CHARGED BODIES

People, Power and Paradox in Silicon Valley

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Data sheets will probably never be acclaimed for their piquant sense of whimsy, or technical articles for the emotional catharsis they provide. But the centuries old division between the technical and the humanistic domains has begun to break down, in Silicon Valley and elsewhere. The posting of the bans, you might say, to a possible marriage of engineering and art.

In the hills above Palo Alto, down a eucalyptus-lined lane, stands a most peculiarly designed building. It sweeps across a hilltop, describing an arc of about 150 degrees, and from a distance appears to be a new-as-tomorrow structure of stunning design. Only when one gets closer is it apparent that this weathered old place has seen much better days.

This building, the Center for Computer Research in Music and Acoustics (CCRMA), is part of the music department of Stanford University. What better hole to fall through to enter this mysterious new wonderland where the computer's wizardry and the artist's sensitivity are merging not for the

benefit of the computer, but for the user and his or her audience.

John Chowning, the center's director, had told me on the phone that in order for a conversation between us to have any meaning, I had to come up first to one of the monthly evening demonstrations, to hear for myself what computer music sounds like now.

A hand-lettered sign directs me from the parking lot down an outside hallway, past the open doors of the other rooms in this arching structure. The demonstration is full this evening. About thirty people are packed into a dark room, lined on three sides with black drapes. At the front of the room, a young woman named Jan Mattox stands surrounded by keyboards, terminals, speakers and miscellaneous computer parts. The audience of Peninsula residents ranges in age from early teens to late sixties; some have heard about these monthly demos and come up to check one out, others are regulars.

Jan tells us that this center, the largest such in the country, was founded by Stanford in 1975 after more than ten years of pioneering work by Chowning and his colleagues. The purpose was and is to explore the use of the computer in creating music, as well as illusory spatial environments. Such use is dependent upon programming techniques, signal processing and psychoacoustics, which seeks to understand how we process the signals that we hear: the "silence" of a meadow being different from the "silence" of an enclosed room.

For the people who work here—composers, researchers, students, and guest artists from all over the world such as Pierre Boulez—the computer is the ultimate musical instrument, for it has the ability to generate any sound wave that can be imagined, as well as many that can't. It can also "process" naturally occurring sounds, permitting them to have new textures. The study of psychoacoustics yields information that can give sounds a "personality" or "signature."

The demo begins with the flick of some buttons. And somewhere down at the microelectronic level, numbers repre-

senting soundwaves are generated in the bowels of a fleck of silicon.

We are seated between four large speakers. In the dark room there is little visual distraction. As the demonstration begins, we are not listening to beep-beeps or ooo-voo-doo-be-dippps, which many think of as electronic music today. We are listening to sounds (sounds first, music later) that are extremely clear (being digitally produced with no tape hiss), compelling, enrapturing. They seem to move around us in aural space. Or are we moving through the sounds? Then electronically generated natural-like sounds—a human voice and a stringed instrument—do what no sounds in nature can do: they transpose one into the other. The effect is spine-tingling.

Is it just the novelty, or can these sounds really convey an authentic musical experience? With that, more buttons are activated, and a complete musical work is played. This is not an atonal, aharmonic, amelodic assault on the senses. The work has all the evocative richness of a nineteenth-century Romantic score.

Because we patiently put up with the old machines that commanded us not to "fold, spindle or mutilate," we have been rewarded by crossing over some aesthetic barrier. In the hands of a skilled programmer/composer, these machines—though they lack one themselves—can touch something in our souls.

The process, however, is painstakingly slow, we're told. A single movement of the work we're hearing took an entire school term to program/compose. First, the appropriate electronic tones had to be synthesized, then sequenced in a pleasing order: making the sound, first, then the music. Everything comes from scratch, the composer typing in lines of programming code to create the timbre as well as the melody, functioning as instrument builder and performer, as well as composer.

As I left that night and drove back down the dark hillside

into Palo Alto, I wondered if what I'd heard was a new kind of music that was beyond music, a sort of metamusic. But then, wasn't Mozart's work metamusic in his time? And Beethoven's in his? And Stravinsky's in our own century?

Several weeks after the demonstration, I met John Chowning at his office at the center. While he was patient explaining his work, it was clear to both of us that much that lies at the heart of this music—or any music—doesn't lend itself to verbal explanation.

When I asked him to define music—whether acoustic or electronic—he could only say it is "the expression of something that seems to need to be expressed in humankind, just as poetry is. We could talk for a long time about what music is. I don't think we can say much more than that. If we knew what music or the visual arts are, if we could say what the effect or function was by using language, then it would be far easier to express that in language, because it's a far more accessible medium."

Chowning's first instrument, as a child in Wilmington, Delaware, was the violin. Later, he took up percussion instruments, and in the navy, during the Korean conflict, he played a lot of jazz.

