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oboes since, for the sake of consistency, Bouterse would have to use old terms such as *basson* for bassoon and *fluit does* for the recorder.

Bouterse's bibliography and text indicate that his sources end at 1999: thus he relies on the 1980 *New Grove Dictionary of Music*, which is unfortunate, since many of the articles have been updated in the 2001 edition and in *Grove Music Online*. For the English translation, however, he has added a few sources up to 2002 and listed one catalog published in 2004. The index of names is a little cumbersome to use on the CD-ROM, since only page numbers are given, not the chapters into which the CD-ROM is divided. The reader must click on the main index with its full table of contents to find the chapter in which a certain page is located. The English translation of the text is very good, with only a few insignificant typographical errors; the English summary of individual instrument entries in Appendix C, written by Bouterse, is less adept.

Bouterse has produced an important reference publication for organologists and researchers. The CD-ROM and booklet format make it a powerful tool, allowing the user to move easily about the contents. The numerous photos and illustrations provide much useful information, especially when multiple views of an instrument are available. The work on makers' stamps and the new biographical data are significant, and the breadth and depth of the material are impressive. This publication belongs in all research libraries and the libraries of serious woodwind instrument makers, students, and researchers.

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Bernard Brauchli, Alberto Galazzo, and Ivan Moody, editors. *De Clavicordio VI: Proceedings of the VI International Clavichord Symposium, Magnano 2003*. Magnano: Musica Antica à Magnano, 2004. 199 pp.: 14 photographs, 12 figs., 2 drawings, 20 tables. ISBN: 88-900269-3-6. €50,00 (paper).

De Clavicordio VI is the proceedings of the sixth annual International Clavichord Symposium at Magnano, which took place September 10–13, 2003, bringing together musicians and scholars of history, organology, iconography, and musicology, all broadly defined. The focus of this conference was clavichord history before 1700, and most of the essays follow this theme. The table of contents may be seen at http://www.omifacsimiles.com/brochures/declav_6.html.

The sixteen papers taken as a whole begin to clarify details of a historical and cultural picture that is still foggy. They also evoke a gathering of scholars and enthusiasts that I would have found very congenial, and I was moved to seek out previous volumes of *De Clavicordio*. In the space available, I will comment on just a sampling, chosen for their emphasis on physical organology.

The essays of Alfons Huber, Thomas Glück, Andreas Hermert, and Maria Erdmann examine clavichord design and tuning in light of available materials and the mathematics of tuning possibilities. In “Iron Scale or Brass Scale—When Were these Concepts First Used?” Huber combines published writings on clavichord construction from the fifteenth century and later with evidence of modern physical experiments; he concludes that ferrous wire may not have been stronger than brass in the late Middle Ages. The article is self-contained, in that it starts with a review of the then-current understanding of brass and ferrous scales (i.e., the relation between string length and frequency for each material) in eighteenth-century practice.

Huber discusses the limitations of using mathematical ratios, such as 6:5 or 7:6, to determine string length. Such ratios cannot be strictly applied due to a variety of physical factors, including tensile pickup, observable when wire is drawn from modern brass and ingot iron (modern wire, unlike earlier wire, gets proportionally stronger when it is drawn smaller). He then examines written sources for clues to early uses of the two materials. Early comments on the differences between brass and iron strings seem more focused on sound than on scale length; however, clues to pitch can be found in Arnaut de Zwolle’s comparisons of string length to organ pipes, ca. 1440. Huber then examines physical limits of the early fretted clavichord structure, including those imposed by extreme cranking of the bass keys.

The groundwork is thus laid for the experimental work that makes this paper important. Huber performed experiments on loose chain-mail rings of both brass and iron that probably date to before 1500 (chain mail became obsolete as firearms came into use). He drew three samples of each down to about 0.16 mm and measured hardness as a surrogate for tensile strength, concluding that the two materials may not have differed nearly as much as the later versions. This was the beginning of a series of experiments that were not all finished by the time of the conference, and it provides a fascinating foretaste of what I hope Huber will report at subsequent conferences.

