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**Chapter 17 Composing with High Technology  
Todd Winkler interviewed by Kent Lineback**

*Todd, you teach music at Brown University. You have a Doctorate from Stanford. How would you describe who you are and what you do?*

I consider myself to be a teacher, a composer and a multimedia artist. I create interactive works of music and art where human action is the primary input to a responsive computer system. I've worked in several forms: interactive concert works for musicians, dance pieces using motion-sensing systems to generate music and images, and audio/video installations activated by user participation.

I started out my training as a composer in college and, before that, playing classical music and playing in bands. I've always been interested, even as a kid, in gadgets and technology. As soon as I got to college I took an electronic music class with Gordon Mumma who got me involved in music technology. Gordon is one of the pioneers of electronic music. He started one of the first electronic music studios in Ann Arbor in the late 50's, and later worked with John Cage and Merce Cunningham. I've pretty much kept up with all the developments in electronic music from 1976, when I was a teenager, until now. Along the way I also studied classical music and traditional composition in undergraduate and graduate school.

What I've pursued my whole career is taking new technology -- sometimes helping to create that technology, mostly in software -- and then using it to realize a work of art.

*Would you describe some of the work you've done?*

The first phase of my work, starting about 18 years ago, was focused on interactive concert music, a medium I continue to work in. I began writing pieces where a musician would play and the computer would do some kind of analysis of the performance, and then supply an accompaniment, or act as a musical partner, or alter the sounds in real time.

In these concert works, I want the player himself or herself to feel like they are having a real musical dialogue with the computer. So what comes from the computer has to be somewhat unpredictable, but it can't be random. It has to make sense for what they are playing, and it has to have certain kinds of rules of engagement, just like a good conversation. There has to be a kind of give-and-take.

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As I worked on interactive music, I became more and more interested in using a movement-sensing system to allow people to create music by their movements. This might involve dancers, who are so well trained in controlling their movements, or it might be in the form of an interactive installations.

So I started looking into different kinds of visual systems that could analyze movement. I settled on one that I've been very happy with called the Very Nervous System. It was created by an artist named David Rokeby. His system uses a video camera as the input device to the computer. Rokeby's software detects changes in the video image, so I am able to detect the location and speed of someone moving in front of the sensing camera. I am able to impose a grid onto the video image, and the software reports changes in each grid space.

The Very Nervous System is similar in some ways to a MIDI keyboard or to an electric drum set. Each of those systems simply tells the computer *where* something happened (a specific key or drum pad is struck, a person moves into a specific grid space) and *how quickly* (the velocity). And, of course, a computer is good at timing, so it knows *when* something happens.

I've now worked for many years with the Very Nervous System and I've completed several fairly large dance productions and a several installations. My latest work adds dancer-controlled video projections and video processing, along with music and sound.

Some of the algorithms I used for responding to musicians translated well into the motion-sensing world, although I then got more specialized and started developing better and better musical responses specifically for movement, because the kinds of gestures dancers make are different from the kinds of musical gestures that musicians make.

I've always been deeply interested in human-computer interaction. What is important to me is not just finding a way of generating music, but also developing the way the computer responds to a human being. So I'm looking for different ways of analyzing human gestures and how that will respond in the sound world.

*In watching videotape of some of your motion-sensing work, I noticed instances when, say, the dancer's motion triggered a specific and distinct sound from the computer, and that motion always triggered that same sound. But in other instances the connection between the dancer's motion and the resulting sound was less obvious and more varied, richer.*

I've developed some responses which are very obvious, sort of a one-to-one correspondence; and others are a little more mysterious as to how the movement is influencing the sound. I've created a big library of different ways to interpret and map gestures, everything from the very obvious to almost impossible to detect, and lots and lots of different kinds of musical responses. But the main work for me at the beginning was just thinking of all the kinds of ways the computer could respond musically to movement.

*What's been the response of the people, the dancers? Did they like it?*

They love it! Every dancer, when they start moving and making music, says, "Wow! I didn't know you could do this! I'm making the music." Dancers hook directly into being able to alter the sound. They feel it right away. They go with it.

