DREAMING A NEW MUSIC

The inventor of the Hypercello says that it's time for ensemble musicians to explore digital technologies—which, he argues, allow composers to imagine new forms, performers to expand their expressiveness, and presenters to revolutionize relationships with audiences.

BY TOD MACHOVER

Digital technology has been slow to enter the classical music mainstream, perhaps more strikingly so in chamber music than in the symphonic or operatic worlds. This is not surprising, since the intimacy of chamber music rehearsal and performance, the acoustic beauty and subtlety of traditional instruments and the treasures of the classic repertoire have been hard to match by the world of silicon, processors, cables, and loudspeakers. And integrating technology into chamber music often seems to unduly complicate an already difficult and demanding endeavor.

The time is ripe for this to change. Digital technologies are now as familiar to most of us—and certainly to kids (perhaps unfortunately)—as are the mechanical technologies of catgut and horsehair, hammers and reeds. Sophisticated software for almost any conceivable purpose is readily available, relatively inexpensive, and getting easier and easier to use. The Internet is the best medium yet invented for bringing people together around common interests, of which love of chamber music repertoire and performance is as powerful as any. And although much music technology is still designed for pop and commercial music (where the money is), it is easily adaptable to classical contexts and more and more readily available than ever from producers and performing venues.

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The Hyperbow allows players of the acoustic cello to delicately tweak the instrument's timbres without learning any new bowing techniques.

So technology may be easier than ever to integrate into chamber music contexts, but why even consider it in the first place? Because paradoxically, although we might first think of rigidity and mechanization when we discuss technology, its real power comes from its very openness and flexibility. Technology gives us the ability to dream, to imagine new forms of music and performance, and to invent ideal relationships between composer and performer, performer and listener, composer and listener. In careful and creative hands, technology can expand the expressive power of virtuosi, build gorgeous hybrids of natural and artificial sounds, and allow amateurs to again fully participate, helping to re-establish a much healthier "creative ecology" than now exists.

And there is even good news for the technophobe: the era of "techno-fantasy"—the first generation of *Wired* magazine, say, when cool new technology seemed a fascinating end in itself—is over! We are entering a much saner period when technology is no longer the end but the means, when our machines can disappear into the environment, and when our new tools should only be judged by what value, quality, and power they add to human experience.

The culture of chamber music—which emphasizes intimate and refined communication—is particularly well suited to help define the human-centered technology of the future. In fact, it was chamber music playing that drew me to music technology in the first place. I grew up playing the cello, but it was in my teens—when I tried to balance the cello with guitars, percussion, and voices—that I started improvising ways to amplify and transform my acoustic cello. At first, I wrapped headphones around the belly of the instrument and held it on my knees like a guitar, then ran its sound through looped tape recorders and industrial filters, and finally built a little setup at home to try to match the Beatles' studio prowess (they were then working on things like *The White Album*). By the time I made it to Juilliard to study with Elliott Carter, I was imagining strange new sounds that led me to learn FORTRAN programming to conjure them up on early digital computers, and when I went to work at Pierre Boulez's IRCAM in Paris, I found my calling in designing new digital instruments—and writing music for them—that could respond naturally and immediately to performance gesture and nuance.

It is through the creation of such kinds of new instruments that technology can have its first influence in chamber music. Here the word "instrument" is of primary importance. As psychologist Sherry Turkle makes clear in her forthcoming book *Evocative Objects*, we humans have a very special relationship to our tools of expression, which we master and manipulate to communicate our deepest thoughts and feelings. No human tools are more beautifully designed for their purpose than traditional musical instruments, which no collection of buttons, wires, and sensors can replace. That's why it is important that technology be used to augment—not replace—existing instruments. That's the main reason we started developing what we now call "Hyperinstruments" at the MIT Media Lab in 1986. We wanted to measure the performance nuance such as bow pressure, speed, and position, or direction and intensity of breath, so that the virtuoso can evoke and control a greater—even unlimited—range of sounds and textures by simply interpreting the music in the most natural way. To accomplish this, we have built measuring devices and special instruments, such as the Hypercello that we designed for Yo-Yo Ma. In *Begin Again Again…*, my Hypercello piece that Yo-Yo premiered and Matt Haimovitz recorded, sonic sensors built into the cello, a wrist sensor to measure bowing technique, fingerboard sensors, and a specially designed bow send a flow of musical data to a host computer (which these days can be as compact as a Mac Mini), allowing each accent or nuance to morph the cello into a human-sounding voice, an orchestra, or something beyond. The interesting thing is that a known, familiar interface has suddenly become the ticket to a world that can extend way beyond the physical confines of a cello, giving the player access to a much wider range of sonorities and textures—both more mammoth and more delicate—than previously available. Thinking back to my high school days of experimenting with complex multitrack mixing, it occurs to me that playing the Hypercello feels like controlling the most complex digital recording studio from a single, human-sized, familiar instrument—an extension of one's body—all at once. As Joshua Bell said to Alan Alda in a 2002 public television interview, the range of the Hyperviolin "is only limited by our imaginations."

