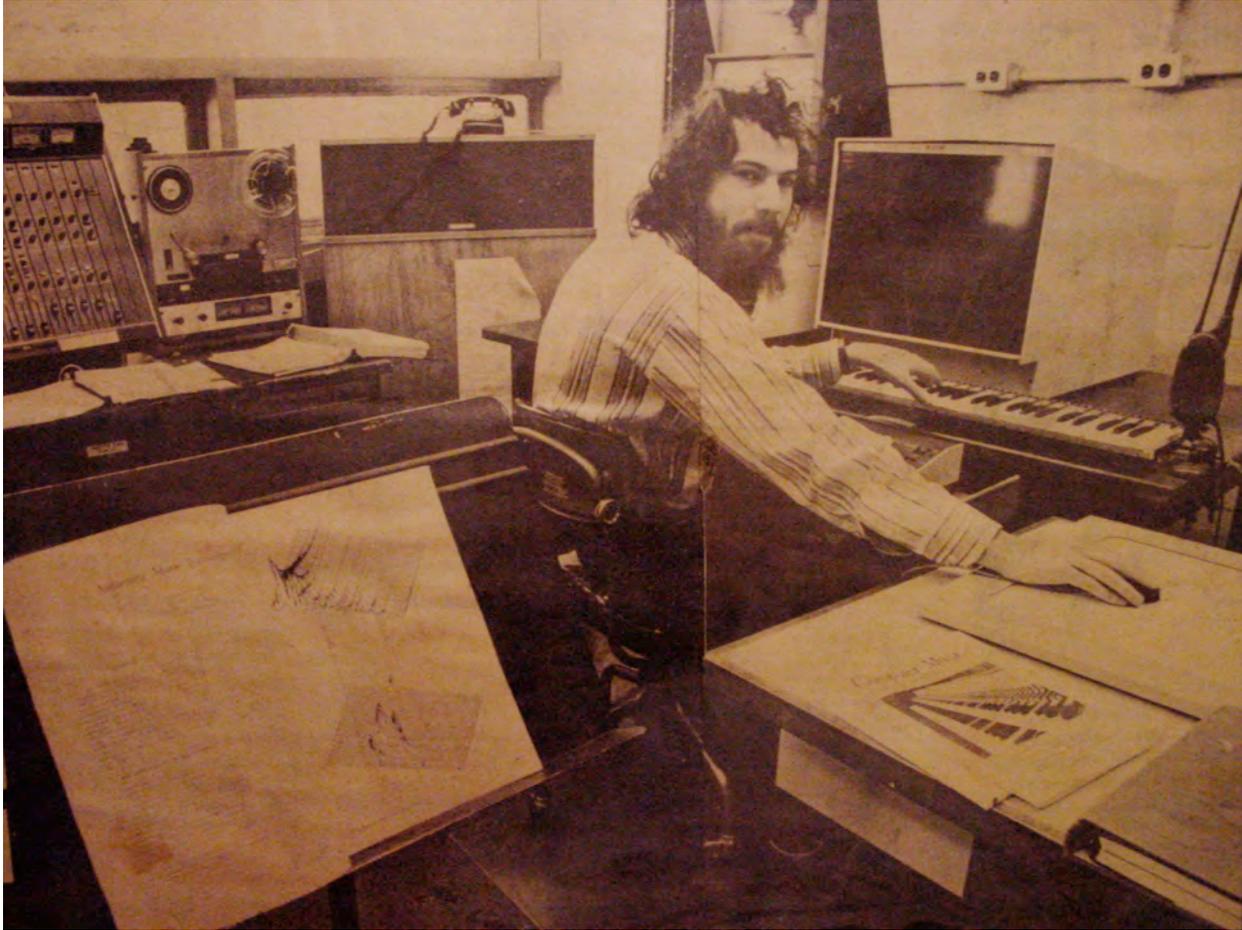


Silverman, "Future Sound," © *The Real Paper*, March 3, 1979, Boston, MA.



Technician Christopher Frye of the MIT Music Lab

Future Sound

by Joan Silverman

The Real Paper

May 3, 1979

Boston MA

Computer music. To some the words might conjure up images of singing robots or science-fiction movies, perhaps against a bank of computers flashing like neon signs.

At the Massachusetts Institute of Technology the computer music scenario is far less dramatic. The experimental Music Studio is a small, quiet niche, nestled deep in the maze of classrooms and laboratories. Inside, the studio is stark – a few teletype terminals, assorted chairs, and a bulletin board. Amid the machinery sit the remnants of two musical instruments: behind and above a computer terminal sits a piano keyboard, disembodied as if in the middle of some surrealistic vision; on a shelf is a fretted stringed object with a small card beside it that reads, "Guitar: a primitive mechanical instrument from the late traditional period."

Established in 1973 by Professor Barry Vercoe, the studio was designed to generate new musical technology. Despite some of its extra-musical uses – acoustic research, the study of man-machine interaction – the studio is not a haven for scientists to tinker with music. In fact, the studio belongs solely to the music department, for the use of advanced students, technicians, and other music researchers.

The studio survives on grants and gifts. Among the basic equipment are two computers, each of which performs separate tasks. The PDP-11/50 stores musical data, and can copy the sounds of musical instruments by synthesizing their sound waves digitally. The IMLAC PDS-4 is a display computer, programmed to screen images such as musical scores. In combination, the two provide both the audio and visual counterparts of music-making.

In musical terms, computers have several possible functions. As an analytical tool, the computer can study existing scores of music. Digital computers are known for superb fidelity and can reproduce sound of unequaled clarity. Technological advances in computers make digital music reproduction the sound wave of the future. At MIT's studio the specialty is creating music – both composing and simulating musical instruments.

