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## A View from the Trenches

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It is good that, from time to time, we should step back to consider what we do. I welcome this opportunity to present some thoughts from the perspective of one who, as maker, player, conservator/restorer, and occasional broker of musical instruments, as cataloguer, researcher, editor, professor, and museum curator, has been involved with organology in its myriad aspects personally, professionally, and continuously since my teenage years. Reading the several essays forming the basis for our meta-organological discussion, I find myself in a position rather like that of Molière's *bourgeois gentilhomme* who was delighted to learn that he had been speaking prose all his life.

### *Organology as an "Other" of Musicology*

As Gabriele Rossi Rognoni points out in his contribution, the study of musical instruments has been regarded as a component of musicology since Guido Adler's definition of *Musikwissenschaft* itself as an academic discipline in 1885. Such prominent musicologists as Curt Sachs (1881–1959) and Howard Mayer Brown (1930–1993) devoted significant portions of their careers to the study of musical instruments.<sup>113</sup> *New Grove* includes organology as one of the "disciplines of musicology" along with such fields as textual scholarship, sociomusicology, and gender and sexual studies.<sup>114</sup> All of the participants in this discussion are musicologists (or ethnomusicologists), albeit in one or two cases (Eric de Visscher's or my own) with somewhat unconventional backgrounds.

I would question Sabine Klaus's argument, endorsed by Gabriele Rossi Rognoni, that organology has grown so far "beyond the immediate

113. See *Vom Sammeln, Klassifizieren und Interpretieren: Deo zerstörte Vielfalt des Curt Sachs (Klang und Begriff: Perspektiven musikalischer Theorie und Praxis 6)*, Wolfgang Behrens, Martin Elste, and Frauke Fitzner, eds. (Mainz: Schott, 2017). Brown's activities as an early member of the AMIS are chronicled in Carolyn Bryant, "'In the Beginning'—The Early Days of the American Musical Instrument Society," *JAMIS* 33 (2007): 162–239.

114. "Organology," in *The New Grove Dictionary of Music and Musicians*, 17 (London: Macmillan Publishers, 2001): 488–533, specifically pp. 492, and 500–501; essentially unchanged in the current *Grove Music Online*.

requirements of musicology” as now, with its own language and techniques, practically to have become an independent discipline. The same could be said of just about any contemporary musicological specialization. How, for example, in a book about J. S. Bach’s counterpoint, does the final chapter, dealing with the composer’s exhumed skeleton, relate in any significant way to “the immediate requirements of musicology”?<sup>115</sup> In any case, the opening sentence of the introduction to the “Critical Organology” roundtable chaired by Emily I. Dolan at the 2013 annual meeting of the American Musicological Society states that “Instruments, machines, and technology occupy an increasingly central position within musicology.”<sup>116</sup>

Musicology today largely consists of diverse communities alienated from one another, each with its own languages and techniques. Organology is one of these communities. Or perhaps one should say organologies, the “traditional” and the “critical,” are two of them, likewise alienated from each other. It is lamentable that, with few exceptions, critical organologists have voiced their interests primarily among themselves. Remaining aloof from the AMIS and Galpin Society, they have thrived mostly within the contexts of ethnomusicology and other corners of musicology. Tellingly, the 2013 AMS Critical Organology session did not include, as far as I can determine, any AMIS or Galpin Society member. One wonders whether our established organological societies are perceived as not sufficiently welcoming to diverse viewpoints or whether they are regarded as not sufficiently prestigious. Leaving aside the latter possibility, I should point out that already in 1995 the call for papers for the 1996 AMIS meeting in Vermillion successfully invited proposals for papers addressing diverse topics including “gender issues . . . [and] ritual, religious, and symbolic use of instruments.”<sup>117</sup> As Rossi Rognoni notes, the 2006 AMIS meeting, also in Vermillion, included Ardal Powell’s paper on issues of critical organology, followed by a diverse panel discussion, “The Study of Musical Instruments in the Present and Future.” A glance through back issues of *JAMIS* and the *Galpin Society Journal* or at the programs of these societies’ meetings over the

