

**A STUDY OF SELF-SIMILARITY  
AND MUSICAL CONSONANCE  
USING A RATIO CORRELATION METHOD**

By

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## ABSTRACT

Perceived consonance – the degree to which sound is judged to be pleasant – is related to the self-similarity of a signal, which in turn can be measured by finding the average ratio among pairs of amplitude maxima. This study aimed to (1) create a precise analytic method for evaluating the self-similarity of wave signals, and to (2) validate it by comparing the effect of time window length, frequency range, phase alignment, harmonic strength, relative amplitude of fundamentals, and reverberation to previous knowledge of musical consonance. In the process, it was shown that (3) most elements of consonance are inherent a priori to physiology, that (4) small integer frequency ratio pure tones are more self-similar than large integer ratios pure tones, and that (5) autocorrelation is not an adequate method for these endeavors.

**Keywords:** acoustics, musical; consonance, musical; self-similarity; wave signal; correlation, ratio; autocorrelation.