BRIDGES
Mathematical Connections
in Art, Music, and Science

Towards A Topology of Music

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Music, that most mathematical of all arts! How can two disciplines continue to enjoy such an uncomfortable intimacy after so many centuries? For the Ancients, after all, music was a branch of mathematics; and, for our exquisitely quantified society, one would assume the comprehensive topology of music to be near completion. Why are we, in fact, still unable to agree on so much?

We begin by exploring four relatively straightforward notions, areas where the mapping ought to be complete: intonation, rhythm, dynamics, and articulation. We explore the notation of these qualities, tracing the increasing precision with which they can be indicated. We then introduce the elements of fuzzy logic to demonstrate the deficiencies of excessively precise topologies. In addition, we chart some of the exceeding subjectivity that exists in systems commonly held to be objective.

When Gerard Manley Hopkins wrote "Glory be to God for dappled things...All things counter, original, spare, strange", he was talking about music, too. We aim to show how mathematics can enhance music, and how it can hurt it. Why is it that if you make a piece of music perfect, people might not like it?

Our closing draws examples from the Western art music repertoire, starting with the canons of J. S. Bach's *A Musical Offering* in honor of the upcoming Bach Year, and ending in our own time.