115. David Yearsley, *Bach and the Meanings of Counterpoint* (Cambridge: Cambridge University Press, 2002).

116. Dana Gooley, ed., *AMS 2013 Pittsburgh, 7–10 November: Program & Abstracts*, p. 28.

117. See *A[merican] M[usicological] S[ociety] Newsletter* 25/2 (August 1995): 20, and *Newsletter of the American Musical Instrument Society* 24/2 (June 1995): 3. For the program, see *Newsletter of the AMIS* 25/1 (February 1996): 2–6.

years will confirm that the venues of traditional organology have always been open to new ideas, new subjects, and new approaches. If critical organology is an “other” in relation to establishment organology, it is because its proponents have chosen for it to be so. Leaving aside questions of how the current estrangement arose—in essence, the “political” situation is merely an example of office politics—we owe our deepest thanks to Rossi Rognoni for arranging the present discussion within the established venues of traditional organology. His introductory essay provides an excellent overview of the origins of critical organology and its principal concerns.

Considerable irony attends the identification of “others” in relation to traditional organology. Since the days of Sachs and Brown the position of organology within musicology has changed so completely that I, born in the middle of the twentieth century, have never experienced organology to be anything but an “other.” Organologists are rarely if ever included on the editorial boards of the major general musicological journals. Paradoxically but revealingly, the title of the sole article substantially about musical instruments published in the *Journal of the American Musicological Society* (JAMS) between 1989 and 2015, Ardal Powell’s magisterial “The Hotteterre Flute: Six Replicas in Search of a Myth,” suggests (albeit misleadingly) that the article is about nothing real.<sup>118</sup> While Powell and Keith Polk, author of the 1989 article “Vedel and Geige-Fiddle and Viol: German String Traditions in the Fifteenth Century,”<sup>119</sup> employed the conventional methodologies of historical musicology and organology (Powell even included several bore graphs), the approaches taken for a 2015 article, Roger Moseley’s “Digital Analogies: The Keyboard as Field of Musical Play,”<sup>120</sup> are those of ludomusicology, a discipline so recently formed that it is not to be found in the frequently updated online *Oxford English Dictionary* (OED). A more recent JAMS article, Carolyn Abbate’s “Sound Object Lessons,”<sup>121</sup> may also be counted as belonging to a broadly defined “new organology.” One could argue that these new approaches, having received the imprimatur of the most prominent organ of American musicology, have definitively relegated traditional organology to the status of “other.” Likewise, institutional mu-

118. JAMS 49/2 (Summer 1996): 225–63.

119. JAMS 42/3 (Autumn 1989): 504–46.

120. JAMS 68/1 (Spring 2015): 151–227.

121. JAMS 69/3 (Fall 2016): 794–829.

sical instrument collections and their curators are typically outliers within the larger organizations—universities and art, historical, or ethnological museums—of which they are a minor part. This may even be true of the freestanding Phoenix Musical Instrument Museum (MIM), which seems to present itself on its internet homepage largely as a venue for performances only tangentially related to its collection.

Critical comments directed from the new organology towards the old are of two general types, relating on one hand to the general public, but on the other hand to the scholarly community. The former is typified by pleas for more generally relevant, consumer-friendly museum displays, while the latter advocates the adoption of research methodologies marked by flashily arcane linguistic usage and an alphabet soup of acronyms (ANT, SCOT, STS). There is something contradictory here, in that organologists are urged to be more entertaining while functioning within frameworks of abstruse theoretical concepts.

