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AUTHOR: Parncutt, Richard
TITLE: Response to Demske: Relating sets
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Richard Parncutt
Depts of Psychology and Music
Keele University
Keele, Staffordshire
ST5 5BG
Great Britain
r.parncutt@keele.ac.uk

[1] Thomas Demske's thorough treatment of the similarity of pc-sets demonstrates how problematical it can be to derive a general and yet musically relevant similarity function. The essay highlights inherent weaknesses in the pc-set paradigm for post-tonal analysis, and suggests that perceptually based approaches may be more appropriate than approaches based purely on pc-sets.

[2] First, there seems to be a tacit problem of definition. What exactly does it mean for two pc-sets to be similar? If we are to speak meaningfully about the similarity of two different pc-sets, then we must first of all satisfy ourselves that one and the same pc-set is highly similar to itself. Unfortunately, even this apparently trivial condition is not satisfied. To take a simple example: A melodic statement of {01369} sounds entirely different from the same tones heard as a sonority. And different voicings (inversions, spacings) of that sonority can sound more different from each other than similar voicings of different sets. It's familiar stuff: Octave equivalence ain't always valid.

[3] *Perceptual* similarity may be a more promising starting point for a theory of similar pitch structures in atonal music. Demske makes several references to perception in his essay. Perceptual similarity is easy to define: It is the average subjective judgment of global similarity by a representative group of listeners. Theorists may be included as one of the groups. Of course, the results depend on musical expertise and experience -- as does the perception of listeners in the concert hall.

[4] Unlike a pc-set-based theory of similarity, a perceptual theory must account for effects of voicing, onset asynchrony, spectral

envelope, temporal envelope, and so on. Consider first an isolated pair of steady-state complex sonorities of the same loudness and duration. Their global similarity breaks down into similarity of pitch and similarity of timbre. Similarity of pitch in turn breaks down into two parts, depending upon whether individual pitches are perceived to fall in the same category (chromatic scale degree) or different categories. These two parts may be called pitch commonality and pitch distance (respectively); tentative algorithms are given in my book *Harmony: A Psychoacoustical Approach*, Springer 1989, and in my recent article in PNM. Different listeners emphasize different aspects of pitch similarity in their responses, depending on their orientation and experience.

[5] Alternatively, we might look at the similarity of two melodic fragments. That depends on the similarity of their contours and of their underlying scales; for details see papers by Annabel Cohen, Jay Dowling, Marilyn Boltz, Mari Riess Jones, Lola Cuddy. This is quite a different affair from the similarity of sonorities, and needs to be treated independently.

[6] For an appropriate set of stimuli for a perceptual experiment on similarity, we need not look past the piano chords in Messiaen's *Quatuor pour le fin du temps* analyzed by Demske. A possible experimental paradigm might involve presenting the chords in pairs to listeners and asking them to rate their global similarity. Then, model the results as a linear combination of pitch commonality and pitch distance. Finally, wonder about the effect of context on similarity judgments. Analogous effects in tonal music have been studied in some detail (see Carol Krumhansl, *Cognitive Foundations of Musical Pitch*, OUP 1990).

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