After graduating from college, he studied music in Paris in the late '50s. At that time, Cologne and Paris were the centers of the new electronic music and *musique concrête*. At the time, this consisted of synthesizing sounds from electronic signal generators (at Cologne) and electronically transforming natural sounds—whether coming from a musical instrument, a buzz saw or a shattering glass—into new sounds (in Paris).

Chowning later came to Stanford to pursue further studies, and soon thereafter heard some early attempts at using computers to synthesize, or create, actual sound waves (as opposed to using electronic devices like oscillators, amplifiers and filters, and techniques like varying playback speeds, to manipulate naturally occurring sounds). The idea of composing on a

computer—synthesizing, then sequencing electronic tones—intrigued Chowning, and it wasn't too long before he took his first course in programming.

"The notions of beauty are very different for artist and engineer. For example, there's a certain beauty about a sinusoid, or sound wave, and I understand that. It has to do with trigonometry and right triangles. But it's not a very interesting sound from the point of view of the ear. I would say the artistic notion of beauty is a little more inclusive than the engineering notion. That is, an artist who sees the geometric manifestation of a waveform is able to appreciate that beauty. The engineer probably has a little more trouble understanding what artistic beauty is, or why an artist wants to do certain things which seem to be a perversion of the intended use of a machine.

"But, that's the nature of it . . . the artist is not interested in right workings of machines, but in making art. The first sculptor, for example, didn't use a tool that was manufactured for those purposes. It was most certainly a cast-off spearhead or something. So we who used computers for music in the early years were seen as having some sort of perverse intent. That's not what these machines were intended to do, we were told."

For Chowning, the process of humanizing computers will be a long one, but he is sure that artists/software programmers will continue to find capabilities in the hardware which will astonish electronic engineers.

In talking with Chowning I'm struck by how he and other artists I've known talk about their work in a different manner than do engineers. His remarks are on the order of a working draft that gets polished even as he explains further. Whereas, I've found, when engineers speak, what they say has a much more finished tone to it. First pass, for them, is final draft.

The difference isn't so much in the "what" of what's being said, but in the "how." Engineers assert statements;

artists seem to process them before the listener. Perhaps the word that best explains that difference is "nuance": the lifeblood of art, the bane of engineering. Every performance of a given étude has its own personality. Every 68000 16-bit microprocessor from Motorola damn well better be just like every other.

Computer music, Chowning feels, will be "additive, not exclusive." It will be a new branch of music only, not a replacement, any more than the nineteenth-century symphony orchestra has replaced the eighteenth-century chamber orchestra.

"I don't think the San Francisco Symphony is going to disappear because we have more powerful computers and more digital music devices. Loren Rush, a very fine composer on our staff, had a piece called 'Song and Dance' commissioned by Seiji Ozawa with the San Francisco Symphony. That was for orchestra and quadraphonic tape, and the tape was realized here."

"Karlheinz Stockhausen [a leading composer of the Cologne School of electronic music] asked me once, 'Can you write music at a faster rate with computers?' Well, in fact, I don't think so. It's certainly no faster as far as my own experience is concerned, and maybe a little slower."

One of the principal differences between composing music for the computer, as opposed to composing for traditional orchestras, is the degree of control the artist has over the microstructure of the sound. The electronic composer is his or her own instrument builder. For the traditional composer, for example, the violin comes for nothing. "That is, if it's a good violin and a good performer, then there's a wealth of information that's implanted in that local system of performer and fiddle that the traditional composer's not required to specify, that is simply a part of the heritage.

"The computer composer has a kind of control which was heretofore denied simply because the traditional composer hadn't the capability or the time to deal with music at that

level, to build instruments. And that seems, on the surface, to be an inordinately difficult task because there's so much data. Except that computer programs begin to help."

The curved building we are in previously housed Stanford's artificial intelligence (AI) research facilities. Because Chowning needed a computer to work with from the beginning, he became a "parasite" at the laboratory, working on the periphery of that group, using its computers at night and on weekends for his programming/composing. In 1979, the AI lab moved out and down to the main campus; Chowning's group remained. Now the CCRMA, too, is about to leave the heights for the campus, perhaps symbolizing the mainstreaming of computer music.

Though he was a hanger-on at the AI lab for a number of years, using its computers, Chowning sees little connection between his work and the work of those who would write "expert systems": software that attempts to distill the essence of a given process (such as discovering hidden oil deposits, or diagnosing a disease) in order to facilitate/automate/elucidate that process.

"There are some who are interested in automatic composition. I'm not. I see that as a more difficult problem even than computer-generated poetry." While AI may vastly speed up some routine procedures, to the point of making the process appear intuitive, he doubts that will ever or can ever happen in the artistic domain. Who can even understand "imagination" or "intuition" or "inspiration," much less codify it?