### *Public Organology*

Museum collections of musical instruments are the principal public face of organology. As for the typical stodginess of their displays, I could not agree more, although I would not go so far as to express the thought as tactlessly as Eliot Bates did in an earlier publication (2012): “Instrument museums are mausoleums, places for the display of the musically dead, with organologists acting as morticians, preparing dead instrument bodies for preservation and display.”<sup>122</sup> A botanist colleague at the University of South Dakota similarly once lamented to me about the lifelessness of instruments at the National Music Museum. But are the specimens in herbaria any more alive, or the glass flowers at the Harvard Museum of Natural History? Should the seventeenth-century Swedish Vasa ship, exhibited on land in its own museum, be refloated in Stockholm harbor, or the U-505, the World War II German submarine on display in Chicago’s Museum of Science and Industry, be submerged in Lake Michigan? Should the beds on display in period rooms be slept in? Should one worship the sculptures of Egyptian gods? In an essentialist

122. Eliot Bates, “The Social Life of Musical Instruments,” *Ethnomusicology* 56/3 (Fall 2012): 363–95. How such immoderate language, insulting to an entire class of professionals, found its way into a reputable scholarly journal is beyond comprehension.

view, these artifacts might rightly be considered dead insofar as they no longer function according to their original “script” (in the terminology of science and technology studies, or STS, a useful coinage, albeit not yet in the *OED*). In a constructivist view, they have become something else—museum objects, which may be brought to life by any number of imaginative treatments. Harvard’s glass flowers, for example, made to serve as permanent specimens for students of botany, are now staged as one of the Boston area’s major tourist attractions. In the past, museumgoers on their own could engage intelligently with objects on display without reference to elaborate labeling, audio guides, or multimedia kiosks. That today even learned professors cannot be expected to exercise active imagination in response to “dead” artifacts is the result of large-scale changes in education and society.

Overworked, underpaid curators, struggling to maintain the viability of musical-instrument collections in the face of myriad obstacles, should not be regarded as the cause of public indifference. But it largely falls to them to find viable solutions. The overall challenge came into focus in a discussion on the AMIS Listserv between 30 December 2017 and 12 January 2018, initiated by our colleague Robert Adelson, about how to explain to non-specialists “Why study the history of musical instruments?” Respondents struggled to recommend “non-intimidating” publications that might convey to a general audience our passion for what we do. (Some suggestions, I daresay, fell wide of the mark, for example, an ethnomusicologist’s recommendation of Margaret Kartomi’s *On Concepts and Classifications of Musical Instruments*,<sup>123</sup> which, despite its merits, even some of us professionals find a wearisome slog.) Adelson himself rightly pointed out the important contributions that the study of instruments has made to historically informed performance practice. But what of people who have no interest in early music, or no particular curiosity about music at all?

Decades ago, when I was a harpsichord maker and met new people socially, they frequently asked three questions:

- What wood do you use?
- How many do you make per year?
- How much do they cost?

123. Chicago: University of Chicago Press, 1990.

That is, whether or not they were interested in instruments or music, people could relate to the materials and the economics of production and distribution. I've taken up these and other nonmusical matters from a historical perspective in my own teaching and organological work,<sup>124</sup> also in some talks directed towards the general public,<sup>125</sup> and in grant applications (demonstrating to the satisfaction of the NEH that a museum of musical instruments falls within the purview of the humanities<sup>126</sup>). But they could just as well be applied in the display of musical instruments in museums and in publications or other media intended for public consumption. In the course of the AMIS Listserv discussion, Byron Pillow suggested along similar lines that the subject could be expanded into "an examination of 'Why study artifacts' in general[.] . . . It might be easier to draw in a non-specialized audience by first angling at the artifact element, and then extending that element to uniquely musical qualities." If the history of the world can be told in stories of coffee, sugar, or *Friese nagelkaas*, it could just as engagingly be told in stories of harpsichords, rebabs, or fifes. A Ruckers harpsichord may be "musically dead," but one can consider the cultural implications of how, for example, oak from the Baltic region was shipped to Hanseatic Antwerp to be used for the wrestplanks of instruments that were sent as far away as Peru; how the patterns of Ruckers decorative papers are similar to those of the *parchin kari* (*pietra dura*) adorning the Taj Mahal; how the bog oak sharps and the bone covering the natural keys were by-products of the