*So, it's an infinite loop. The dancers hear it, and it changes how they dance. But how they dance changes the sound the computer produces. Which changes how they dance. And so on and on.*

Right. I've done a few workshops with dancers where I'll experiment with suddenly changing the sound. The computer will be making a big rumbling abstract sound and all of a sudden I'll change it to bright bells and plucked sounds. And immediately the dancers' movement will change - especially a good dance. And this also happens with untrained dancers. They will be doing the movement that they think will make that sound. I've seen this in my interactive installations. If I have a big percussive sound, people stamp their feet and move their arms up and down. But if, all of a sudden, I come in with some very delicate sparkly whooshing sounds that are more ethereal, people will pause and move slowly, sort of wave their arms around in the air, and their feet won't be stomping around so much.

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*You use the computer in most of what you do. What is it you're basically up to in using a computer or technology to compose music?*

I think of the computer as a tool. A very fancy, sophisticated tool. It allows me to do certain kinds of work I can't do without the computer.

*You remain the composer?*

Absolutely. My software is the composition. The computer is dumb as wood. It simply does what my software tells it to do. My software is the work. It represents all the potential outcomes. All the things it can produce are represented somehow in that code. There might be a million different melodies, and I've set it up to give it that potential. What happens in my interactive work is that that potential is only realized by human action. It doesn't happen on its own.

*So if you say the computer is simply a dumb machine for realizing your musical ideas, then, in effect, it's you who are reacting to the dancer. Or, better, it's an interaction between your mode of thinking, as expressed in the software, and the dancer or the drum player or whatever.*

Exactly. It's a mode of thinking that is open enough to generate many results. When I was in graduate school I studied some of Beethoven's sketchbooks. They're Beethoven's outtakes, the stuff he threw away. I'm looking at this music and thinking, "Wow! This is great stuff!" The stuff that Beethoven threw away is fantastic. And I thought, "Wouldn't it be great if you could hear all the different versions that were running through Beethoven's mind?" People think this is sacrilegious. The Ninth Symphony, the Fifth Symphony, they're perfect in every way. How could anybody ever change anything, or touch it? But he kept changing it constantly and I would love to hear all of the versions that were running through his head.

So why not set my composition up in the beginning to have this range of possibilities? If I have a good idea, why not hear all of the variations? That's what I'm doing in my algorithms. I'm thinking, "Oh, it could go up or down, it could do this or that." Well, let's have it do all of it, let's allow the computer to be able to do all those things at some time, based on what comes up. So it's really an environment that has the potential for making lots of different kinds of things. I'm still keeping pretty good control over it, as an artist and as composer. I don't want it to do just anything. I want it to produce music I want to hear and I'm interested in.

*Yet sometimes, maybe often, you're surprised.*

I am. Yes, I am. And I like those surprises.

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*Do you as a composer care about innovation? Do you get up in the morning and say, "I'm going to be innovative?"*

Not really. I just follow the things that interest me the most. It usually turns out that the things that interest me the most are the new things. And that's what I want to go toward. Like a lot of other artists and academics, once I've figured something out, I'm not really that interested in going over and over it...

Usually, I think of musical innovation as ideas, which may become techniques or instruments or whatever, but before anything happens you have an idea. I'd say the ideas that are the most influential are the most important ones. They're the ones that change the way future composers, or people in general, think about music.

John Cage, for example. He said, "Sounds are sentient beings. Any sound is music." Sound is music. Wow! How can that be? Noise is music. My refrigerator is music. But when you stop and really consider what he said, it completely changes the way you think about music. I don't think music would be the same today without John Cage's ideas. Yet, I don't know very many composers who sit around and listen to his music, but they would all say they were highly influenced by his ideas.

So the ideas that people have are what's infectious. They're the viral part of it. The idea invades people's minds and all of a sudden everybody starts thinking it and suddenly, Boom! Everything changes.

