<u>RESEARCH AGENDA</u>

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In my research I design musical software instruments, frequently using procedural generation and visualization of musical content. I then integrate those instruments into new compositions, often alongside acoustic instruments. I also compose purely acoustic orchestral, choral and chamber music. In both compositional realms, I thematically draw upon the relationships of humankind to both nature and technology, creating text collages for lyrical, structural or simply inspirational use. I am particularly attracted to philosophy and literature with an ambivalent view of technological progress. My work synthesizes an enthusiasm for technical invention with a critical ear towards abstraction in order to balance the rational and irrational forces in my art.

My dissertation, *Ouroboros and Apocryphal Chrysopoeia: Aesthetics and Techniques*, consisted of three creative components: a generative audio-visual software instrument (*Apocryphal Chrysopoeia*), an electroacoustic piece integrating that instrument with ensemble (*Ouroboros*), and a text collage used to thematically structure the electroacoustic piece in time. These components are accompanied by a paper describing the methods used in their creation.

Apocryphal Chrysopoeia, meaning "legendary but dubious alchemical transmutation into gold," was implemented in the graphical programming language MAX/MSP/Jitter. Performing with the instrument involves interacting with a collection of sound- and light-emitting objects in a virtual three-dimensional space. This space is projected for both the performer and audience on a large screen, and a surround sound system is used to sonically immerse the audience. The collection of objects, or cells, provides a structured resource of potential sound and light that is activated by a cellular automaton. This automaton gives the instrument a rudimentary, moment-to-moment musical intelligence. The computer music performer can then manipulate both the long-term activity of the automaton, and the spatial geometry of the cells. In tandem, these two areas of control allow the performer to create a dramatic multimodal experience for the audience.

The design of *Apocryphal Chryspoeia* draws upon research in spatial models of pitch perception. Pitch space theories correlate the experience of relatedness between pitches with spatial proximity. This sense of relatedness is context dependent, learned through exposure to a particular musical idiom. The fundamental pitch space used in my instrument is an altered form of cognitive scientist Roger Shepard's "double-helix." I altered the double-helix to more efficiently map spatial proximity to consonance. However, my work focuses on exploring new harmonic possibilities, emergent from spatially organizing virtual sound sources. The initial emphasis on consonance was simply used as a principled point of departure for finding more complex harmonies.

My dissertation demonstrates ways in which pitch space models can be used to create novel multimedia experiences, creatively departing from their normal use in describing the psychological experience of harmonic relationships in pre-existing music. It furthermore shows how cellular automata can be used as an alternative to other procedures as an aid for computer music improvisation. Through my instrument design, these two systems founded in abstraction are yoked together to serve the intuition of a musician. I have presented my audio-visual instruments at several events, including the Society of Electro-Acoustic Music in the U.S. and the New Interfaces for Musical Expression conferences, as well as the Harvard Group for New Music colloquium. I am currently extracting a chapter from my dissertation for submission to the *Leonardo Music Journal,* and my previous research with spatial audio has been published, along with an audio CD, in *Perspectives of New Music*, vol. 51, no. 1 (2013): 256-261.

Software instrument design also forms a core aspect of my collaborations with other musicians, most notably with U.C. San Diego professor Roger Reynolds. Since 2011 I've worked with Reynolds to design and perform computer music systems in the context of his chamber music. My contributions to Reynolds' algorithms focused on optimizing their contrapuntal character through the spatialization of discrete layers of sound. I've performed Reynolds' works in concert, as a digitally-enhanced chamber musician, with notable interpreters of new music, including Irvine Arditti, Ensemble Signal, and the Calithumpian Consort. The JACK Quartet, video artist Ross Karre and I will perform the complete version of Reynolds' *FLiGHT* (2012-16) at the Armory in New York in October 2016. Furthermore, my research with Reynolds is published by Edition Peters in the technical manual *Four Real-Time Algorithms* (2015).

Future projects include a collaboration with cellist Tyler Borden and computer musician James Bean. In 2015, we created a new system for performing Brian Ferneyhough's seminal electroacoustic work, *Time and Motion Study No. 2* (1973-76), using networked tablet controllers and digital tape-compression modeling. In 2016 we will record a video release of our new interpretation, along with companion pieces by Bean and I. My companion piece, for cello and live audio-visual media, will playfully interrogate the cultural implications of the cello through a counterpoint between the live instrument and a collage of appropriated concert footage. This audio-visual collage will be generated live, controlled by computer analysis of Borden's live cello sound. This new work will lay the foundations for future projects incorporating a greater degree of referentiality, contrasting with my more abstract works using cellular automata and pitch spaces. Borden will premiere the new work in April 2016 at U.C. San Diego, and will we also perform at the Darmstadt Summer Course for New Music in 2016.

As a whole, my computer music research and compositions harness algorithmic procedures while maintaining a vital place for artistic intuition. This allows me to more effectively navigate a space between natural and artificial sounds, in a search for uncanny or sublime hybrids. My audiences experience this navigation physically, through sheer visceral stimulation, and emotionally, through the resonances I preserve in my work with familiar musical idioms.