124. For example, for my *Keyboard Musical Instruments in the Museum of Fine Arts, Boston* (1994), I identified by scientific means the woods used in approximately 1200 components in 54 instruments from the mid-sixteenth century to the nineteenth, thus answering the question of what woods the makers used. In "Master Joos Karest and the Rise of Clavecimbel Making in Antwerp," (with co-author Jeannine Lambrechts-Douillez), *Musique-Images-Instruments* 6 (2004): 116–31, and "The Virginal by Hans Bos, Antwerp, 1578, at the Royal Monastery of Santa Clara, Tordesillas," in *Música de tecla en los monasterios femeninos de España, Portugal y las Américas*, Luisa Morales, ed. (Garrucha, Almería, Spain: Asociación Cultural LEAL, 2011): 67–89, I treat (among other things) the economics of keyboard-instrument production in sixteenth-century Antwerp.

125. Copies of the slides and script notes for two of these, "Strings, Pipes, and Commerce: the Historical Economics of Musical Instrument Making" (2012) and "Vermillion's Museum of History, Art, Science, Industry, Natural History (and more)" (2013), may be requested from the author at John.Koster@usd.edu.

126. In a draft of the narrative for an NEH grant to fund improvements to the National Music Museum's facilities, I pointed out that the museum was relevant to the program because its collections are studied by scholars of organology which is a branch of musicology. The NEH officer who helpfully commented on the draft suggested that I should also explain what musicology is.

fossil fuel (peat) and food (beef) industries; how the letters written on the keys to indicate the notes, which directly stemmed from the origins of Western notation among privileged males, were related to the rise of literacy in both sexes; how Amsterdam's municipal organist, Jan Pieterszoon Sweelinck, could travel to Antwerp to purchase a harpsichord for his city in 1604, when the United Provinces were formally at war with the Spanish Netherlands; or how, after about 1850, Ruckers harpsichords were repurposed, often lavishly redecorated, as pretentious pieces of mute furniture redolent of the Ancien Régime.

Whatever creativity and imagination we might employ to present instruments to the public, please let us not sink to the level of that preposterous movie, *The Red Violin* (1998), which Bates cited in his 2012 article as an example of the potential appeal of stories about musical instruments. Historically and organologically, if not necessarily dramatically, this film rings false from beginning to end. Would any old master smash, rather than finish and sell, the instrument an apprentice had nearly completed? Do contemporary auction consultants ever submit violins to acoustical and chemical tests? If we weave stories around instruments, let us at least make them plausible and get the facts right.

### *Academic Organology*

Rossi Rognoni has helpfully summarized the perceptions about traditional organology among scholars in other fields, particularly musicology and ethnomusicology. Organologists are seen as obsessively concerned with systems of classification and with the physical description of instruments to the exclusion of broad cultural interpretations. Some organologists, no doubt, may indeed be preoccupied with such things, and a glance into a couple of museum catalogs or, say, the list of "Resources" on the CIMCIM home page<sup>127</sup> could perhaps lead to the impression that such pursuits are characteristic of organology as a whole. But to dismiss traditional organology as principally concerned with trivial matters of definition, or with the mere collecting of facts as if they were postage stamps, is unwarranted on two counts. First, these pursuits are not necessarily so trivial in themselves. Second, within organology there is an abundance of work that takes into consideration the larger contexts of

127. See <http://network.icom.museum/cimcim> (accessed 15 March 2018): Resources.



musical instruments in musical usage, society at large, and the histories of art, science, technology, among other subjects.<sup>128</sup>

Few organologists of my acquaintance care much about systems of classification. Like Supreme Court Justice Potter Stewart, who famously declined to define hard-core pornography, “But I know it when I see it,” we know what’s a harp or a drum or a keyboard instrument.<sup>129</sup> Nevertheless, studies of classification schemes can be of significance beyond that of mere pigeonholing when approached retrospectively, to take into account their social implications. Two of us involved in the present discussion have written about how particular systems of classification influenced the formation of museum collections in the late nineteenth and early twentieth centuries.<sup>130</sup> Looking at early catalogs of the instrument collection of The Metropolitan Museum of Art, for example, one recognizes that there was a broad cloud of racist social classification casting its dark shadow over the Mahillon/Galpin system (strings, winds, vibrating membranes, sonorous substances) that guided the lower levels of organization. Note the subtitle of the third volume of the *Catalogue of the Crosby Brown Collection of Musical Instruments of All Nations . . . Instruments of*