One part of the puzzle is not addressed in this paper. Both iron and brass differed significantly in composition depending on origin, both because of impurities native to the ore, and because methods of processing differed. For example, Brian G. Awty ("The Development and Dissemination of Walloon Ironworking," *Technology and Culture* 48, no. 4 [October 2007]: 783–803), discussing the first large batch of iron cannonballs made in Europe (in 1414), mentions that Walloon iron, while suitable for cannonballs, was unsuitable for some other uses because of impurities. Loose chain-mail rings are hard to trace to a maker or refining process, but trace-element analysis may one day provide clues. This information, in conjunction with research on patterns of trade and commerce, might provide some clues as to where the metal was processed. It is no flaw that the paper stimulates such questions in a reader, as it may also trigger further fruitful research.

An earlier paper by Huber inspired Thomas Glück to write "Rack Division—The Fingerprint of Historical Fretted Clavichords." Huber had found the rack spacing of five traveling clavichords to be so similar that some explanation seemed required, or at least that pure coincidence could be excluded. Three of these clavichords are probably by Otto Joachim Tiefenbrun, he found, the other two by Johann Heinrich Gräbner.

A modern reader might assume that quarter-comma meantone fret spacings would be mathematically obvious. But early builders did not have logarithms, slide rules or calculators. If a master had a scale-stick and fret pattern that worked, his apprentices would be likely to copy it, as well as other details of construction, such as the angles formed by the string band and the fret face with the back wall.

Glück proposes a rack-spacing data bank to search for other similar correlations in the physical record. To build a case for such a project, he explains the limits on layout that all makers of fretted clavichords face, suggesting that there are enough choices to distinguish traditions, if not individual builders. He helpfully offers a non-contact way of measuring the rack with a laser-pointer mounted on a rail (much more likely to be acceptable than methods that require contact with old artifacts), and he hopes those with access to anonymous instruments will provide detailed information to the database.

In "A Seventeenth-Century Clavichord from Poland," Andreas Hermert describes an unusual clavichord, made in Kraków by "Jacobus," that shows features archaic by the time of its apparent seventeenth-century

date, given on a paper label as “16[?]4.” The instrument has been in the Clarist convent in Stary Sącz, southwest of Kraków, for most, if not all, of its existence.

The forty-five-note compass is normal for that time, but other features seem archaic. For example, the instrument has a full-length soundboard that passes under the key levers, wrest plank, and hitch-pin rail, spanning the whole length of the box. Its bridge, necessarily tall, is not curved, and is held without glue by the pressure of the strings. The string band is nearly parallel to the spine (back wall). Instead of rack slots, the instrument has brass blades that jut out of the rack, and matching slots in the ends of the keys. The full-length soundboard seems a hangover from earlier practice, but the “male” rack is unique, to the author’s knowledge (and mine). These features may indicate a line of apprenticeship that separated very early from the rest of central Europe.

Kraków archives mention a cabinetmaker Jacobus, active in the early seventeenth century. The lid painting and inscription, however, commemorate the installation of the new abbess of the convent in 1691. That this instrument can be identified with a specific place and a relatively specific time gives it a significant place in clavichord history.

The Jacobus clavichord also figures in Maria Erdman’s overview of a Polish treatise, whose title she translates as *The Tablature of Music or Musical Practice* (Kraków, 1647). The author of the treatise, Jan Alexander Gorczyn (1618–1694), was born and died in Kraków. He was a bookseller, printer, and author of several books on various subjects. His ten-chapter tablature was couched as a “catechism” in question-and-answer form for beginners and amateurs of music.

Erdman translates the short tenth chapter, “On the Tuning of the Clavichord,” in its entirety. Gorczyn devotes two paragraphs to stringing, giving a starting gauge and suggested ranges. If a note doesn’t sound right, he suggests trial and error. He also includes cautions one would hope unnecessary, such as “you also need to learn that you should never wind two strings on one pin . . .”

Gorczyn gives hints on tempering some intervals: he is not explicit enough for me to identify the tuning, but it includes at least one pure third. Erdman questions why the pure third needs mention, and proposes that maybe there was only one. Then, given that Gorczyn distinguishes different kinds of fifth, she suggests the possibility that one of those could be a pure fifth. From there she leaps to the suggestion that Gorczyn anticipated Kirnberger III tuning, which would emerge in print

only in 1760. This is a bold hypothesis, not easy to reconcile with a triple-fretted clavichord like the Jacobus instrument. However, Gorczyn did not say specifically that he was discussing a fretted instrument. Also, any number of working musicians, even before Gorczyn, might possibly have discovered that one pure third, with pure fifths almost around the circle, results in bearable enharmonics. I believe Erdman will face a lot of criticism over this, though not from me.

