

Wearable Speakers

Since the advent of electroacoustic chamber music- chamber music with electronics- composers and performers alike have struggled to find a balance between the acoustic and the electronic. Too often, this problem is ignored- the volume of the electronics remains at such a low level as to barely be heard, or the electronic sound emanates from speakers a hundred feet above the ensemble. To create a truly integrated electroacoustic composition, attention must be paid to the composite. The electronic part is as much a member of the ensemble as the violinist, and should be treated as such.

A moment that stands out in my experience as audience member with electroacoustic chamber music is a concert I saw at Weill recital hall. A well-known chamber group was performing a well-known composition with electronics by a well-known composer. They had at their disposal extremely high-end microphones and speakers, plenty of rehearsal time, etc.- essentially, all the elements needed for a high-level performance. Yet there was absolutely no connection between the musicians and the electronics. The electronic sound emitted from speakers hung fifty feet above the ensemble, and the musicians performed acoustically, creating an absolute disjoint. One had the impression that two separate compositions were being performed simultaneously.

Since that day, I've spent a great deal of time working on overcoming the inherent disjoint between acoustic and electronic sound in electroacoustic music. When performing with my ensemble, I try to give each member his/her own speaker, although it is not always possible to have five individual mixes. This has led me to the concept of wearable speakers.

This project is part of my thesis- I am constructing a customized sound system for my chamber ensemble, which will consist of microphone arrays for each instrument (flute, violin, cello, piano, percussion) as well as processing capabilities (software) and wearable speakers.

My proposed solution is to construct speakers using carbon nanotube thin film- this technology was recently developed at the Nanotechnology Research Center and the Physics Dept at Beijing Normal University, both in Beijing. The speakers are carbon nanotubes drawn out into single- or multi-level films capable of conducting electricity and, through a thermoacoustic phenomena, reproducing sound. It is an extremely fine and flexible substance capable of producing high-quality sound with no moving parts. The speakers will be sown into dresses and wide-legged pants, allowing the illusion that the performer is acoustically producing all her/his sounds, with no spatial confusion.

If I'm not able to use this technology, I plan to design dresses with stiff areas made of styrofoam or another lightweight resonator, upon which I will implant piezo speakers, very small speakers that use anything as a resonating board. The sound quality is not as high as the carbon nanotube films.