Copy for the ATMI Newsletter October 25, 1995

PIONEERING NEW TRAILS THROUGH THE WILDERNESS OF MUSIC, COMPUTER, AND COMMUNICATIONS TECHNOLOGIES

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Note: This essay is adapted from several presentations including comments prepared for the ATMI/CMS panel, "Pioneers Still Searching for the Promised Land" in Minneapolis, 1993, Charles Boody, moderator.

I would like to comment on issues of connectivity and networking. The telecommunications wave of the 1990s that is upon us will soon hit with an avalanche effect that will far exceed the impact that the personal PCs of the 1980s had education and society. More on this in a moment. Since I was asked to participate on a panel of "pioneers still searching for the promised land" I suppose that means I need to act like a "pioneer" (time to put on my coonskin cap here!) and step back in time for a moment. Those of us who were actively involved with the first microcomputers (I am talking about KIMs and Polymorphic 88s kits that pre-dated the Apple IIs and TRS-80s) did so because we wanted to escape from the tyranny of the mainframe. We were all connected through boxes of punch cards, magnetic tape, and hard wired terminals to these monoliths. The keepers of the "big iron" had enough to do in their daily feeding of these machines than put up with musicians wanting to play with their multimillion dollar computing investment. I suppose it is a natural inclination for musicians, anyway, to want to have their own instruments to play with. (Sharing my clarinet was not something I was ever comfortable with.) The first micros gave us a wonderful, portable instrument to play on without ever having to again step inside the hallowed halls and pay homage to another CDC or Cyber, Burroughs, or IBM 370 mainframe. Since the first consumer personal computers arrived in the late 1970s, we've done marvelous things turning these one-person machines into personal music workstations. Here, from my point of view, are four accomplishments of the 1980s wave of personal computers:

• The first significant accomplishment was turning them into wonderful, inexpensive, surrogate teachers for drill and practice of music ear training and theory skills.

• The next accomplishment was getting our PCs to carry on conversations with our music instruments —MIDI became the lingua franca of music technology.

• Then, musicians rode the wave of personal desktop publishing, and usurped the right of the music printing industry to the production of inexpensive, professional quality

music printing.

- And lastly, we simply turned all sonic events into digital ones and harnessed the control of those digital platters we call compact discs with our personal computing machines.

Four very significant accomplishments from a personal computer workstation: portable music CAI, MIDI, music desktop publishing, and computer control of compact audio discs and digital sound processing. Not too shabby for about 10 years of progress I would say! After having accomplished all of that, what "promised land" or "new trails" could we possibly still be looking for? There are several trails through the future wilderness of technology we could travel at this point. But, my compass has swung around to connectivity and networking. After having severed our ties of connectivity to mainframes and "doing our own thing" with personal PCs for the past twelve or so years, we are now being drawn back to the need to connect and share. Not "connectivity" that means being directly wired to one single monolith as in the pre-microcomputer days. Connectivity which means electronically having PCs connected to each other and to a global smorgasbord of online data. At a keynote address I gave last year at the Duluth conference on music education and technology, I emphasized the "alchemy of technology, instruction, and music"—the mix of many wonderful activities that are all occurring simultaneously.

On the screen please study the graphic illustrating this alchemical mix. On the right we see the common music ingredients: writing, listening, performing, composing, dancing or movement. In the center we see instructional ingredients that reflect recent trends in innovative strategies for teaching. And, on the left we see an overwhelming set of ingredients that come from the latest trends and developments in technology. If you step back and look at how music, instruction, and technology are coming together, interacting and complementing each other, you will see that these forces are changing the way we perform our various music tasks. Let me expand briefly on these future trends in instruction and technology.

INSTRUCTION The traditional model of instruction and communication is an instructor-centered model. Valued are:

- hierarchical relationships,
- structured learning environments, and
- instructor-centered or expert-centered modes of working and learning.

This model was promoted by the emergence of the industrial revolution to insure a disciplined work force that was punctual, could follow directions, and could read. This model also illustrates the old concept of the single user having to go to the "master" mainframe computer to perform any task.

An alternative is a cooperative model for instruction and communication. Valued are:

- networking relationships;
- informal, unstructured environments; and
- student-centered modes of working and learning.

Experts and lectures give way to collaboration, partnerships, guides and mentoring. With this model, people share information electronically from their own personal desktops. Key figures like Alfie Kohn, Spencer Kagan, and the team of David and Roger Johnson in Minnesota have promoted models and strategies for cooperative and collaborative learning. These strategies have significantly impacted the elementary school classroom, to some extent the secondary level, and have begun to make their way into the college classroom. Many argue that the basic nature of humankind favors cooperative relationships rather than competitive ones. Eisler, in her book, "Chalice and the Blade," builds such a case as does Alfie Kohn in his book, "No Contest." Eisler points out that it is the difference between ranking relationships and linking ones where "diversity is not equated with either inferiority or superiority." Prerequisite abilities for the next century will be the ability to work cooperatively with others and to be self-directed learners as knowledge expands exponentially.