128. Prominent examples of such studies include Frank Hubbard’s classic *Three Centuries of Harpsichord Making*, Cambridge, Mass.: Harvard University Press, 1965; Christopher Page, *Voices and Instruments of the Middle Ages: Instrumental Practice and Songs in France 1100–1300* (Berkeley: University of California Press, 1986); Grant O’Brien, *Ruckers: a Harpsichord and Virginal Building Tradition* (Cambridge: Cambridge University Press, 1990); Peter Williams, *The Organ in Western Culture, 750–1250* (Cambridge: Cambridge University Press, 1993); Sheridan Germann, *Harpsichord Decoration – A Conspectus* (Hillsdale, N.Y.: Pendragon Press, 2002): 1–213; and Annette Otterstedt, *The Viol: History of an Instrument* (Kassel: Bärenreiter, 2002).

129. See my *Keyboard Musical Instruments in the Museum of Fine Arts, Boston* (Boston: Museum of Fine Arts, 1994): xvi, note 6, where I explain that “Excluded from the present study are such instruments as hurdygurdies, accordions, and concertinas. Although from a mechanical engineer’s standpoint these are indeed keyboard instruments, to the musician whose fingers are accustomed to playing the harpsichord, clavichord, piano, and organ they are not.” Of course it could fairly be argued that this is a socially based classification.

130. See Gabriele Rossi Rognoni, “La definizione dell’organologia come disciplina attraverso i primi cataloghi museali (1866–1911),” in Università degli Studi di Firenze, Dipartimento di Storia delle Arti e dello Spettacolo, *Annali*, nuova serie 9 (Florence: Titivillus, 2008): 155–71. I regret that I did not yet know of this study (an English translation of which by Julia Weiss is available at <https://rcm.academia.edu/GabrieleRossiRognoni>) when I prepared my own “Concepts in the Development of Public Musical-Instrument Collections in the United States” in Beatrix Darmstädter, Rudolf Hopfner, and Alfons Huber, eds., *Die Sammlung alter Musikinstrumente. Die ersten 100 Jahre / The Collection of Historic Musical Instruments. The First 100 Years* (Vienna: Praesens Verlag, 2018): 125–44.

*Savage Tribes and Semi-Civilized Peoples, Part I. Africa.*<sup>131</sup> The collection's donor, Mary Elizabeth Brown, explained the reasoning behind the arrangement of the galleries and the content of the several volumes of the catalogs published between 1902 and 1914:

Of the two most common methods—the geographical and the genetic [i.e., Mahillon/Galpin]—the former has been preferred. . . . Roughly speaking, the three geographical divisions correspond to the three main stages in the history of the art. In the first room [Africa, the Americas, and Oceania] we have the musical instruments of primitive man. . . . In the second [Asia and Islam], we meet highly developed forms of the art. . . . Entering the European rooms, we find that . . . Music has assumed a character truly cosmopolitan. . . .<sup>132</sup>

Farther back in history, one might consider how the treatment, amounting to classification, of instruments' makers and players in Hans Sachs's and Jost Amman's *Eygentliche Beschreibung aller Stände auff Erden* (Frankfurt am Main, 1568) shows an ordering from more to less prestigious while demonstrating systems of production organized according to the materials and tools used by the artisans. Even the myth of the contest between Marsyas and Apollo can be regarded as an example of the social classification of musical instruments.

It is a relief to read Flora Dennis's recognition of the importance of the detailed physical analysis of instruments, gathering the sort of information typically incorporated into museum catalogs and many journal articles—that is, the importance of establishing the facts. Much of the detailed analysis of instruments that can be applied in broader studies takes place in museums, which traditionally have included research, from the perspectives of both the hard sciences and the humanities, as a significant component of their missions. De Visscher, in his final paragraph, quite appropriately emphasizes the importance of research in the museum context. It is distressing, however, that anything specifically called research is lacking in the diagram he adapts from Magdalena Hillström.