"Now there's a certain view toward this. That if you have good AI researchers hanging over the shoulder of a creative scientist or artist, the researcher will see things that this person doesn't and formalize these 'expert systems.' But when you're looking at some chemist doing his work, many things are quite well defined. It's different when looking at a poet write down words. There's so much less that's formalized at the basis of a poetic statement than, let's say, in organic chemistry. We can't even make a very precise bound-

ary as to what's poetry and what's not, or what's theater and what's not. . . . John Cage's notion of music is one that includes anything which impinges upon the eardrum. That's all potential music. You see, the notion of art doesn't seem to allow itself to be rigorously defined, because it is always redefining itself."

Several years ago the CCRMA began giving outdoor concerts in the hills near the center. Within four years, the audiences had grown from about two hundred to over a thousand people at a performance. The assembled would sit in a natural amphitheater between four large loudspeakers. The illusion of sound moving through space was "astonishing" to many. The concerts have now moved down to a performance center on the campus, and the crowds continue to grow. Why?

"We are right on the edge of Silicon Valley, and people come who live and work in that world because they hear 'computer music,' expecting trivial beeps and bloops. Not expecting anything that is perceptually rich or has meaningful properties which would allow the listener to say, 'Hey, I've got to sit down and listen to this.'

"And that's what happens. Continually, we get a 'Gee, I never thought computer music would sound like that.' And they come back and bring their friends.

"Silicon Valley needs a soul. Because it's heavy commerce, heavy engineering. And most of what people are doing is done for purposes that are . . . Well, let's imagine you're working on this video game device that some kid's gonna stare at, bumping little bodies around. It's pretty hard to convince yourself, you know, that this technology has any soul. Well, art *is* soul. And in a certain sense what we do becomes the soul of this industry.

"There's no resentment in my feelings. You can't have machines that are used for artistic purposes without having a large commercial interest in them as well."

Certainly, no one would have undertaken the expense of creating computers solely as a compositional tool. But has the purpose of software programming reached its popular height in the creation of video games? Chowning isn't so pessimistic.

"There's something potentially there in video games that may not be seen by the critics. Mainly, kids become fascinated with the processes by which these games are created. And, to some extent, will become programmers in order to do something that has more than trivial entertainment value.

"And in so doing, they will contact the whole world of the intellect which would never have been part of their experience . . . namely, high-level language, which represents thousands of man-years of thought about thought, thought about logic which goes back to the origins of thinking.

"To learn to program, for whatever reason, is already an enriching experience. And though I don't think that that's the game companies' purpose, they're going to have to accommodate to the fact that kids are going to want to program their own games. That's already begun.

"A kid learns to program in BASIC and quickly generates a game, finds it much too slow and says, 'Well, how can I speed this up?' He finds that if you learn to program in ASSEMBLY language, you can make all this happen faster. That's the seductive aspect of it, and to good purpose, I think. It's almost as if it happens in spite of the intentions of commerce."

I am not a programmer. I have never written a line of code. And I wonder, as I leave the center, why Chowning made such a big thing about the seductive nature of programming.

Then on my way home from the CCRMA, driving along the Bayshore freeway, I pass Intel's facility just south of the Lawrence Expressway, and I'm struck by one of those "Aha!" notions.

Whether they intended it or not, Intel and Motorola and National Semiconductor and Zilog and all the others have

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taken their little microprocessor brainchildren and by the handsful thrown them to the wind, to the world, saying, "Go solve problems."

To which Chowning and others are replying, "Yes, and more than that. Create things, too! On our own. In our own way."

Microprocessors are cheap enough, and mass-produceable enough, to become universally available. But until the ability to manipulate that power, by programming, is equally universal, we are no better off for the technology.

As programming becomes more simple, however, and as that ability becomes as widely taught as verbal literacy is supposed to be now, the microprocessor will open up realms beyond imagining, and not just for professional composers.

Consider the parallel in literacy. In the Middle Ages, the ability to read and write was the private preserve of the few in the state and the church, who could thus manipulate mass ignorance to their own ends. With the introduction of the printing press in the mid-1400s, technology made available inexpensive, mass production of printed material. One has to suspect that the subsequent broadening of the base of literate people is as much a cause, as a result, of the increase in the standard of living and personal liberty in Europe after the fifteenth century.

And books are passive. They don't read, they *are* read. Imagine the impact of the world becoming literate with a knowledge tool that is not passive, but active. Not centralized, but decentralized. Not solely in the hands of an elect or an elite, but everywhere. Useable by everyone.

Imagine the impact when the concept of software extends beyond productivity tools for the officeworker, or games aimed at kids, to creativity tools allowing an individual to generate sophisticated, aesthetically pleasing visual and aural experiences at home; when the computer is an extension not only of our heads, but of our hearts as well.