Journal of New Music Research
1998, Vol. 27, No. 4, pp. 416–417

0929-8215/98/2704-416$12.00

Reply to Balsach

Richard Parncutt
Department of Musicology, University of Graz, Austria

Dear Editor,

I wish to point out three errors in the article by L. Balsach (1997), Application of virtual pitch theory in music analysis. *Journal of New Music Research, 26*, 244–265.

(1) In Parncutt (1988), I revised Terhardt's (1982) model of the root of a chord. Amongst other things, the revision improved the predictions of the model for the root(s) of the minor triad. Balsach correctly notes this on p. 246 of his paper, but goes on to imply that the reason for the improvement was my inclusion of the minor-third interval (m3) among the root-support intervals P1, P5, M3, m7, and M9. In fact, the problem of the minor triad's root was solved by weighting the root-support intervals relative to each other. The inclusion of the m3 interval had relatively little effect, since it was assigned a lower weight than all other root supports.

(2) In his footnote 5, Balsach comments on a passage in Parncutt (1988, p. 75) where I argued that the m3 could be a root-support interval (i.e., that a note might lend indirect support to a root candidate lying a minor third below it). He concludes (correctly) that my argument at that time was flawed. I realized this soon after publication of Parncutt (1988), and have explained why, and offered a corrected model, in four further publications: Parncutt (1993), footnote 7; Parncutt (1994), p. 160; Parncutt (1995), p. 75; and Parncutt (1997), p. 187.

(3) On p. 250, referring to all dyads and triads that are subsets of the chord C-E-G-Bb (and including the dyads E-G and E-Bb), Balsach writes that "if we listen to these convergent chords as pure tones... we will indeed see that in each case the pitch C is perfectly audible". In a footnote, he adds that "I have experimented myself and it seems to work quite well with

Correspondence: Richard Parncutt, Department of Musicology, University of Graz, Mozartgasse 3, 8010 Graz, Austria.
Accepted for publication: 11 November 1997.

pure tuning". From these indications it is clear that, in cases like E-G and E-Bb, Balsach is referring here to combination tones, not virtual pitches. According to the algorithm of Terhardt, Stoll, and Seewann (1982), the salience of a virtual pitch produced at (any) C by pure-tone dyads on E-G or E-Bb is tiny; and according to virtual pitch theory (Terhardt, 1972), the salience of such virtual pitches diminishes even further if such a sonority is listened to analytically, as Balsach seems to have done. In any case, it is questionable whether experiments involving pure tones tuned to pure intervals can be of much relevance to real music consisting of complex tones spanning intervals whose tuning deviates systematically from pure intonation.

To apply virtual pitch theory to music theory, which – as Balsach acknowledges – is a tricky business due to the overriding effects of music-historical processes (Eberlein, 1994), it is essential to distinguish clearly between combination tones and virtual pitches. Combination tones are generally inaudible in music; and when they are audible, they tend to sound both timbrally unpleasant and out of tune (since real music does not conform to pure intonation). For this reason, combination tones can hardly be regarded as a basis for harmony. Further details may be found in Terhardt (1974) and Parncutt (1989).

REFERENCES

Eberlein, R. (1994). *Die Entstehung der tonalen Klangsyntax*. Frankfurt am Main: Peter Lang.

Parncutt, R. (1988). Revision of Terhardt's psychoacoustical model of the root(s) of a musical chord. *Music Perception 6*, 65–94.

Parncutt, R. (1989). *Harmony: A psychoacoustical approach*. Berlin: Springer-Verlag.

Parncutt, R. (1993). Pitch properties of chords of octave-spaced tones. *Contemporary Music Review, 9*, 35–50.

Parncutt, R. (1994). Template-matching models of musical pitch and rhythm perception. *Journal of New Music Research, 23*, 145–168.

Parncutt, R. (1995). Perceptual modeling of the finality of harmonic cadences: The effect of root progression. *Systematische Musikwissenschaft, 3*, 71–85.

Parncutt, R. (1997). A model of the perceptual root(s) of a chord accounting for voicing and prevailing tonality. In M. Leman (Ed.), *Music, Gestalt, and Computing - Studies in Cognitive and Systematic Musicology* (pp. 181–199). Berlin: Springer.

Terhardt, E. (1972). Zur Tonhöhenwahrnehmung von Klängen. *Acustica, 26*, 173–199.

Terhardt, E. (1974). Pitch, consonance, and harmony. *Journal of the Acoustical Society of America, 55*, 1061–1069.

Terhardt, E. (1982). Die psychoakustischen Grundlagen der musikalischen Akkordgrundtöne und deren algorithmische Bestimmung. In C. Dahlhaus & M. Krause (Eds.), *Tiefenstruktur der Musik* (pp. 23–50). Berlin: Technical University of Berlin.

Terhardt, E., Stoll, G., & Seewann, M. (1982). Algorithm for extraction of pitch and pitch salience from complex tonal signals. *Journal of the Acoustical Society of America, 71*, 679–688.