Temperament: The Idea That Solved Music's Greatest Riddle. By Stuart Isacoff. New York, NY: Knopf, 2002. 259 p. ISBN 0-375-40355-8 $33.00

"Temperament" is a concept upon which western tonality places much emphasis. Temperaments are tunings of the scale adjusting the pitch of certain notes slightly for effect, but why is that necessary? Natural tuning is based on how things vibrate, which is followed in most cultures and can be heard in the vocalizations of many animals, but of course a musician may wish to vary pitch for effect. Why would it become an obsessive concern of western civilization?

The problem was (and is) that following the natural overtone intervals did not create scales in which all intervals were equal. The differences were subtle, and only became a serious aesthetic problem when composers began creating complex harmonic structures and making entire key changes along with shifts in tonal center. Problems with harmonic relationships were immediately evident. Music sounded different, using the same intervals, depending on what note the composer started with, on a fixed-pitch instrument such as the piano. Once tuned, it didn't change until re-tuned by man or nature.

This problem became music's greatest riddle in the western world. Composers and theoreticians analyzed the situation and attempted to come up with satisfactory solutions. Many tuning systems were utilized with varying success. Unfortunately, one of the tragedies of music education is that the repertoire of earlier eras of music history is seldom performed or taught using the appropriate tunings.

Ultimately, by about the mid-nineteenth century the concept of equal temperament emerged as dominant in the western world. It was not the invention of any one individual; the Chinese had developed such a temperament in the distant past, but did not make use of it, preferring to tune up according to the natural environment. However, the usefulness of equal temperament made it the obvious temperament-of-choice for composers interested in harmonic progressions and key changes. All intervals are equidistant on the piano keyboard, and instruments are manufactured to be easiest to play with that tuning. Problem solved: it became possible to have consistent harmonic relationships in any key.

It may seem surprising that a book about the history of ideas concerning tuning and temperament could be so much fun to read. Nevertheless, Stuart Isacoff, a pianist, composer, lecturer, and writer on music whose work has been widely published, has managed to provide just such an account.

Isacoff begins by tracing theories about the physical principles of sound, beginning with the ancients, including Pythagorean concepts. He lucidly explains the development of ideas concerning the effects of music, tuning, and the relationship of music to mathematics including applications to architectural proportions. Finally, the gradual acceptance of the inevitability of equal temperament as the logical solution is described.

Isacoff sprinkles his sweeping history with the kind of stories and details that makes his

subject come alive, and writes with admirable clarity. He concisely summarizes the positions and theories of the traditionalists and the innovators. The controversy spanned the western world. Important thinkers like Newton, Kepler, and Descartes as well as musicians, craftsmen, church leaders, and heads of state entered the debate with passionate concern.

The big issue was: Is it wise to tamper with temperament? After all, the natural tuning relationships obey mathematical laws relevant to the structure of the universe! The cast of characters throughout history is broad and dazzling. Isacoff's comments on their roles and contributions are frequently witty and insightful.

Isacoff begins with a technical and philosophical discussion on the history and nature of the modern piano, as it has been designed and tuned since the mid-nineteenth century. He illustrates the principles involved with appropriate sketches throughout the book. The mechanics of the piano's development and the need for practical tuning systems are clearly explained. In the process, he summarizes the genesis and evolution of the concepts that have dominated musical thought on tuning in the west for well over a century.

Isacoff also provides a brief discussion of relevant contemporary experiments and theorizing. He correctly points out that the debate concerning the relevance and effects of different tunings continues among contemporary composers and theorists as well as early music specialists investigating original tunings. (Sadly, most often when early music is performed, taught, or recorded, equal temperament has been used, but this trend has happily been reversed.) Isacoff cites rather than rehashes such intriguing works as Ernest G. McClain's *The Myth of Invariance* (1976) which discusses mathematical implications of musical meanings in the texts of the world's religions.

Concluding with his impressions of a recital by New York composer Michael Harrison, Isacoff emphasizes Harrison had studied with Pandit Pran Nath and performed La Monte Young's six-hour marathon solo piano work, "The Well-Tuned Piano," which was composed using "just" intonation. (A five-hour version of this composition appears in a five-CD set on the Gramavision label.) Harrison then went on to compose "From Ancient Worlds" on his 24-notes-per-octave grand piano. Isacoff describes the effects of a recital using Harrison's "revelation tuning" on this instrument. The select audience (Isacoff notes the presence of Philip Glass and describes his reactions) was apparently impressed, leaving Isacoff with the personal meditation, "Perhaps Pythagoras was right after all."

Since the implications of (let's face it) "un-natural" tuning are not widely understood, despite relevant work in the neurophysiology of sound, it is likely the debate concerning temperament will continue indefinitely. Isacoff has supplied a well-grounded background for understanding the concepts involved.

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