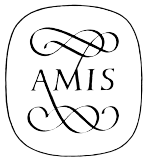
Journal of the American Musical Instrument Society

VOLUME XVII • 1991



Hans Georg Richter. *Holz als Rohstoff für den Musikinstrumentenbau.* Celle: Hermann Moeck *Verlag,* 1988. 44 pp.; 24 black-and-white illustrations. DM 38.

Trombones, gender, and oliphants notwithstanding, wood is the single most important class of materials used for musical instruments. Although those who make and study musical instruments should therefore have considerable knowledge of wood and its properties, most remain unfamiliar with the broader perspective and assistance that can be provided by the scientific study of wood. This unfamiliarity is not surprising: much of the relevant information is to be found only in difficult-to-obtain and highly technical literature widely scattered in a variety of fields including botany, engineering, and acoustics. Clearly, if this store of learning were organized into a single interdisciplinary treatment of the musical uses of wood, the resulting book would be a major resource for organology. One approaches *Holz als Rohstoff für den Musikinstrumentenbau* (Wood as Raw Material for Musical Instrument Making) with great expectations. That the author is a distinguished scientist at an important center for the study of wood[1] raises these expectations, as does the assumption that the publisher, a prominent manufacturer of musical instruments, has contributed organological information and practical insight from the workshop that would help to illuminate this grey area between art and technology. The book that they have produced, whose title seems to imply a comprehensive treatment of the subject (or, given its small number of pages, at least an overview that could provide an intelligible introduction to the subject), is, however, marred by numerous deficiencies. These include poor organization; inadequate presentation of scientific concepts for the benefit of the nonexpert; scientific and organological errors; insufficient indexing, cross-referencing, and citation of sources; and a most distressing myopia that results in a disproportionate treatment of subjects apparently of special interest to the author or publisher and in an almost exclusive concentration upon woods used by present-day German large-scale industrial manufacturers.

The arbitrary decision so to limit the subject geographically and chronologically, which should have been explained in the general introduction but is barely mentioned here and there in the text, is, I believe,

1. The Institut für Holzbiologie und Holzschutz of the Bundesforschungsanstalt für Forst-under Holzwirtschaft in Hamburg.

unjustifiable. Instruments from non-European cultures are, after all, musical instruments too and are of significance not only in their own right but also because of the considerable extent to which they have, over many centuries, influenced and continue to influence Western music and instrument making. Further, instruments originally developed in Europe, for example, pianos, guitars, and recorders, are now made in large numbers elsewhere in the world so as to rival the native European production in quantity, quality, and international distribution. Within European instrument making itself, modern practice is largely founded upon tradition: present-day violin and harpsichord makers, for example, strive to equal the finest instruments of past centuries. Since the woods available to and chosen by instrument makers vary from place to place and time to time, this book's concentration upon a single time and place undermines, from the inception, much of its potential substance and utility. Its discussion of soundboard wood, for example, which deals exclusively with spruce and similar softwoods, would have been greatly enriched by the inclusion of the hardwoods used in some early Western and contemporary non-Western instruments,[2] not to mention cypress, traditionally used for Italian harpsichord. As for the section on woods used for keyboard instruments, it seems perverse that poplar is mentioned only as used for laminates of "flat components of low mechanical strength requirements (e.g., harpsichord and spinet lids)" (p. 34) while its use by the Ruckers for the cases, key levers, soundboard ribbing, etc., of their preeminent harpsichords is unmentioned.

Immediately, in the first paragraph of the introduction, readers with the slightest awareness of the history of musical instruments will question the organological competence of one who could write that the "type, form, and construction of the most widely used instruments have changed little during the last five centuries." After two largely irrelevant paragraphs about the difficulty of finding substitutes for spruce as a soundboard wood, the introduction ends with the presentation of a peculiar ad hoc system for classifying musical instruments according to

2. Until the eighteenth century soundboards of continental European harps were usually of maple (*Acer campestre,* for example, in a German harp of about 1700 in the Museum of Fine Arts, Boston, N. Bessaraboff, *Ancient European Musical Instruments* [Cambridge: Harvard University Press, cat. no. 237 p. 41]). See also Robert Hadaway, "The Re-creation of an Italian Renaissance Harp," *Early Music* 8:1 (Jan. 1980), pp. 59–62. Among non-Western instruments, *Cedrela toona,* for example, is used in the sitar (see Alastair Dick, "Sitar," *NGDMI,* 3:395),and *Firmiana platanifolia* is used in the *qin* (Liang Ming-Yueh, "Qin," *NGDMI* 3:171.)

their principal uses of wood: 1) instruments with resonating woods, divided further into a) instruments with resonant plates (i.e., soundboards, violin bellies, etc.) and b) xylophones; 2) instruments with wood not directly involved in sound production, i.e., woodwinds (appended to this category are instruments, or parts thereof, in which wood is used for mechanical or visual reasons, e.g., bows and keyboard instrument cases). The body of the book follows this scheme. Thus, there are two main chapters (resonant and non-resonant woods) divided into subsections, each with a brief introduction, followed by descriptions of various woods. This arrangement, which might have been practicable if each kind of wood were used for only one purpose among all musical instruments, is, in reality, an organizational nightmare. Brazilian rosewood *(Dalbergia nigra),* for example, used for guitar sides and backs, xylophone bars, woodwinds, violin chinrests and pegs, piano-case veneer, etc., could have been listed in several categories. As with some other woods (e.g., maple, pear, and ebony) each used for several purposes, Brazilian rosewood is arbitrarily described under what is obviously a favorite section (its sixteen pages taking up nearly half of the book's text), woodwinds. Although some other uses of this wood are mentioned here (p. 25), there is no allusion to it under the other appropriate categories, except for a reference, in the xylophone section, to see the woodwind chapter. (The inadequacies of the book's internal referencing and indexing are further exemplified here by the failure to state a specific page number to turn to.) Even more remarkably, the most important use of Brazilian rosewood in modern instrument making, as the preferred wood for guitar sides and backs, seems to have been lost in the shuffle and is not reported in the book at all, nor is East Indian rosewood *(Dalbergia latifolia),* used as a substitute for the increasingly rare Brazilian species, mentioned. A clearer organizational procedure for the book, by which such lapses might well have been avoided, would have been to have, first, a general introduction about woods and their properties, second, an organologically arranged list of instruments naming the woods used in each type, and, third, descriptions of the various woods arranged according to their botanical families.

The descriptions of individual woods range from relatively complete accounts (including scientific and common names, geographical distribution, gross features, physical characteristics, and uses both for musical instruments and other objects) to a few lines (giving only names and distributions). Because there is no discussion of wood structure in the

book, technical terms used to describe near-microscopic features (e.g., "storied structure" and "storage-cell bands" on p. 14; "pith flecks" and "pores . . . diffuse" on p. 20) will be meaningless to most readers. Persons familiar with wood anatomy will admire the excellent photomicrographs of cross sections, but their usefulness is vitiated by a failure to indicate the magnifications. These are the only illustrations. It might have been more appropriate and more useful to most readers to provide color photographs of wood surfaces like those on the book's cover.[3] The only quantitative physical characteristic included in the descriptions is density. Although the elastic modulus (Young's modulus) is mentioned more than once (pp. 8 and 13) as an important acoustical factor, this value is not given for the described woods, nor are data about other factors mentioned in the acoustical literature such as internal damping, "Q," and shear.[4]

The woodwind subchapter, with detailed descriptions of eighteen woods arranged in order of increasing density from maple to Africa blackwood *(Dalbergia melanoxylon),* comprises the most complete treatment of any subject in the book. Makers and players will be particularly interested in warnings about the unhealthful properties of certain woods and in the tonal qualities associated with each wood. The introduction to this section (p. 17) mentions (without reference to a source) that experiments with organ pipes have established that increasing roughness of internal surfaces (greatly influenced by the microscopic structure of the

3. Low-magnification photomicrographs of cross sections like those found in *Holz als Rohstoff* are usually used as references (along with more detailed verbal descriptions of the pore arrangment, etc., than those provided in this book) for identification of wood by viewing the end grain through a hand-held lens. Although this is easy to do with a piece of lumber, I have found in identifying the woods used in antique musical instruments that suitable surfaces for this kind of identification are rarely available and that one must usually examine thin sections under a microscope. On the other hand, closely related woods, such as the various rosewoods of the genus *Dalbergia,* are often microscopically very similar, and features visible to the unaided eye, e.g., color, are important for an accurate identification. Thus, color photographs of rosewoods, for example, those in Dick Boak, "The Rosewood Jungle Finding your way in and out," *Fine Woodworking* 77 (July/Aug. 1989), pp. 48–51, can be more useful than the Dalbergia illustrations in *Holz als Rohstoff.*

4. See, for example, I. Barducci and G. Pasqualini, "Misura dell'attrito interno e delle costanti elastiche del legno," *Il nuovo Cimento* 5:5 (1948), pp. 416–66, reprinted in Carleen M. Hutchins, ed., *Musical Acoustics, part I; Violin Family Components,* Benchmark Papers in Acoustics no. 5 (Stroudsburg, Penn.: Dowden, Hutchinson & Ross, 1975), pp. 379–409 (with an English translation by Elizabeth B. Abetti, pp. 410–423); Daniel W. Haines, "On Musical Instrument Wood," *Catgut Acoustical Society Newsletter* 31 (May 1979), pp. 23–32; and John C. Schelling, "Wood for Violins," *Catgut Acoustical Society Newsletter* 37 (May 1982), pp. 8–19.

wood) reduces the overtones (a brief paper reporting a similar effect in the finger holes of woodwinds is also cited). Nevertheless, tonal characteristics reported about each wood—e.g., maple recorders are "full and lovely . . . fundamental and gentle," (p. 19); African blackwood flutes are "bright and carrying, clear rich in overtones and elegant," (p. 32)—are presumably the authors (or publishers?) subjective evaluations. Although such adjectives as "elegant," or "easy [of] speech" and "warm" (see olive, p. 23) would be difficult to quantify, this is such a controversial subject[5] that some more objective data (e.g., overtone analyses might well have been included.

Although the discussions of wood for woodwinds and also for xylophones seem to be fairly complete and authoritative as far as modern practice is concerned, there are some minor lapses, for example, the statement (p. 25) that "formerly, oboes, clarinets, and transverse flutes, later also recorders" were made of boxwood (can the author really be unaware that boxwood recorders were made long before the earliest clarinets?); the failure to list birch as used for xylophones[6]; and the assertion, unsupported by the available acoustical data, that the woods used for xylophones, being "very dense, therefore have high internal damping" (p. 12).[7]

Far more serious are lapses in the coverage of woods used for stringed and keyboard instruments. As mentioned above, the subchapter on woods for resonant plates deals only with a few softwoods: apparently ignoring studies establishing the importance of the resonance characteristics of the backs of stringed instruments,[8] the author has deliber-

5. At the beginning of his woodwind subchapter, Dr. Richter aptly opposes quotations from two authorities on the recorder with diametrically opposed opinions as to the effect of wood on tone.

6. Experiments on birch xylophone bars, used in Japan, are reported in Masamitsu Ohta, Takesi Okano, and Ikuo Asano, "Vibrational Properties of Marimba Sound Boards Related with its Grain Orientation and Density Variation," *Proceedings of Pacific Regional Wood Anatomy Conference* (Tsukuba, Ibaraki, Japan, October 1984), pp. 25–27, a source listed in the bibliography of *Holz als Rohstoff*.

7. See the data in Barducci and Pasqualini, *op. cit.*, esp. pp. 391–94, and in Haines, *op. cit.* For example, the logarithmic decrements (measurements indicative of internal damping) reported by Haines (p. 27) for European spruce and for maple *(Acer platanoides)* are similar, but maple is about 40% denser.

8. See, for example, Carleen Maley Hutchins, "The Physics of Violins," *Scientific American* 207:5 (Nov. 1962), pp. 78–93, and "The Acoustics of Violin Plates," *Scientific American* 245:4 (Oct. 1981), pp. 171–86. According to John C. Schelling, "Requirements for Sounding Board Material," *Catgut Acoustical Society Newsletter* 11 (May 1969), pp. 18–22, in "the

ately excluded (see pp. 9 and 19) from consideration in this context woods, such as maple, used as tone wood by instrument makers. In the introduction to this subchapter, the measurable characteristics of good resonant wood, such as density, elastic modulus, and annual-ring width are touched upon. Readers familiar with keyboard instruments will wonder why it is recommended (p. 8) that soundboards he composed of planks with wide rings in the bass and narrow in the treble: in modern pianos the planks are placed more or less parallel to the bridge so that there can be no differentiation in grain width between treble and bass; in fine antique harpsichords the grain in the treble is usually no finer than that in the bass and is sometimes coarser.[9] Readers familiar with acoustics will notice that the mathematical formula for the derivation of the speed of sound in a material from its elastic modulus and density is given incorrectly.[10] And readers expecting at least a minimal comprehensiveness will be led to frustration with the statement (p. 9) that "this overview of important physical and biological criteria gathered from the specialist literature can give only broad indications for the characterization of high-quality resonant woods (those interested can find more information in the literature listed at the end)." Can many, if any, of these sources (e.g., and unpublished *Diplomarbeit* at the University of Hamburg and papers in such journals as *Sozial. Forstw.* and *J. Jap. Wood Res. Soc.*) be available even to those with access to large research libraries?

The last sections of the book concern woods used for keyboard and percussion instruments, bows, and recorder blocks. What might have been an enlightening discussion of the slowness of bow makers to adopt pernambuco, introduced to Europe in the sixteenth century, while snakewood was the standard wood used in the seventeenth and early eighteenth century, is spoiled by the statement that pernambuco was first used for bows about 1750 (p. 39): it was, in fact, used much ear-

violin the top plate provides about ⅔ of the radiated sound pressure" (p. 21). Presumably most of the remaining ⅓ is radiated by the back.

9. See Grant O'Brien, *Ruckers: A Harpsichord and Virginal Building Tradition* (Cambridge: Cambridge University Press, 1990), p. 100: "No attempt was made to use, say, wide-grained wood in the bass, and narrow-grained wood in the treble." In the harpsichord by Henri Hemsch, Paris, probably 1736, in the museum of Fine Arts, Boston, the grain is wider in the treble than in the bass.

10. See p. 8. The square root symbol that should be around E/r (E = elastic modulus, r = density) is missing, and an extraneous lambda is present.

lier.[11] An entire page is devoted to the theory of recorder blocks and a description of the red cedars (i.e., *Juniperus* spp.) used for this purpose, but the vast subject of keyboard instruments is summarily dealt with in two-and-a-half pages. Organs (in which the choice of woods for pipes, windchests, cases, and actions can hardly be deemed unimportant) are dismissed in a footnote. This leaves stringed keyboards, for which "only the most important woods used in domestic [i.e., German] instruments are presented in a brief format," because "with the exception of components with very specific requirements for wood qualities (e.g., soundboards, wrest planks, etc.) the criteria . . . are of a general nature" and "of much more importance to selection are tradition, experience, location of the workshop . . . appearance . . . availability and price." (By the same standard the woodwind section would have been reduced to a few pages.) Thus, only a few species used in pianos and harpsichords are listed. Spruce and pine are mentioned only as used for soundboards, not also for such components as ribs, cases, and framing.[12] Not mentioned at all in the book are numerous woods widely found in historical harpsichords and still used by the finest German makers (who do not work on an industrial scale), for example, limewood (i.e., linden, *Tilia* spp.), cypress, and walnut.

Holz als Rohstoff might be of marginal interest to xylophone and woodwind makers. This generally superficial and uninformative book—really little more than a pamphlet—cannot, however, be recommended to the majority of those in the organological world. Lamentably, a rare opportunity to introduce instrument makers and scholars to the science and technology of wood has been squandered.

JOHN KOSTER
The Shrine to Music Museum, The University of South Dakota

11. See David D. Boyden, *The History of Violin Playing from its Origins to 1761* (London: Oxford University Press, 1965), pp. 114, 207, and 209; and David D. Boyden, "BOW," *NGDMI* 1:259.

12. The cases of Bösendorfer pianos, for example, are made almost entirely of spruce: see Anthony Liversidge, "Of Wood and Wire Wrought: The Making of a Bösendorfer," in James R. Gaines, ed., *The Lives of the Piano* (New York: Holt, Rinehart and Winston, 1981), pp. 75–99.