Since a fully equipped Hypercello is one of a kind, not readily available at the corner music store (alas!), we have recently experimented with enhancing traditional instruments with a single "hyper"-accessory, such as the Hyperbow, designed by Diana Young, my colleague at the lab. In collaboration with the Royal Academy of Music in London, a group of young composers and string players have been creating new works for acoustic strings played with Hyperbow. In Patrick Nunn's *Gaia Sketches,* for example, the timbre of the acoustic cello is delicately and beautifully tweaked by the continual modification of seven different measurements from the Hyperbow, all without the player having to learn any new bowing techniques.

The results of all these compositional efforts have been musically compelling enough, and easy enough to learn and play, that there is optimism about seeing this technique enter the musical mainstream, and hopes that some of this technology will be commercially produced. In 2002, my colleagues Tristan Jehan and Mike Fabio and I used an even simpler technique (from the performance—not necessarily the inventor's—point of view!) for my orchestra piece *Sparkler*. Placing a small number of microphones within the orchestra, we captured the acoustic sound of all the instruments, analyzed it with a laptop, and used the acoustic performance to shape and manipulate a complex electronic "aura" that was added live to the orchestral sound. The result is like a wasp's nest of intricate textures swarming around and through the

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orchestral sound, what Anthony Tommasini of *The New York Times* called "a kind of young person's guide to the hyperkinetic orchestra."

With commercially available interactive software, such as MAX/MSP and software synthesizers such as Reason or Kontakt, the acoustic instrument-plus-laptop combination is getting easier and easier to work with. And the technique is now being taught at music schools and conservatories worldwide. Still, it is not so easy to integrate these solo hyperinstruments into meaningful chamber music performance, because acoustic perspective is often different on stage from how amplified music sounds to the audience, and augmented instruments can often feel like "more" than a single part, threatening to obscure the counterpoint of independent voices. The balance problem is actually not simple to solve, and often requires a chamber group to add a sound engineer to the ensemble, with the correct balance only heard from a privileged mix position off-stage and in the house.

Surely this is not the usual approach for chamber music, where players must listen carefully to each other and adjust according to the slightest nuance. Therefore, the composite sound of each instrument must either emanate from the instrument itself, or from specially designed loudspeakers such as Bose L1's, which sound soft and delicate up close, keep independent the sonic image of each instrument, and resonate amply to fill a hall. I attempted to create this new kind of balance this year with *Another Life,* a piece for nine instruments and electronics. The un-amplified acoustic instruments are complemented by delicate electronics played and transformed by a keyboard-with-laptop. The electronics are heard through onstage speakers, creating shifting textures that "fuse" the various instrumental lines, all played at a modest volume so that the performers onstage hear the same blend that the audience in the hall hears.

Of course, technology can also offer radically new definitions of ensemble playing and the relationship among instruments. In my *Bug-Mudra,* the playing of a guitarist and percussionist is modified by the gestures of a conductor wearing a specially designed dataglove; and in *Towards the Center,* MIDI data from keyboard and percussion are combined to form a "double instrument," in which the keyboard contributes intricate pitch details, while percussion adds rapid rhythm and articulation. One of my MIT students, Gil Weinberg, has even written a Ph.D. dissertation on this exciting new field of "music interdependency," exploring the innovative kinds of music that can be made when the performance of each instrument is directly connected one to the other to produce a common result.

Digital technology can be used to enhance performances themselves. Adding an image component is relatively easy to do (most theaters have projectors, screens, and laptop attachments) and can help guide and focus listening. For a recent collaboration with the Ying Quartet at New York's Symphony Space, called "…but not simpler…," we projected brief program notes behind the quartet, interspersed with colors and textures, to give just enough information and ambience to keep the audience informed and to set the mood. These projections worked particularly well for this concert, which wove together seventy minutes of music that I assembled around a new piece I wrote for the Ying, which goes from Bach to Beethoven, Cage to Carter, Byrd to the Beatles, all played nonstop and interconnected with specially composed electronic interludes. The visuals helped tie the program together, allowing the audience to remain immersed in the music without needing to read printed program notes. Another approach to "active information" during concerts is the Concert Companion, a specially designed handheld digital device—rented at concerts—which provides program notes and extra information during classical music concerts. More and more venues will be equipped with such devices, and it is not inconceivable that some will make such augmented information available on one's own mobile phone or PDA.

In fact, the providing of extra information—online, via mobile devices, on kiosks at venues, etc.—about repertoire, interpretation, and the intricacies of fine music-making is one of the most potentially productive paths that any chamber music group or presenter can take. I was reminded recently of the importance of sharing and explaining such background information through discussions with specialists not from the music field, but from clothing design. On a recent visit to Milan to launch a research

project to integrate technology into the fashion industry, I was surprised to discover that most designers—from such well-known firms as Gucci, Armani, and C.P. Company—were obsessed with the fact that even their most loyal customers did not begin to appreciate or understand the complex use of materials, the delicate layering of textures, or the fantastically intricate production process that lay behind even the most seemingly simple clothing. They were extremely proud of these details, and felt—rightly so—that people would more fully appreciate their products if they were aware of how they were made. If this applies to something as tangible and physical as clothing, how much more must it apply to the ephemeral, emotional world of chamber music performance. And technology is the perfect way of providing engaging, immersive, and constantly up-to-date background and behind-the-scenes information.