Whether it's God or the devil who is in the details, the details are enormously important. A museum conservator might rightly be regarded, if not as a mortician, as something like a pathologist in analyzing samples of leather or peering through a microscope at samples of wood

131. New York: The Metropolitan Museum of Art, 1907.

132. *Catalogue of the Crosby Brown Collection of Musical Instruments of All Nations, 1, Europe* (New York: The Metropolitan Museum of Art, 1904): xviii.

to determine their species, but the information so gathered can be put to good use. The material quality of the leather on piano hammers, for example, has a profound effect on the tone of the instrument. Much of the current debate as to whether the pianos of Bartolomeo Cristofori and his followers are appropriate for the keyboard works of Bach, Handel, or Scarlatti is colored by the misperception that a piano is a piano (Hornbostel-Sachs's 314.122-48), or, only slightly more refined, that any early piano would sound like the familiar Viennese fortepianos played by Mozart. Yet, Cristofori, his pupil Giovanni Ferrini, and others, including Gottfried Silbermann and Iberian makers, used thick, soft leather which generates a soft, rather dull tone which, however successful it might have been for accompaniment, many would regard as deficient for the rendition of most of the solo keyboard literature of the late Baroque. As for wood, accurate identification of the species, for example, in a harpsichord by José Calisto, Portugal, 1780 (National Music Museum, Vermillion, South Dakota, catalog number NMM 6204) discloses a complex pattern of international trade: pine (*Pinus sylvestris*) from northern Spain, spruce (*Picea abies*) from the Alps, walnut (*Juglans regia*) harvested locally but from stock originally introduced by Roman colonists (and, before that, brought from Central Asia to the Mediterranean region in the time of Alexander the Great), tulipwood and rosewood (*Dalbergia*; several species) from the Portuguese colony of Brazil, and ebony (*Diospyros ebenum*) brought from Portugal's South Asian colonies via the sea route discovered by Vasco da Gama.

Ethnomusicology might well profit from closer physical examination of instruments than is usually the case in this field. For example, while preparing a global study of how instrument makers applied the ancient "Pythagorean" theory of strings as understood before the initial development of the modern scientific theory by Vincenzo and Galileo Galilei,<sup>133</sup> I could find only one source with sufficiently detailed descriptions of strings in actual examples of folk or non-Western instruments.<sup>134</sup> This information, gathered from Scandinavian bowed lyres collected in the nineteenth century and published in the early twentieth, was valuable

133. "Strings and Theories of Stringing in the Times of the Citole and Early Cittern," in *The British Museum Citole: New Perspectives* (Research Publication 186), James Robinson, Naomi Speakman, and Kathryn Buehler-McWilliams, eds. (London: The British Museum, 2015): 84-92.

134. See O. Andersson, *The Bowed-Harp: a Study in the History of Early Musical Instruments*, translated by M. Stenbäck and edited by K. Schlesinger (London: William Reeves, 1930), based on his 1923 dissertation, *Stråkkharpan*.

enough and could be used, together with an anecdotal account of the Mongolian *morin khuur* and written sources from China, classical antiquity (Ptolemy and Boethius), medieval Islam, and medieval Europe, to suggest a pan-cultural tradition ranging far from the Greco-Roman/European axis. But with more detailed data carefully gleaned from instruments, the results could likely be extended to Africa, South Asia, and wherever else there were or are old traditions of stringed-instrument making.

