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of cultural or social activity? Are particular instruments the harbingers of certain kinds of messages of general import to the society at large? Are the sounds or shapes of particular instruments associated with specific emotions, states of being, ceremonials, or calls to action?" (Merriam, p. 45).

The foreword to Nercessian's book, which was pasted into my copy, reflects a notion that many musicians perpetuate concerning museums and curators. Written by composer Benedict Mason, it accuses curators, Western ones in particular (I do not know why), of condemning instruments to "become artifacts, rather than living things that can be restored or remade and given a continued life." He implies that instruments should be played and repaired. But curators have learned through experience that such activities wear out the instrument and destroy evidence—it eventually ceases to be part of the historical record for researchers like Mason, who constructs instruments, and loses its documentary value to someone like Nercessian. This unfortunate and misinformed attitude, presented at the start of the book, made me wonder about the author's understanding of the field, if he was familiar with museological standards, and if he actually knew any curators in major collections.

While the book's information is compelling, revealing, and useful for understanding the variable dynamics at work in the production of a symbol, its lack of technical drawings, photographs, recordings, and a discography—more or less standard features in a work of this type—limits its usefulness in achieving a fuller understanding of the duduk as an instrument.

J. KENNETH MOORE  
THE METROPOLITAN MUSEUM OF ART

**Murray Campbell, Clive Greated, and Arnold Myers. *Musical Instruments: History, Technology, and Performance of Instruments of Western Music*. Oxford: Oxford University Press, 2004. x, 510 pp.: 45 black-and-white plates, 91 figures, 4 tables, 32 musical exx. ISBN: 0-19-816504-8. \$230.00 (cloth).**

First, the price: Although this volume is dense with data and handsomely produced, its publisher can hardly have expected many buyers to pay the full retail price either in dollars or pounds. Even at a 30 percent discount for on-line purchases, the book's cost puts it out of reach of most individ-

uals and many libraries. Those able to afford the book will find it a handy source of information on many instruments of Western “literate” musical traditions, including some less familiar types both old and new. However, instruments primarily associated with folk music, such as the banjo, are mostly bypassed, resulting in an odd imbalance, considering the space devoted to, say, the cinema organ and electric guitar. The book is no substitute for *The New Grove Dictionary of Musical Instruments* (Stanley Sadie, ed., London: Macmillan, 1984), which now seems a bargain in comparison, nor does it replace standard surveys of the history of instruments, orchestration, or performance practice, or even Campbell and Greated’s more comprehensive *Musician’s Guide to Acoustics* (1987; repr., London: Oxford University Press, 1998).

The four authors (Patsy Campbell wrote portions dealing with viols) concentrate on providing an introduction to how instruments work in acoustical and mechanical terms, and in this respect their teaching experience at the University of Edinburgh shows to advantage. Explanations enlighten as far as they go (the text addresses college-level readers, not scientists or musicologists) and are amply supplemented with mathematical formulae, graphs, and diagrams—perhaps more than most musicians will find essential to their comprehension. Treatment of brasswinds in particular shows the benefit of research by Arnold Myers and his colleagues, more fully reported elsewhere (for Myers’s publications see <http://homepages.ed.ac.uk/am/pvl.html>). Playing techniques, too, are treated sensibly if briefly. However, the historical content is neither original nor entirely trustworthy, and too often it seems cluttered with facts of no apparent significance. For example, what is the point of saying, in connection with “special effects for avant-garde performance” (p. 348), that Friedrich Wilhelm Rust’s clavichord sonata was published in 1939, if we’re not told where to find that modern edition (Rust died in 1796) or which sonata is meant?

An overview of the book’s contents will indicate its ambitious scope. The first chapter introduces general acoustical principles, clearly explaining the nature and propagation of sound and defining concepts of hearing and cognition, pitch, timbre, tuning, loudness, and other elements. Chapter 2 relates the commonplace classes of woodwinds, brasses, strings, percussion, and electronic instruments to the more systematic Hornbostel-Sachs scheme, then shows how sound is produced in each family and subfamily, differentiating among cylindrical, conical, and flaring tubes; single-reed, double-reed, lip-reed, and air-jet excitation;

plucked, hammered, and bowed strings; analog and digital generation of electronic musical signals; and so on. The behaviors of air columns, stretched strings and membranes, and vibrating bars, plates, and tubes are succinctly described.

With knowledge of this introductory material and of basic physics terminology and music notation assumed, the following eleven chapters look more closely at the salient acoustical principles, operation, construction, historical development, and some traditional and modern performance practices of, in turn, reed-sounded woodwinds; flutes (using the term broadly); bugles and horns; trumpets and trombones; pitched and unpitched percussion, including drums; bowed strings; plucked and hammered strings; clavichord and harpsichord; pianoforte; pipe organ; and electronic instruments. Three appendixes provide (1) a table of pitches and frequencies in equal temperament at  $a' = 440$  Hz; (2) key-work tables for typical woodwinds—that is, a list of the most common keys and their functions; and (3) a list in order of length of common sizes of ordinary brass instruments, expressed as their nominal sizes (4-foot C, 6-foot F, etc.) and equivalent cone lengths (not actual tube lengths) in meters.

A combined glossary and index extends the book's usefulness by summarily describing instruments that are not discussed in the main text and by providing other concise definitions and biographical data, though most readers will already know that Beethoven was a composer, if not that he used the "clarichord" (*sic*). Arnolt Schlick and Curt Sachs surely deserve better than the one-word descriptor, "author." The glossary would have helped general readers by defining more specialized terms such as newtons, since it is annoying to have to hunt for meanings elsewhere.