Do you see the importance of these trends in instruction to the whole issue of instructional technology? To the alchemical mix? Changes in technology are helping to facilitate this trend toward collaboration and cooperation.

TECHNOLOGY
The "alchemy" figure shows an incredible array of technologies: HDTV, MIDI, digital media, wireless networking, personal digital assistants or PDAs, merging of telephony and cable TV, and Al Gore's National Information Infrastructure or superhighway for communications. Let me touch on four topics from this array:

- Networking
- Client/server models of computing
- Faster and smaller personal computers
- Digital media

Networking. The world as well as the nation is being connected with cables, radio frequencies, fiber optics, and satellites. You will soon be able to "reach out and touch someone" any where, any time from a phone, TV, computer desktop, or your even your Dick-Tracy-like digital watch. The reality of this is only a few years away. Realize that the National Information Infrastructure (NII), the superhighway of connectivity for computers is already here. We know it by various names like the Internet, Bitnet, NSFNet, and others. The government and industry want to further integrated the networks into a cohesive system with enough bandwidth to make digital video and sound communication possible. Cable television and the phone companies—AT&T, Sprint, MCI, and TCI, for example—see tremendous commercial benefits for being active, profit-making participants on the network super highways. Some of us fear this "profit-making" motive, perhaps justifiably so.

Clients and Servers. Software applications are being separated from their data. Computers can be "servers" or "clients." A computer as a "server" functions to maintain data and deal with requests from other computers for these data. Server computers can be as large as mainframes or as small as microcomputers. In fact, many mainframe manufacturers like IBM see a new role for their "big iron" as powerful servers on the NII, especially digital video servers for services like video on demand. Other computers and software (like your's at home or in your office) fill the role as "clients." You have a collection of client software on your computer that has the intelligence to navigate the network and access "servers" to retrieve and exchange data. "Knowbots" can be given your research requests and sent out upon the network in search of matching keywords among the servers of the world. The new software jargon of networking clients includes "gopher," "listserv," "archie," "World Wide Web," "WAIS," "Fetch," "Mosaic," "FTP and FAQ," and new ones being added every day.

Small and Fast Computers. The Newton MessagePad is an example of how computers keep getting smaller and faster. We went from desktop computers to transportables, transportables to laptops, and now laptops to personal digital assistants or PDAs. Companies are even working on the designs for personal computers built directly into TV sets and watches. The pocket calculator that you carry around will give way to an intelligent PDA with full word processing, spreadsheet, database, communications, and personal management software. Perhaps even a MIDI interface included to control your home entertainment center. It won't even have to be plugged into the wall; wireless connectivity will let it connect to the networks as you stroll in the park, sit in your favorite coffee house, drive in your car. Think about what impact this will have on the way we now maintain public labs for our students. Just what are the "public labs" of the future?

Digital Media. It is all going digital. We have an ever expanding, rich palette of digital speech, text, graphics, and music. The data that "server" computers will maintain and distribute will be rich, full-text, full-graphic, full-sound databases. Digital media will be available on demand. Not only will you be able to dispense digital CDs or music scores or home videos from a kiosk at the local mall, but you will be able to do so from the comfort of your home cable system. Full multimedia documents will be accessible for viewing and printing from your home computer from anywhere in the world.

WHERE IS THIS HEADING?
In our "promised land" we will have servers all over the world—you won't care where they are—holding a rich resource of documents, digital video, digital imagery, digital recorded music, MIDI and digital sound samples, music notation, and multimedia instruction modules. The globe will be encompassed by an international networking infrastructure to provide the connectivity to these multimedia servers. You and your desktop or PDA can plug-in or tune-in to the network at any place or any time. Then, run your client software and you can access anything or converse with anyone in the world. The title of Douglas Adams' novel, "Hitchhikers Guide to the Galaxy" takes on a new meaning, one that moves from science fiction to reality. Indirectly through our computer desktops, we will all become clients hitchhiking around the network galaxy exchanging information, electronic visiting and interacting with others. Network hitchhikers call this to-

tal universe of connectivity the "cyberspace" or the "telecosm." Let me close by giving you a final morsel to ruminate on if you decide to set out hiking on this "pioneer" trail I've described to the "promised land." The alchemy or interaction between networking and multimedia technology, cooperation and sharing, and this business we call music may well bring about three significant changes in the 1990s. It will:

• Alter or reduce the limitations of time and space and change what we physical know as the "music classroom" or even the "rehearsal room" for that matter.
• Expand our palette of digital media far more than we can even envision now, and
• Revolutionize the way we interact and relate to one another.

With that I'll take off my coonskin cap, turn off my word processor, and go check my USENET newsgroups, drop in on my favorite World Wide Web sites, and read my e-mail—checking e-mail from the ATMI listserv of course!. See you in Cyberspace.

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