In many computer studios musicians compose or perform their music using numbers instead of musical notes and symbols. At MIT's studio, however, the foreign language of computers has been translated, by programming, into actual musical symbols. Thus, the sores that appear on the graphics screen look like those traditionally used by musicians.

A computer musician can be a one-man band, in charge of all phases of music – composition, interpretation, and performance. Whether the computer threatens the essential human element in music remains to be seen. But computer music is not intended to replace traditional instruments or music. As Vercoe explains, "the computer can fill in the gaps, but it can't beat the instrument at its own game."

Music 11, conceived by Vercoe, is the basic language used at the MIT studio. It allows composers to create music for computer or live performers. Like any computer language, Music 11 offers a general framework to accommodate specific programs. According to studio technician George Stetten, Music 11 is a *brad* language "of which you can, in effect, make little paragraphs describing each instrument in terms of the mathematics of what you want it to do." For example, the computer can mimic the sound of a violin, by analyzing, then reproducing its harmonic structure. However, Stetten warns, "there is no such thing as an 'instrument'; there's a person playing an instrument, and that's what makes the music. A violin is useless unless it's in the hands of a good violin player." Although it is unlikely that a computer could match the richness, the expressiveness of a violinist like Heifitz, it *is* capable of producing a wider range of violin sounds. "You want to get sounds that have never been made," says Stetten. "the whole thing about a computer is that you're not limited to reality [in terms of] a piece of wood and a string. You're completely free [in] what you can make."

The display computer in MIT's studio can portray music in two ways: traditional music scores and graphs. Computer graphs serve as an adjunct to the traditional score, providing subtle textural information. Each graph presents a series of contours, resembling a mountain range, that show the precise relationship between each note. For composing via computer, the graphs offer an exacting means of modifying sounds. According to Stetten, "The future computer musician [will have] to be both performer and composer. He'll compose the traditional pitch/time structure [score], but he has to put the chutzpah into it – the intuitive part of it. One way [to do that] is graphics."

"Sine wave," "real time," and "digital," are basic terms in the computer world. At MIT, the key word is digital." There, they simulate musical effects digitally on a computer rather than with a synthesizer.

The process of translating a program to actual sound is vastly complex. Unlike synthesizers¹ a computer has no direct sound rendering device; typically, it has no innate talent or "musical bias," no "genes" that determine its use. Only through programming – and several years of fancy, arduous programming at that – can the computer double as a musical instrument.

If the MIT studio is considered bold and high-brow by insiders, it is with sound reason. In the field of electronic music, MIT is considered an innovator for its digital approach. According to Stetten, "What makes this lab avant-garde is that it's totally software. There's no analog hardware; it's not a Moog synthesizer, it's not an Arp synthesizer." Digital computers are far more adaptable, and in the long run, cheaper than synthesizers. "Our approach is strictly computers," says Stetten. "It lets us be totally versatile. Hardware evolves so quickly, and you have to throw it out." For all its unique assets – superior sound quality, dynamic range, and clarity – most digital computers cannot compete with "real time." To illustrate, Stetten programs the computer for "Mary Had a Little Lamb." he bangs out the notes quickly, on the keyboard, then types in the proper length of each note. At first, his keyboard rendition sounds slurred, improperly punctuated. With the teletype additions, he informs the computer of the song's fine points. Next, a score of the tune appears on the graphics terminal. Then, about ten seconds later, the finale: a computer version of "Mary Had a Little Lamb," in staccato, electronic tones.

Fast as it seemed the transaction took thirty seconds. With a piano or synthesizer, the touch of a key produces instant sounds. With the computer, however, there is a time lapse, albeit brief. "It's much more immediate to have an analog synthesizer," Stetten concedes. But, he says, "we, in computer music gave up that avenue of approach. You can't get that with [most] computer speeds. Moog and Arp and all the people who build synthesizers said, 'We're going to make electronic circuits so that we can get some real sound out *right now*, so that Emerson, Lake and Palmer can do their thing.' "

Even with the vanguard status of digital, Stetten acknowledges the value of synthesizers, and the growing alliance of these two technological forms. In fact, the two can be used concurrently, as shown by Joe Zawinul of the musical group, Weather Report. In his mixing board, Zawinul programs a variety of computer settings for the synthesizer.

With the advent of computer music, we now have the ironic phrase, "human performer," and a host of aesthetic questions. Conceivably, a composer could simulate each instrument in the orchestra, produce a symphony, and never engage a human hand in its performance. At the other end of the spectrum, the day may come when anyone can be a computer composer in his or her own home, turning art into gadgetry. Surely, if there's a defense for computer music it lies between these barren extremes.

For all the technical detail attainable on a computer, there remains the human factor which, by definition cannot be programmed. As Stetten muses, "It's hard to program things that are art; they're always a little more complicated than the program you write."

¹ note: in 1979, when this article was written, "synthesizer" meant "analog synthesizer," since computers were far too expensive to put in a commercial musical instrument. The PDP-11/50 mentioned in this article was a million-dollar donation from Digital Equipment Corporation. (George Stetten, 2007)

Silverman, "Future Sound," © *The Real Paper*, March 3, 1979, Boston, MA.

In Vercoe's terms, both computers and musicians can be exploited for their separate capabilities. Vercoe recognizes certain limitations in human performance, such as the inability to reach a chord that extends beyond one's grasp. In such cases, he suggests, the computer might better perform the task.

Ultimately, the fate of computer music will rest with musicians, their use of computers, and respect for their art.

Silverman, "Future Sound," © *The Real Paper*, March 3, 1979, Boston, MA.