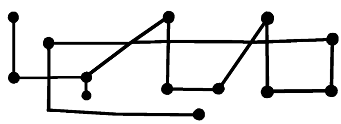
A Brief Guide to the Tiling Articles



John Rahn

The initial idea for an issue of *Perspectives of New Music* featuring work on musical tilings came to me from the composer Tom Johnson, an American who makes his home in Paris. *Perspectives of New Music* is uniquely appropriate for such a feature, because all this mathematical work on tilings in music derives from a very long, unprecedentedly difficult (for musicians) article by a young Romanian mathematician named Dan Tudor Vuza. This article, "Supplementary Sets and Regular Complementary Unending Canons," was published between 1991 and 1993 in four parts, serially, in *Perspectives of New Music* 29/2, 30/1 and 2, and 31/1. Twenty years later, this is the fruition.

This feature in *Perspectives of New Music* on musical tilings is dedicated to Dan Tudor Vuza.

I recruited as my co-editor the amiable and brilliant Emmanuel

Amiot, a professor of mathematics at Perpignan in France who has published much work in this area. We got off to a running start by incorporating a number of papers which Moreno Andreatta had been collecting at IRCAM in Paris with the aim of eventually publishing a book on musical tilings. Moreno generously allowed us to publish some of them here.

Musical tilings are one-dimensional tilings interpreted in time or pitch. The one-dimensional tilings discussed in this issue of *Perspectives of New Music* are interpreted in time as canons. A tiling covers a space in n dimensions using a limited number of shapes, to within a certain group of transformations, with no overlaps. The familiar two-dimensional tilings, such as the famous ones in the Alhambra, typically use only two or three shapes, to within transposition and inversion (shifting and flipping), and, if we are in two dimensions, rotation. The transformations used in musical canonic tilings first included only transposition, then added inversion, then added stretching by affine transformations (faster and slower copies of patterns). Transposition and inversion are of course the only transformations that preserve interval patterns intact in one dimension. Affine transformations in one dimension preserve the pattern but change the scale (size).

The first two articles here are by Tom Johnson and by Fabien Lévy, two composers with very different musical styles, who each recount how they have been using musical tilings in their compositions.

Then comes an article by Moreno Andreatta giving a historically oriented survey of these developments from the IRCAM point of view, and introducing some of the mathematics involved. This is accompanied by an article by Andreatta and Carlos Agon, another researcher at IRCAM, describing how they implemented the theory described in the previous article by Andreatta into software for computer-aided composition. If you are a composer reading all this, you've now read two examples of compositional use, followed by an introduction in depth to software that you can use to compose using this theory.

The final two articles are both research articles by professional mathematicians. Emmanuel Amiot writes a rather complete exposition of the mathematical theory, with plenty of musical examples. Jean-Paul Davalan's article is original research on perfect rhythmic tilings of degree 4, the solution to a question posed some time ago by Tom Johnson.

The tiling articles in this issue of *Perspectives of New Music* then are ordered approximately from the most musical to the least musical, and from the least to the most mathematical.