The well-illustrated text is entirely self-contained; no notes lead the reader to more detailed discussions or supporting evidence. In lieu of a thorough bibliography, a short guide to further readings, exclusively in English and rather parochially weighted toward recent British books, accompanies each chapter. Journal articles are all but absent among the indicated readings, so important relevant literature is overlooked: fundamental research by John Koster and Grant O'Brien (who was, until recently, curator of the University of Edinburgh's own Russell Collection of Early Keyboard Instruments) concerning early keyboards; recent discoveries about early violins; exciting experimental work on organs underway at the Göteborg Organ Art Center in collaboration with Chalmers

Technical University; even seminal articles by leading music acousticians—all escape notice. Iconographical and older musicological publications bearing on organology are largely ignored, as are performance practice studies reported in periodicals. This bibliographic shortcoming alone belies the publisher's jacket blurb claiming the book to be "the essential reference for everyone researching and working with musical instruments and performance."

Lest all this criticism seem unfair, some specifics are necessary; I shall limit these to struck-string keyboards. (The inevitable typographical errors, such as "nearly nearly" on page 363, cause little concern.) Page 315: "[clavichords] typically used two different metals for the strings, brass in the bass and steel in the treble," yet on page 326: "Strings on a clavichord are normally made of either brass or iron"; so are steel and iron supposed to be synonymous or interchangeable? Page 359: "... Johannes Zumpe, a former pupil of Gottfried Silbermann"; this is unproven, as we learn from Michael Cole's book cited in the "Further Reading" for this chapter but evidently not read by our informant.<sup>1</sup> Page 361: "Broadwood ... optimized the striking position of the hammers on the strings, choosing a striking point about one ninth of a string length from the end"; measurement of Broadwood's striking points discredits this fusty myth.<sup>2</sup> Also on page 361: "... in 1859 Henry Steinway obtained a patent for a metal framed overstrung grand ..."; correctly, the patentee was Henry Steinway Jr., son of the firm's founder.

Page 362: "The early part of the [twentieth] century was a peak time for the piano industry, with practically every other household in Europe and America being the owner of an instrument"; truly, or a hyperbole? Page 363: "The fact that the [grand piano's] soundboard is horizontal, rather than vertical, is also an advantage"; precisely what is this advantage, and to whom? Page 367: "Overstringing ... allows a greater length of string to be used for a given frame size" and "means that the [piano's] bridges are more centrally placed on the soundboard ..."; Paul Poletti convincingly disputes these assertions.<sup>3</sup> Page 372: "It is important that

1. Michael Cole, *The Pianoforte in the Classical Era* (Oxford: Clarendon Press, 1998), 56.

2. John Koster, "The Divided Bridge, Due Tension, and Rational Striking Point in Early English Grand Pianos," this JOURNAL 23 (1997): 5–55, especially p. 41.

3. Paul Poletti, "Steinway and the Invention of the Overstrung Grand Piano Frame," in *Matière et Musique: The Cluny Encounter*, ed. Claire Chevallier and Jos van Immerseel, 241–63 (Antwerp: Labo 19 and Alamire, 2000).

[piano] soundboards are varnished, in order to seal the surface; otherwise the natural resins in the wood tend to evaporate over a period of time, causing the resonance characteristics of the board to deteriorate"; what experimental evidence supports this claim, and if it is true for pianos, why not for harpsichords and clavichords, whose makers historically did not varnish soundboards (made of presumably well-aged wood), while violin makers famously use varnish but only on the outsides? Finally, the eleven-page discussion of piano tone control, performance style, "great pianists of the nineteenth century," national schools, pedaling, and contemporary trends is occasionally so cursory as to be funny: "Recent exponents of the international school . . . execute authentic and literal interpretations of compositions from a broad repertoire . . ." (p. 380); what on earth are authentic and literal interpretations?

These discomfiting quotations do not necessarily represent the text as a whole. The discussion of aerophones seems better informed and more reliable (though I have not elsewhere encountered the term "hot potato" rather than "sweet potato" in reference to ocarinas, p. 124), if admittedly somewhat simplistic; windstream and air column behaviors in real instruments are by no means fully understood. It is a good sign that the bowed string chapter acknowledges the contributions to violin acoustics of Carleen Hutchins and her collaborators. The book would have benefited from attention to other ongoing investigations such as Christophe D'Alessandro's on clavichord acoustics; his analyses paint a subtler picture of how real instruments behave.<sup>4</sup> Incidentally, the description of organ tuning methods omits cone tuning, a standard historical method for metal pipes. On the other hand, instructions for cleaning a flute seem superfluous.

In summary, the authors deal competently, even imaginatively, with the elements of musical acoustics, instrument mechanics, and playing methods, but offer no fresh insight into the evolution of Western instruments, much less into performance styles. Despite its lapses, the book has value as a broad compendium and so will find a place on library reference shelves, if not in many homes or classrooms.

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4. Christophe D'Alessandro and B. F. G. Katz, "Tonal Quality of the Clavichord: The Effect of Sympathetic Strings," in *Proceedings of the International Symposium on Musical Acoustics, Nara, Japan, March 31–April 3, 2004*, 21–24 (ISMA, 2004).