Going a step further, technology can also help to engage the public *actively* in musical experiences, increasing not just understanding but also *emotional investment* in all aspects of chamber music. Just as technology can measure and interpret the most subtle virtuosic nuance, it can also provide "training wheels" for amateurs, meeting each person at the appropriate level of experience, skill or background. We first tested this idea ten years ago in projects such as the "Brain Opera," which allowed—and still allows, in the permanent installation at Vienna's Haus der Musik—the general public to experiment with composition and performance using interfaces adapted to anyone's natural abilities. Such projects have had an influence on the entertainment world, as evidenced by such PlayStation2 videogame hits such as "Guitar Hero" (designed by two former students of mine who co-founded Harmonix, a Cambridge-based interactive music company), which allows anyone to emulate a Jimi Hendrix-style guitar virtuoso. Drawing upon their own musical, mental, and physical skills, players enter into the world of expert performance, gaining appreciation and experiential knowledge on the way. Our Hyperscore software (www.hyperscore.com) was invented to let amateurs understand the process of composing original music, also from the inside out. Using only lines and colors, anyone can create her own sophisticated compositions without any technical or theoretical music training; this music can be heard immediately on the computer, and then transcribed to traditional notation for acoustic musicians to perform. With the Ying Quartet, we initiated projects where we invited the general public to use Hyperscore to compose pieces for string quartet, the best of which were included by the Ying in public concerts. Judging from the full houses, enormous public participation, and media buzz, we found this to be a powerful tool for audience-building, and for increasing audience appreciation of chamber music repertoire and performance. An added component of long-distance mentoring (via Internet 2) from the Ying for people composing their pieces allowed amateurs to truly increase their knowledge and skill while also developing a meaningful relationship with chamber music experts.

> "Many technologies may help re-establish the 'creative ecology' that has always made chamber music such a cherished activity for experts and amateurs alike."

I am currently working on a new project for Portland's Third Angle Ensemble, for which I am composing the basic version of a new Hyperscore piece, then posting it on the group's website and inviting the public to create variations and additions, using Hyperscore elements that I provide. Third Angle will periodically choose particularly interesting versions of this ever-changing piece to perform live at their concerts. And in an even more extreme extension of public involvement, I am creating a new work for cellist Matt Haimovitz and DJ Olive that will invite audiences to help create and choose musical elements online before each concert, and then use inexpensive handheld sensors to influence the progression of each performance. Talk about using technology to rethink traditional boundaries between composer, performer, and audience!

In a way, all of the previous examples have been ways to use technology to bring performers and audiences closer together, helping to reestablish the kind of "creative ecology" that has always made chamber music such a cherished activity. In this day of expertise and specialization, we have moved far from the roots of chamber music, when a healthy continuity existed between informal music-making at home, high-level amateurism showcased on special occasions, and the most refined performances—often in intimate surroundings—by experts and for connoisseurs, with musical compositions created for each circumstance. Perhaps the best example we have in modern society for this kind of continuity between expertise and amateurism is in cuisine: most of us appreciate a fine, professionally prepared meal; yet we cook special treats for friends and family without self-consciousness, and we put daily food on the table for subsistence.

Technology in music is not new: it has been approximately ninety years since Léon Theremin first demonstrated his eponymous instrument; almost sixty years since *musique concrète* appeared in Paris and *elektronische musik* in Germany; fifty years since the first computer music; and forty since the Moog synthesizer. More than twenty have passed since the PC computer, the

first digital music instrument (the Yamaha DX-7), and MIDI—the industry standard that, to this day, connects any computer with any digital music or sound device—were introduced in 1984.

It just might be that technology—which on the surface seems so foreign to the world of wood, wind, nature, and vibration—can provide the ideal tools and environments to allow everyone to fully participate in chamber music, helping composers, performers and producers reach out to audiences with invigorating new sounds and ideas, and offering the public a way back in—through listening, learning, and participating—to the magical heart of musical experience.

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FOR FURTHER INFORMATION:

Articles referred to above can be found online at: http://www.media.mit.edu/hyperins/publications.html

Evocative Objects: Things We Think With (Sherry Turkle, ed.) Cambridge, Massachusetts: MIT Press, forthcoming.

Information on Hyperinstruments projects, past and present, at: http://www.media.mit.edu/hyperins/

Information on Hyperscore and H-Lounge at: http://www.hyperscore.com and http://www.h-lounge.com

Information on Guitar Hero and Harmonix at: http://www.harmonixmusic.com/

Bug-Mudra and *Towards the Center* are recorded on *Flora* (Bridge CD #9020) *Begin Again Again...* is recorded on *Hyperstring Trilogy* (Oxingale CD, 2003)

Other information at: http://www.todmachover.com