For instance, this movement sensing technology. I didn't invent it. But just the idea that a dancer's movement can create music is a new idea. It bursts an old conceptual bubble, the idea that movement and music are two different things, or that the dancer moves to the music and not the other way around. It's like gravity. You drop something and it falls. If one day you drop something and it floats, your whole world would change, and you'd have to think of everything differently. Movement sensing is something like that but on a much smaller scale. You move and there's a sound. Wow! What do you do with that? The new dance piece I am working on, called *Falling Up*, explores this whole subject of how technology changes what we believe by making the impossible possible. Its about flying.

*I'm fascinated by the relationship between technology and art in your work. How do you view the innovations you create? Are they musical, technological?*

I view myself as an artist, an experimenter, a researcher and an inventor - not a gadget inventor, and not an innovator in the technology itself, other than writing software for a specific project. I'm waiting for other people to make the hardware available for me, a faster computer, a better hand-held camera, new sensing systems. Then I will experiment with it and see if I get some new ideas for work that requires those new capabilities.

But in some ways, some piece of technology -- for instance, something like the Very Nervous System -- in and of itself shouldn't be impressive. If someone tells me that now the computer can know where people are and how fast they move around, my first response might be, "Wow!" Hopefully, though, everybody gets over that "Wow!" response very quickly and moves to the "So What?" or the "Now show me what it can do" response. It's like if somebody invented the first piano and people said, "Wow! This is great. Lots of keys!" Then you they would say, "Ok, but now what can it do? Now play something. Play something beautiful or interesting or complex."

That's where I am, at that spot. Here are the new inventions, but there needs to be somebody who's artistic or smart or thinking things through, to show they can be used to realize some of the new ideas, or to show some of the potential that it has. We have had an amazing amount of technical progress in the last ten years, with very little memorable content to show for it.

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*When you start working on [a new piece], what's your goal? What's your purpose -- not for the specific piece itself but overall -- when you're doing a piece of art?*

I'd say there are a few goals. One of them for me is that I always want to learn something new. There's some research aspect to every piece that I've done. I want to try out some new artistic ideas that I have, based on this technology. I also might want to try a new software idea, because I'm writing software to make it all happen

But that's not all I want to do. I also want to come out at the end with a work of art that stands on its own, that is intriguing, and emotionally and intellectually engaging. I care most that the end result will express something significant, or inspire someone to have a significant experience. I think I've succeeded when somebody comes away with new ideas or has felt something deeply, or learned something to the point that it has actually transformed him or her somehow.

*So trying out things is a means to that end, not an end in itself?*

Yes. I want to end up with artwork instead of something that just demonstrates how a technology works. I'm actually very aware of not simply making my artwork a demonstration. I'm aware of the danger of that and fight against it. Everyone is so easily impressed with technology just because it is new. They say "Wow! isn't this great!" No. It has to say something or do something worthwhile.

When the Mac Plus first came out, people started writing these crazy documents with every word a different font, and some words were italicized and some bold and some underlined. But that didn't make the writing any better. It still said what it said. You could throw as much technology at it as you wanted - a better printer, faster computer, better fonts - but in the end, there was some content there and it still had to mean something.

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*Since you love working with new things, it must be a goal to do something new.*

No, not to do something new just for newness sake. As I said, I want the end result to be some type of artwork that's really interesting, that has content that needs the technology to work. I actually try to talk my students out of using technology. I'll say something like, "You're writing an interactive piece. Well, can you put this on CD or tape?" If they say yes, I'll say, "Don't make it interactive then. Don't use any more technology than you have to. Don't use technology just because it's there."

Because technology is difficult. It doesn't make your life easier. That's a myth. Technology makes it more difficult. Playing a video, a VHS, that's easy. Anybody can do that. Playing video off the computer, that's almost impossible, especially in real time in response to somebody moving. So if I have an idea and my idea could exist equally well in interactive form, or on tape, tape's much better, much, much better. I would never do the interactive form just because I could or because it's new. That would be a waste of my time and the end result wouldn't be as good. I'm trying to find a reason to use the technology, a reason that's essential, that's required for the project and for the artistic idea. I do hope that the artistic idea is new, but if I had an artistic idea that wasn't new, that I thought was really good and compelling, I would go with it.