these two instruments and coordinate them in a new form of public spectacle that thrived and inspired imitators well into the nineteenth century. As both eidouranion and celestina were adaptations of previously established instruments, their design speaks to shifting market opportunities, aesthetic values, and conceptions of the relationship between nature and its mechanical imitations. The changing role of the celestina over five decades of the Walkers' astronomical lectures, moreover, charts the increasing spectacularization of popular science through synchronized instrumental effects. While astronomers sought ever more precise instruments for observation and measurement, the Walkers refined the eidouranion and celestina to impart to large audiences a knowledge of celestial mechanics and sense of awe at the universe – a universe that, according to their instruments, harbored innumerable inhabited worlds, resounding with the harmony of the spheres.

Willson, "The Order of Things? Musical Display at the 1851 Great Exhibition"

Joseph Paxton's so-called "Crystal Palace" opened in Hyde Park in London on 1 May 1851. Not only the largest glasshouse ever constructed, it contained an unprecedentedly massive and multinational "Exhibition of Things" (to use Thomas Richards' phrase). As an explicit materialization of progress and innovation for all to see, the Great Exhibition was thought of almost from the outset as a turning point in nineteenth-century British industrial, cultural and social history. Much has been written in this vein, particularly about the modes of presentation employed in the British displays (more than half of the total). These were ordered according to four basic categories—raw materials, machinery, manufactures and fine arts—plus an all-too-necessary "miscellaneous" section. There were nonetheless widespread tensions in the classificatory systems informing the Exhibition: between its twin functions as museum and marketplace; and, more generally, between art and industry.

It is in this context—of the epistemological questions raised by the sorting of objects for display in 1851—that this chapter addresses the status of music (and, in particular, musical instruments) at the Great Exhibition. Musical performance played a relatively small role in the opening ceremony; and the Crystal Palace could claim no high-profile musical encounters such as famously occurred at the 1889 Paris Exposition. A vast array of musical instruments was nonetheless on show, scattered across multiple categories of the British section. Indeed, these exhibits manifested a prevailing uncertainty about what sort of object a musical instrument was thought to be at a time when patterns of dissemination and consumption of elite music were changing and when "high" musical culture was seeking to distance itself from the increasingly pervasive sounds of the industrialized city. Building on work in the history of science about Victorian classification and display, on Leo Marx's recent writings on the nineteenth-century emergence of "technology" as an idea, and on musicological research into changing listening practices and the rise of the work-concept in mid-nineteenth-century London, this chapter attempts to add a material perspective to existing arguments about epistemological shifts in nineteenth-century London's elite music culture.