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 -- the first based on types of collaborative work and the second based on the likely applications of technology -- we sketch a vision of collaboration in music composition that celebrates the social aspects of collaborative work over and above the development of new technologies, whether in the arts or elsewhere.

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. And we bring the perspectives of our work as composers to the way we develop the technologies we use in our own music and that we make available to other composers. 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 both 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 noteheads?) to the properly social (what are the ways that consumer computing technologies exert their alien 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 generally. When is music composition collaborative? Are we able to 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 not with other composers but with practitioners of allied disciplines. Opera is certainly one of the clearest -- and most historically reified -- examples. 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. And, 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 the production. And this joining together of agents from such an array of different practices points to the inherently transdisciplinary nature of opera and 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, both operatic and otherwise, 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 transciplinary collaboration.

Is there something inherent in the nature of opera that embeds the composer alone in the middle of a social network of collaborators taken from other disciplines? The role of the composer as film scorer recapitulates everything we observe in opera. And the coproduction of songs further convinces us of the transdisplinary nature of compositional collaboration when 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. Here we find the composer embedded in an intimate social network of only two collaborators. But only one composer. And only in collaboration across disciplines 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 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 (necessarily 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 embedded transcriplinarily in the production of the stage works of, 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. The production of paintings and novels tends to exhibit the same pattern of lone authorship we observe in music composition. And so perhaps the preference for lone authorship is a creative preference that (whether the result of varied types of elitism or not) is not merely the baggage of Romanticism but in fact a a well-attested pattern in our creative history. We are probably forced to admit that this is at least partially the case.

But in the present moment we feel that something substantial has changed. Decades after the (discourse of 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 very 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 at all uncommon. Sending samples back and forth across the Internet has benefitted DJs and producers enormously. And indeed one of the collateral benefits of the rise of fixed media generally would appear to be cases of precisely this sort of intradiscipliarity for which we search mostly in vain in composition proper. And 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 unacknolwedged -- 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 unacknoweldged 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 what digital audio *is* is remarkably simpler than any corresponding model of music notation.