Music composition and the technologies of working together: towards an assessment of technology's impact on the structure and incidence of collaborative music composition

ABSTRACT: In this article the authors consider cases of collaboration in music composition together with the ways that technology intersects composers' work. Considerations of intradisciplinarity versus transdisciplinarity in music composition motivate reflections on the differing roles of content-creation technologies and communications technologies in music composition.

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How are collaborative efforts at music composition impacted by the increasing availability of technology? And how is the relationship between composerly collaboration and technology likely to develop in the future?

Attempts at an answer depend on which technologies we mean when we ask the question and, crucially, on what we imagine composerly collaboration to be. In the paragraphs that follow we consider the status of collaborative work in music composition. Then we turn our attention to the ways that the increasing availability of technology stands to impact this work. Our reflections will taxonomize collaborative work by disciplinary orientation and classify technologies according to design. Supplied with this pair of distinctions, we sketch a vision of collaboration in music composition that celebrates the social aspects of collaborative work above the development of new technologies.

The three of us work as both composers and technologists every day. We write our music in ways that are informed by practices drawn from software engineering. We bring the perspectives of our work as composers to the way we develop the technologies we use in our own music. As the primary developers of Abjad — an open-source, object-oriented API for the formalized control of music notation that extends the widely used Python programming language and that has now been downloaded thousands of times by composers all around the world — we have a position overlapping both the arts and engineering from which to reflect on the ways that computing

technologies help (and hinder) our work as artists. Our concerns range from the technical (how can the interface to a class be optimized to express the ways that rhythmic augmentation dots work in conjunction with differently shaped note-heads?) to the properly social (what are the ways that consumer computing technologies exert their pull on our work as artists and what strategies do we have in place to subvert these tendencies of new technology?). It is from this perspective that we pause to reflect on the nature of collaboration in music composition. When is music composition collaborative? Do we discern different types of composerly collaboration? And what does collaborative work in music composition look like?

Cases of composerly collaboration almost always bring the composer together with practitioners of other disciplines. Opera provides an example. Opera joins composer, conductor, librettist, singers and players with managers, marketers and a whole chain of financial functionaries necessary to underwrite the production as it is readied for stage. Dancers and stage and lighting directors extend the project further; indeed, the number of roles allowed by operatic production can probably be multiplied indefinitely. Opera has always been collaborative and the composer has always occupied a central position in opera's production. This joining together of agents from such an array of different practices points to the inherently transdisciplinary nature of opera and to the composer's role in its production. But note that what is almost never the case is the production of an opera authored by more than one composer. There are cases of composers completing each other's scores, especially posthumously. But the composer's role in the overwhelming majority of cases of operatic production, both at the present moment and in the past, is essentially a unary role embedded in some larger transdisciplinary collaboration.

Is there something inherent in the nature of opera that embeds the composer in a network of collaborators taken from other disciplines? Film scoring recapitulates what we observe in opera. The co-production of songs further convinces us of the transdisciplinary nature of compositional collaboration: we think of the composer at one desk and the lyricist at the next, toiling in moonlighting stints at a hotel, knocking off song after song. In the co-production of songs we find the composer embedded in an intimate social network of only two collaborators. But still only one composer. And still collaboration across disciplinary boundaries rather than within them.

Is there room to imagine collaboration within composition rather than collaboration across the boundaries of composition? Two composers sitting at the same desk co-creating the details of the same score at more or less the same time: this is almost unattested. Such composer-to-composer collaboration would constitute a type of intradisciplinary collaboration in music composition. But intradisciplinary composition is not at all what we find when we reflect on composerly collaboration. What we find instead are overwhelmingly cases of transdisciplinarity in music composition.

We're not sure why this is the case. The historical and continued persistence of transciplinarity in preference to intradisciplinarity in compositional collaboration is at least something of a mystery. The baggage left over from Romanticism surely continues to prop up an outdated ideal of the lone composer-genius. But the shadow of Romanticism, no matter how it intersects the impenetrability of contemporary commodification, can't explain the norm of the lone composer in, say, the Renaissance or the Baroque. There's the very real possibility that composers have avoided composer-to-composer collaboration simply for reasons of not wanting to collaborate in such a way. Paintings and novels exhibit the same pattern of lone authorship we observe in music composition. So perhaps the preference for lone authorship is a creative preference and not merely the baggage of history. We are forced to admit that this is, probably, at least partially the case.

But in the present moment we feel that something has changed. Decades after the death of the author and the beginnings of the first attempts to take seriously emergent types of political pluralism, we detect a manifest desire on the part of many creators in all media to interrogate the older patterns of production and try out newer ones in their place. In the domain of musical production we observe that producer-to-producer collaboration in the creation of electronica is not uncommon. Sending samples back and forth across the Internet has benefited DJs and producers enormously. Not only samples but, indeed, working sessions for entire tracks now cross the globe in seconds for changes at the hands of different digital producers working together. One of the collateral benefits of the rise of fixed media would appear to be cases of precisely this sort of intradisciplinarity for which we search mostly in vain in composition

proper. The persistence of the terms "composer" and "producer" as distinct from one another is telling: the culture continues to designate as composers those who author musical score destined for live performance while reserving the term producer for those working in the fixed-media creation of audio. Celebrated cases of producer-to-producer intradisciplinarity are common enough while corresponding cases of composer-to-composer intradisciplinarity are still very much exceptions to the persistence of a cultural norm.