Two exemplary studies of a non-Western instrument, the *khāēn* of Laos and northeast Thailand, provide direct accounts, based on interviews and observation, of how makers measure out and construct these instruments.<sup>135</sup> The process of determining the acoustical lengths of the pipes is remarkably similar to the methods described in medieval European treatises for measuring organ pipes and monochord string lengths according to Pythagorean ratios. Although the *khāēn* makers use a gauge made from a strip of palm leaf while the Europeans used a compass,<sup>136</sup> the underlying theory is the same. One can envision a more extensive study of how analogous methods are or were used by makers of traditional instruments worldwide. Even without written sources or the possibility of directly observing makers at work, detailed examination and measurement of instruments in museum collections could provide critically important information. All such studies of how instrument makers measure and design instruments are a part of the cultural history of the world's peoples and are easily relatable with the histories of science and technology and with the design of artifacts of all sorts. Sebastian Virdung provided a hint in a backhanded way when he began the account of the clavichord in his *Musica getutscht* (Basel, 1511): "I will not describe how one should make the clavichord and other instruments because that is more relevant to architecture or the cabinetmaker's handiwork than to music."<sup>137</sup>

135. L.E.R. Picken, C.J. Adkins, and T.F. Page, "The Making of a *khāēn*: the free-reed mouth-organ of North-East Thailand," *Musica Asiatica* 4 (1984):117–154; and Terry E. Miller, *Traditional Music of the Lao: Kaen Playing and Mawlum Singing in Northeast Thailand* (Westport, Conn., and London: Greenwood Press, 1985), especially pp. 195–217.

136. See my article "The Compass as Musical Tool and Symbol," *Musique-Images-Instruments* 5 (2003): 10–31.

137. Sig. E ii, recto: *Das clavicordium unnd andere instrument wie man dye machen soll das wil ich nit beschreiben dann das trifft mer dye architectur / oder das hantwerch der schreyner*

New disciplines may well have something to contribute to organology, even if Eliot Bates's "although with caveats" with reference to actor network theory is perhaps applicable to SCOT and STS as well. I myself would recommend such resources as George Basalla, *The Evolution of Technology*,<sup>138</sup> and Everett M. Rogers, *Diffusion of Innovations*.<sup>139</sup> Even without SCOT or ANT, the concept of "compatibility" outlined by Rogers<sup>140</sup> goes far to explain why the Moog synthesizer, with its piano-like keyboard, was quick to be adopted (as, six centuries earlier, had been the clavichord, essentially a monochord provided with an organ keyboard), while re-engineered keyboards, such as Paul von Jankó's or more recent "6-6" efforts have always failed to make much of an impact.

I should mention one further acronym: STEM (Science, Technology, Engineering, and Mathematics). Sciences and technologies including metallurgy, statistics, computed tomography scanning, x-ray fluorescence, cladistics, acoustics, wood anatomy, dendrochronology, and chemistry have already made inestimably important contributions to organology and will continue to do so. Musical instruments are complex and their relationships with everything else are even more complex. They are concrete objects but their effects among humans are ultimately intangible. Their study requires a multiplicity of methodologies and approaches adopted from all the sciences, hard and soft, and from all the humanities. Not only facts, but also the ability to synthesize them into meaningful narratives, both scholarly and popular, are necessary for organology to achieve its full potential.

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*an / dann dye Musicam*. I attempted to take up this challenge in "Cathedrals, Cabinet-making, and Clavichords," *Clavichord International* 4, no. 1 (May 2000): 6–13; no. 2 (November 2000): 40–47; and 5, no. 1 (May 2001): 6–13.

138. Cambridge: Cambridge University Press, 1988.

139. Fifth ed., New York: Free Press, 2003. I've attempted to apply the lessons of these books in such articles as "Toward a History of the Earliest Harpsichords," in *Das Österreichische Cembalo: 600 Jahre Cembalobau in Österreich*, Alfons Huber, ed. (Tutzing: Hans Schneider, 2001):17–33; "The Clavichord in the Netherlands before Henric Arentss van Zwolle," *Clavichord International* 12, no. 1 (May 2008): 6–19; and "The Harpsichord Actions of Henry Arnault de Zwolle in their Developmental Context," in *Unisonus: Musikinstrumente erforschen, bewahren, sammeln*, Beatrix Darmstädter and Ina Hoheisel, eds. (Vienna: Praesens, 2014):167–96.

140. Rogers, *Diffusion of Innovation*, 240–49.