Erdman dissects Gorczyn's stringing instructions, which give no information about fretting. She refers to the Jacobus clavichord mentioned above, which she has inspected; gives her interpretation of its triple-fretting scheme; and suggests a possible stringing in millimeter diameters for such an instrument, consistent with Gorczyn. Erdman also discusses Gorczyn's fingering directions at length, attempting to untangle some of the ambiguities, and she succeeds in extracting some interesting fingering suggestions that differ from those of other sources. Players will doubtless judge their plausibility through trial.

In "Every Player's First *Grammatica*," Gregory Crowell advances an explanation for the value German organists placed on the clavichord for practice and teaching in the sixteenth through eighteenth centuries. In particular, he raises the question of why it was less important to French organists. Marpurg is quoted as saying that Jacques Duphly "plays only the harpsichord in order, as he says, not to spoil his hand by playing the organ." No German keyboardist had the luxury to be so specialized. Crowell launches the argument with a quotation translated from Johann Gottfried Walther's *Musikalisches Lexikon* of 1732. Walther apparently considered the clavichord so familiar that there was no need to describe it, calling it the "first *Grammatica*" of all keyboard players, "for if they have command over [it] they can also get on well with spinets, harpsichords, regals, positive [organs] and [large] organs."

Crowell tries to convey the significance of the word *Grammatica* in German culture, going back as far as Martin Luther in a 1530 sermon. The *Grosses vollständiges Universal-Lexicon* (1743) of Johann Heinrich Zedler, which quotes the Walther clavichord entry nearly verbatim, has its own lengthy definition of *Grammatica*. It begins: "an art that displays how one writes and speaks a language correctly, and has four main sections: orthography, etymology, prosody, and syntax." After a lengthy exegesis of the origin and history of the word, Zedler closes his definition with a very important application of *Grammatica*, "the study of foreign languages." I am grossly oversimplifying Crowell's (and Walther's)

argument; it is well worth reading whole, as are a host of other essays in this compendium.

I am unable to accept Crowell's understanding of two quotations (p. 58) describing keyboard technique. One is Burney's description of Handel's playing, the other a translation of Forkel's description of J. S. Bach's. In both cases, Crowell takes the absence of visible hand motion to imply that arm motion is used to press the keys. I take both authors to mean that finger motion is hidden by the hand. Except for this caveat, I find Crowell's essay utterly compelling. Of course, I became convinced of the value of clavichords more than thirty years ago through comments made by the modern organists Harald Vogel and the late Klaas Boldt, both of whom emphasized the importance of clavichord practice in achieving an idiomatic style for early organ music.

I hope readers will be sufficiently tantalized by my words that they will look for *De Clavicordio VI*, and that they will enjoy it as much as I did.

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Gerhard Doderer and John Henry van der Meer. *Cordofones de tecla portuguesas do século XVIII: Clavicórdios, cravos, pianofortes e espinetas / Portuguese String Keyboard Instruments of the Eighteenth Century: Clavichords, Harpsichords, Fortepianos and Spinets.* Lisbon, Fundação Calouste Gulbenkian, 2005. 489 pp: 109 plates (88 color photographs, 21 black-and-white photographs), 20 silhouettes. ISBN: 972-666-077-7. €35,00 (paper).

Studies of stringed keyboard instruments of the Iberian peninsula have been few and far between, most likely due to the difficulty of accessing the few instruments that have survived to the present day. This volume is the most important source of information in existence today about Portuguese stringed keyboard instruments of the eighteenth century and the only survey on the subject to appear since Gerhard Doderer's *Clavicórdios portuguesas do século XVIII / Portugiesische Klavichorde des 18. Jahrhunderts* was published in 1971, over thirty years ago. The authors do not claim this new publication to be a systematic organological study, but rather a summary of information about instruments with which they are familiar. However, it contains enough information to keep even the most meticulous of organologists happy. The instruments in the study include