

*Journal of the
American Musical
Instrument Society*

VOLUME XLIII • 2017



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scholarship, it is these personal and singular glimpses of a rapidly vanishing cast of characters and their stage that makes this book uniquely valuable. It is easy to imagine that it will unfold a past world for future readers as Algernon Rose's *Talks with Bandsmen* does for us today. In the meantime, there is something here for everyone and *Horns and Trumpets of the World* deserves a place on the bookshelves of students, scholars, performers, curators and the musically curious.

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DEPARTMENT OF MUSICAL INSTRUMENTS

METROPOLITAN MUSEUM OF ART

Hannes Vereecke. *The Sixteenth-Century Trombone: Dimensions, Materials and Techniques*. Turnhout: Brepols, 2016. 254 pp, 22 tables, 74 color plates, 100 black-and-white illustrations. ISBN 9782503566399. EUR 75.00.

The early trombone (known as "the sackbut" to many players of reproductions) is an integral constituent of the instrumentation of an extensive repertoire, both of compositions with instruments specified by the composer and from the earlier period for which present-day performers choose an instrumentation based on what is known to have been typical. Trombones with their design and construction based on early models have been made since the mid-twentieth century. Some are marketed as copies, some are in the style of early instruments, and all to a greater or lesser extent are compromises. It is a valid question to what extent compromise matters. How much does an ever more slavish following of early design, materials, workshop techniques and ornamentation contribute to musical quality? However, even if one accepts some compromise on grounds of expediency or economy, it is necessary to know what can be achieved by a careful attempt to approach as closely as possible an exact reconstruction of a good original or a generic sackbut. This raises the question, which this book aims to answer: what were the essential characteristics of the early trombone? Anyone who has studied the surviving instruments will have come quickly to the conclusion that there are question marks over each one. How much has it been altered? Do the slide and the bell originate together? And, is it a typical instrument of its time and place? The closest approach we can make to standard practice (or establishing that there was one) is to make detailed study of every extant early trombone, analysing each using all relevant available techniques.

This is precisely what Vereecke has done in a study occupying a number of years and presented in this welcome and important book.

The book provides a comprehensive picture of the physical characteristics of the early trombone by means of acoustical, mensural and metallurgical analyses of all surviving trombones made in sixteenth-century Nuremberg. There is little problem in limiting the study to Nuremberg-made trombones; only two extant instruments are thereby excluded, and Nuremberg production dominated the market across Europe. There is more of an issue with the cut-off date of 1600—was this a convenient cut-off point dictated by the limits of research time and funding, or was there a change in trombone design around that time? We are not told.

The book is well structured, with introductory chapters on acoustics and brasswind engineering, followed by discussions of metal analysis and a description of the scientific methods used. A chapter on mouthpieces, another minutely documenting the eleven extant sixteenth-century Nuremberg trombones, a chapter dealing with the brass used in their manufacture of sixteenth-century Nuremberg brass are followed with appendices containing metal analyses for the components of each trombone.

The treatment of acoustics is basically sound, though there are a few statements that might mislead the unwary. Strictly speaking, the vibration of a player's lips does not necessarily "chop" the flow of air from the oral cavity into the mouthpiece, rather it modulates the flow. In loud playing the lips do indeed close in each cycle, but in quiet playing, although the orifice area varies, the lips do not touch. There is a confusion, frequently encountered, between the different air column resonances and the natural tones (p. 25). Air column resonances are each centred on a single frequency, while natural tones have a harmonic spectrum. It is not necessarily true that the amplitude is greater when the played frequency closely matches the closest resonance frequency (p. 28), indeed for trombones (with their considerable lengths of close-to-cylindrical tube), the lowest resonance frequencies are considerably lower than the corresponding natural notes. Similarly, the plot of acoustical input impedance (an important parameter) against frequency shows the resonance frequencies as peaks, not the natural notes. It is also misleading to claim that an instrument that exhibited perfectly spaced resonances (their frequencies harmonically related) would feature perfect intonation (p. 34). It might be a very responsive instrument, but harmonic playing frequencies would diverge from not only equal tem-