Before leaving our reflections on the types of composerly collaboration and their distribution we would like to suggest one further — and largely unacknowledged — reason that composer-to-composer collaboration may occur so infrequently. The reason has to do with the nature of music notation in itself. Our experience implementing Abjad as a type of object-oriented interface to the structure of musical score has convinced us of the complexity of modeling music notation as a coherent system. The fact that children can read and write music notation competently attests to the systematic nature of at least the primary features of music notation. But generalizing those systematic qualities into a coherent formal model is a much more complex task. What type of model best exhibits the understanding of music horizontally and vertically at the same time? What type of context must be modeled to spell accidentals correctly according to composers' manifestly different uses of pitch? Are measures to be modeled as containers of content or demarcators of musical time? What are the semantics of beams, ties and the other details of rhythmic notation in nonmetric musics? These are nontrivial considerations that have bedeviled the authors of the various music notation and composition systems now available. And so we offer the possibility that a largely unacknowledged attenuator of intradisciplinary collaboration in music composition may be the difficulty of producing a computational model of music notation in itself. DJs and producers may find it as convenient as it is to send audio files over the Internet — and then iteratively to modify and resend such files — precisely because our current cultural understanding of digital audio is remarkably more straightforward than any corresponding model of music notation.

We now turn our attention to the intersection of technology and composerly collaboration. We will find it helpful to distinguish between technologies composers use to create score from the technologies composers use primarily to communicate with collaborators. Artists can and do

creatively subject technologies of all types to purposes for which they were never anticipated, a fact which renders moot any hard-and-fast taxonomy of technologies applied to the production of art. But, for practical reasons, it can still be helpful to separate content-creation technologies from communications technologies when thinking through the technologies available to composers.

Which are the content-creation technologies of music composition? Probably music notation and engraving packages. Conceivably also computer-assisted composition software. Any number of online resources for orchestration, instrumentation or whatever else might also be of service in a composer's work on a given project. The collection of content-creation technologies applicable to composition will never be a closed set. But content-creation technologies conceived of in this way can be set in contradistinction to the communications technologies composers use to work and meet with collaborators: voice and video calling, email, any number of messaging services and social media of all sorts.

A number of distinctions suggest themselves between these two types of technology. Perhaps the most important of these being that content-creation technologies are generally designed with a model of some sort of real-world artifact in mind while communications technologies specify the format of information without any model as to the meaning of content. Content-creation software for use in publishing almost certainly implements a model of a book, magazine or other artifact, as well as a formal definition of a page and the layout of information on it, the ways that pages relate and the rules governing the attributes and behaviors of text and graphics; such an application must also define what happens when users change or update any of the things included in the model. Content-creation software for use in composition must function analogously. At minimum we would expect a model of musical score that defines the layout and contents of a page, the structure of a musical voice, the way that voices may start and stop, the differences between the written and sounding pitches of transposing instruments, and so on. All of which stands in contrast to the design of the communications software the composer then uses to send a digital copy of a score excerpt to a conductor or choreographer. Whether over email or messaging or whatever else, the communications technology used to transmit information during collaboration must specify the structure of information but will neither make nor be able to make

any assumptions about the meaning of the information sent between collaborators.

Supplied with this distinction between technologies designed for content-creation and those for communication, we are in a position to observe that whatever feelings of technological globalization we detect in the present moment are due almost exclusively to the upswell of communications technologies following from the advent of the consumer Internet. Surely it is not the development of new scoring packages — nor for that matter the development of new publishing, analysis or design packages in the other disciplines — that provides the feelings of globalization attaching to the present moment. Content-creation packages are defined in terms of the artifacts they help create. But communications technologies have become such a pervasive part of consumer experience in at least the rich economies precisely because they are not constrained in any such way. The affect of technological globalization results from communication and not from authorship.

The implications for collaborative composition are clear. If our knowledge of notated compositional practice in the first fifteen years of the present century gives us any useful information, neither the newest of content-creation technologies nor the newest communications technologies have made composer-to-composer collaboration any more likely. Composers still find ourselves embedded in networks of collaboration that are not distinguished in any qualitatively different way than those of the past. Our collaborators are still conductors, performers, dancers, choreographers and writers, even if we now add to the list installation artists, computer programmers, research scientists and political activists. We still find ourselves the lone node charged with composing music in the graph of our social network of collaborators. We still collaborate across disciplines rather than within them: collaboration between composers is still frustratingly difficult and it remains a major challenge of software systems to enable composers to collaborate on score as an artifact composers have been trained to create autonomously. But what is markedly different in the present moment is the rate at which we can communicate the details of work to our collaborators. Voice and video calling, email and messaging accelerate communication internal to collaborations in music composition the same way they accelerate communication everywhere else. We are, in effect, primarily the beneficiaries of innovations in technologies that make no effort whatever to model our work as

composers: our communication is faster than ever before but not because computational technologies model our work in any substantially better way. We are currently positioned at a moment where developments in the content-creation technologies we use to produce the artifacts specific to our practice advance only very slowly while the technologies we use to share the results of our work improve extremely rapidly.

The different ways that we each compose our music make heavy use of a collection of programming languages and development environments which we manage with tools for version control, unit and regression testing and all the other accoutrements of open-source development. But even for this we remain, in part, technoskeptics. In our work as developers of Abjad we are deeply committed to making available a model of musical score amenable to computation. But we do this not because of any interest in technology itself. We continue our development of Abjad as a way of helping streamline the sometimes incredibly detailed work of writing music. When we realize late in the compositional process that hundreds of events in a complex musical texture must change in some systematic way as a result of our own deeper listening, we understand this as one of the proper places for the assistance of computation in music composition. We believe that the problems we solve computationally should be freely available to composers everywhere to help facilitate artistic production around the world. And we chose to model our music with code because code helps clarify complex musical relationships in our music. This is not a posture that derives from an interest in technology but an understanding that comes from the joys and difficulties of composing music.