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Tom Johnson, Found Mathematical Objects

The title of Johnson's paper, and its thesis, imply that [some] art, and [some] music are less "creations" (as the term is normally used) so much as "found objects" – already existing and merely needing to be uncovered, or DIScovered, in its literal sense. This attitude is distinctly Platonic: that things have an Ideal reality outside of their concrete instantiations.

One might readily accept the Platonic notion when applied to scientific principles that undergird the physical world, and which are all around us, all the time. The law of gravitation, for instance, seems a secret that the universe had been hiding in a locked cupboard until Newton pried it open. This was indeed a discovery. But does the same kind of thinking apply to art? It's easier to say yes if "art" is formulated the way Johnson describes his musical automata: "I look … for music that comes from outside myself, not music that arrives subjectively from personal ideas and feelings." It's clear from this definition that Johnson's idea of music is vastly different from music as it is traditionally understood.

The heart of the article are forays into various of Johnson's "discoveries", which occur by finding correspondences between mathematical formalisms and musical structures. This is a fascinating idea and one that is basic to science, one might even say basic to human intelligence: mapping structure from one domain to another. This need not be so esoteric a subject as it might at first seem; we use transformative rules for syntax trees, which are used all the time in natural language processing applications like machine translation, and we use rules to transform L-Grammars to model the structure of plants. The idea of systematic transformation is a general one, and powerful in its generality.

Johnson finds his correspondences between math and music by assigning numbers to notes, or to sequences of notes, or to musical structures in time. The musical particulars of this process are beyond me, but it brings to mind a scene from "Mr. Holland's Opus" where a painfully insecure red-headed girl was having trouble playing a piece she had been assigned. She was frustrated by her inability to play it right. Her music teacher soothed her, and asked her some questions, including "What do you like most about yourself?" "My hair," the girl replied. "Play the color of your hair," the teacher said. She did, and finally played the piece to her satisfaction.

This might seem a gratuitous bit of drama, but it gets at the heart of Johnson's process. How we do we find isomorphisms between disparate structures? What did it mean to the girl to play the color of her hair? Speaking more broadly, what does it mean for a depressed person to say he's feeling "down" or a vacationer to talk about going "up to the cabin" or to recognize that a car being started and a baby waking up are, in some ways, the same event?

There are no algorithmic answers to these questions, at least, none that would satisfy a computer scientist tasked to implement such an algorithm. There is, and will continue to

be, a role for the interpreter, the person who creates (or "discovers") the rules to map from one form to the other. Coming back to the article, this is the place where the muse lives. The world is full of structure; mathematics can generate an infinity of them. Randomly translated into music, 99% of them would be noise. A very purposeful and precise selection is necessary before the isomorphism can produce anything sensible. Johnson seems to view this fact with dismay:

"It was even necessary to make some subjective decisions […] I am happier when the mathematics takes care of all that."

The truth of the matter is that mathematics doesn't even begin to "take care of all that." The process, from beginning to end, is human intensive. Even after its parameters are set, and its domain restricted, Johnson himself gives expression to the mapping. The "discoveries" are not found objects, or, if they are, they require a finder who puts himself into the finding. Guided, perhaps, by the numbers themselves, and their structure, and convention, but never exclusively so.

Johnson's entitled to his opinion, of course, but I myself am happier when the mathematics doesn't even begin to take care of all that.