perament but also from all temperaments historically used in trombone playing. Harmonic playing frequencies are also assumed to occur when they are related to equal temperament (p. 50). The statement that “a fundamental benchmark of good design is one in which all fundamental frequencies of playable notes lie close to one harmonic series” (p. 47) is plausible, but could be taken to suggest that the closer the better—this may or may not be the case. Certainly, they cannot differ too much, but as in the function of some other instruments, a modicum of inharmonicity may have a positive effect on the player’s control of intonation by lip-ping, and will also have some effect, possibly beneficial, on timbre. The careless use of terminology is particularly egregious on p. 113 where we read that the “addition of a mouthpiece brings the harmonics closer to a harmonic series” (it is the resonance frequencies that are brought closer). These slips do not invalidate the subsequent discussion in the book, but they are likely to confuse the reader for whom the acoustics chapter is intended to be an accessible introduction.

There are a few other questionable statements. It is unrealistic to suggest that covering the jaws of a caliper with soft tape (p. 82) will not distort the measurements. One can criticise the determination of pressure transfer function by the measurement of pressure amplitude at a single microphone in the plane of the bell end (p. 97). The sound radiation patterns can show pronounced variations depending on microphone position in front of the bell and on frequency; they are greatly influenced by bell geometry. To gain a measurement of sound output that is relevant to the performance of an instrument in playing, an array of microphones should be used, or a single microphone used at different angles off-axis and the amplitudes consolidated.

In his chapter on mouthpieces, Vereecke bravely attempts to extract results which can be applied to present-day manufacture and player selection. One major problem is the small sample size with only four extant examples. Another is that the acoustics of mouthpieces is as intractable as it is important. The systematic approach and detailed investigation lead discouragingly to an admission of defeat. “There is a discrepancy between musicians’ subjective experiences and what can be derived from scientific study” (p. 120). This discrepancy is exacerbated by the ill-defined terminology used by some players, such as “more centred playing behaviour” (p. 121) and “sound that remains focused” (p. 122)—phrases with some intuitive meaning but which require rigorous definition to be used authoritatively.

The documentation in chapter 7 of the eleven extant sixteenth-century Nuremberg trombones is perhaps the most valuable feature of the book (though it would be useful to be told the nominal pitch of the bass trombones described here). The differences in response of the extant early trombones (p. 159) is not explained; one is tempted to ascribe the weaker resonances of some instruments to leaks.

The publisher's presentation of Vereecke's material is initially attractive, but the author has not always been well served. The use of color printing is welcome but puzzling. The many bar charts in the appendices use color unnecessarily; many of the instrument photographs would have benefitted from color printing. Color should also have been used in some of the diagrams where a monochrome printing requires the use of dotted lines in comparative graphs. The dotted lines are almost completely invisible in Figure 6.12, for example. The final stage proof-reading was deficient, as in footnote 12 of chapter 1, showing stray hyphens. The quotation from Adolf Ledebur in German on p. 69 should also be translated. On p. 158, one reads, "The results . . . are provided to the reader on the CD attached to this thesis"—but there is no CD provided with the book.

The intended audiences are the small number of instrument makers and the large number of sackbut players. The players can now be well informed in selecting an instrument for the early repertoire. The granularity of the data presented is commendable, although few readers will be concerned with the second decimal place in the elemental composition of brass. Indeed, the general reader might have welcomed a few more conclusions about the relative significance of the amassed facts, but at least they can be confident that no stone has been left unturned in the quest to ascertain what the extant instruments can teach us.

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Germain, Christopher, Philip J. Kass, Darcy Kuronen, Dameron Midgett, and John Montgomery. *The American Violin*. AFVBM Foundation, 2016. 327 pp. 363 color photographs, 30 black & white photographs, 3 tables, reference list, index. ISBN 978-0-692-64339-6 (standard edition), ISBN 978-0-692-64340-2 (Deluxe edition). \$299 (hardbound standard edition), \$479 (leather deluxe edition).

In 2006, an exhibit chronicling the development of American violin making was mounted at the Library of Congress, "The American Violin: