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rhythmic notation—a matter of current concern to all who perform early music. As to the section on registration of organ pieces, every organist who wishes to play early French music will find *The Organ-Builder* an important source of help. The translator and publisher are to be congratulated on this large-scale venture, and they deserve every positive contribution towards correcting the last defects in their monumental work.

I am astonished to discover that examples of this superb work are still available for purchase. The limited edition of one thousand, if it had been energetically advertised, should have been sold out in the first year.

FENNER DOUGLASS

Owen Jorgensen. *Tuning the Historical Temperaments by Ear*. Marquette: The Northern Michigan University Press, 1977. 453 pp. \$22.50.

A number of recent reviews¹ have already commented on the serious deficiencies of content and style in Owen Jorgensen's *Tuning the Historical Temperaments by Ear*. The present writer was no less confused, amused, and vexed by the author's curious way of assembling words and sentences, by the seemingly endless pages of mechanical duplication of text in the tuning instructions, and by the welter of undocumented and unverifiable historical statements and claims. The real problem with this book, though, is that the novice tuner will find within its pages no real help in evaluating the eighty-nine tunings and temperaments, or the methods presented, and must resort to other sources, or to trial and error.

Even for the more experienced, the barriers erected by the book's structure and language remain obstacles to the use of its content. Jorgensen himself is a skilled practitioner of the art of musical temperament, and his ideas about the historical development of the tuning of keyboard instruments are certainly thought provoking. A

1. In particular, those by Mark Lindley in *Notes* 34(1978): 616–17, and in *Early Music* 6(1978): 453.

reader will certainly feel that many years' effort and care must have gone into this book; indeed, it does contain much that is useful in the way of tuning techniques and procedures. It is all the more unfortunate, then, that users of the book will find it quite difficult to take advantage of the author's expertise.

For those interested in the fascinating and elusive history of the subject, J. Murray Barbour's *Tuning and Temperament*, upon the framework of which Jorgensen appears to have fashioned his own approach, is indispensable.² In fact, Jorgensen's book can be appreciated as a practical companion to the theoretical and descriptive Barbour text.

Despite Jorgensen's professional bias toward the tuning of pianos, his book will probably appeal most to harpsichordists, because of the relative ease of tuning the harpsichord (and clavichord), as well as the greater historical breadth of its repertoire. For the less experienced users of the book, the present writer recommends concentration on a few temperaments that will suffice for almost all early keyboard music and that will develop tuning confidence through repeated practice. These are: (1) *Pythagorean* (p. 51), for medieval music in which the major third is not treated as a consonance; no intervals are tempered in this tuning. The following *unequal temperaments*³ are suitable for most eighteenth-century music: (2) *Kirnberger II* (p. 256), which has but two tempered fifths, all the rest being tuned pure; (3) *Kirnberger III* (p. 311; called Aron-Neidhardt by Jorgensen), a so-called quarter-comma temperament, in which one learns to temper four adjacent fifths; and (4) *Werckmeister III* (p. 304), a closely related temperament that string players (especially gambists) will find somewhat easier to play with than (3), as the third C-E is a bit wider

2. Readers of the Barbour book should be reminded that the author's gratuitous evaluation of each different temperament by a comparison with equal temperament can be defended neither historically nor musically.

3. Though Jorgensen suggests calling tunings of this type "well temperaments," it is to be hoped that musicians will reject this ugly solecism. It was apparently coined on the false premise that a similar phrase exists in German, though, as far as I can determine, it does not and cannot. The German phrase used, for example, by Türk (1789) and Marpurg (1790) is *ungleichschwebende Temperatur*, which renders directly into English as "unequal temperament"; it is this term that the present writer recommends for such tunings.

than *Kirnberger III*'s pure one.⁴ In each of the last three temperaments, all keys are playable, and each affords key color, or affect.

Having acquired the ability to tune a quarter-comma temperament, one can easily proceed to the most useful of the (5) *meantone temperaments* (p. 177), suitable for a great deal of music written before—and some after—1700. Note that while the size of the tempered fifths need not be equalized with great precision in an unequal temperament, for meantone they must be as nearly equal in size as possible, since meantone is a temperament in which the intervals of any category should all sound the same. It follows from this that key color, or affect, does not exist in meantone.

Jorgensen's just interval exercises and instructions on "where to listen while tuning" (pp. 18ff.) are highly recommended, as are his suggested tuning techniques (of the rules for tuning, pp. 13–15, numbers six through eight are not applicable to the harpsichord). Though it is very helpful to count beats at first, in this writer's experience learning to reproduce the sound or "color" of the tempered interval is easier in the long run than beat counting.⁵ In fact, tuners are well advised to develop personal methods suitable to their own ears, rather than follow slavishly a tuning scheme of the complexity and redundancy of those in Jorgensen.

The more experienced, adventuresome tuner may wish to try some other temperaments. Recommended are the one-third-comma temperaments on pages 272 and 284 and the very useful Thomas Young one-sixth-comma temperament on page 323. It is worth noting that the organ builder John Brombaugh uses with fine results an equal-beating version of *Kirnberger III* slightly different from that given by Jorgensen (p. 313). In Brombaugh's version the fourth *g–c'* and the fifth *g–d'* beat at the same speed, just as the fourth *a–d'* and the fifth *a–e'* beat at the same speed.

The handful of temperaments listed here is about all the practicing harpsichord tuner will need. Of course, the harpsichord tuner will be

4. It need hardly be added that all serious performers of early music—not keyboard players alone—will profit from a thorough understanding of historical temperaments.

5. Jorgensen's beat speeds are for modern pitch, $a' = 440$ Hz. For those using a different pitch standard, the beat speeds increase or decrease about 6 percent per semitone up or down.

asked for equal temperament. This writer's advice is to nod agreeably, and tune something like Werckmeister III or Young. It is unlikely anyone who insists on equal temperament will know the difference.

For those who have not acquired the Jorgensen book, there are several very satisfactory and less costly alternatives, of which the best is the pamphlet *Harpsichord Tuning* by G. C. Klop (Garderen, Holland: Werkplaats voor Clavecimbelbouw, 1974). (The temperament names treated as standard in this review are those used in Klop.) The article "Instructions for the Clavier Diversely Tempered" by Mark Lindley, *Early Music* 5 (1977): 18-23, is also very good, as is that by Dale Carr, "A Practical Introduction to Unequal Temperament," *The Diapason*, 65th year, no. 3 (February 1974), pp. 6-8. Historical temperaments are now an integral part of all serious study and performance of early music. May we hope that Jorgensen will publish an abridged, selectively edited handbook of tuning and temperament suitable for the practical use of the increasing number of early musicians?

DOUGLAS LEEDY

Earle L. Kent, ed. *Musical Acoustics: Piano and Wind Instruments*. Benchmark Papers in Acoustics, vol. 9. Stroudsburg, Pa.: Dowden, Hutchinson & Ross, Inc., 1977. xiii, 367 pp. \$34.00.

The affinity between science and music had its earliest recorded expression in the experiments of Pythagoras in the sixth century B.C. He demonstrated that the lengths of strings necessary to give harmonious notes could be expressed as ratios of simple integers, and he established the mathematical basis for the musical scales then in use. Since then, scientific knowledge has flourished and grown to an enormous extent, while musical instruments have evolved very slowly. Nevertheless, the scientist is still trying to identify and explain the many acoustical phenomena that the musician and the instrument maker have learned empirically to handle so skillfully.

This volume of collected papers in musical acoustics is directed to the scientist or engineer. It will be of interest also to musicians or