A Musical Technography of John Bischoff

Douglas Kahn

ABSTRACT

John Bischoff has been part of the formation and growth of electronic and computer music in the San Francisco Bay Area for over three decades. In an interview with the author, he describes his early development as a student of experimental music technology, including the impact of hearing and assisting in the work of David Tudor. Bischoff, like Tudor, explored the unpredictable potentials within electronic components, and he brought this curiosity to bear when he began working on one of the first available microcomputers. He was a key individual at the historical turning point when computer music escaped its institutional restrictions and began becoming widespread.

The San Francisco Bay Area has long been a hotbed of activity in electronic and experimental music, beginning with the work of John Cage, Karlheinz Stockhausen and David Tudor, who performed and conducted residencies there beginning in the 1960s. There followed the establishment of the San Francisco Tape Music Center and the Center for Contemporary Music at Mills College in Oakland, among many other developments. While other locations focus more on individual talents, the Bay Area is known for its collective energies and has proven to be fertile ground when those energies are channeled through circuits and when the ground is made of silicon. Over the last three decades John Bischoff has been at the center of that collective activity, first as a graduate student at Mills College and then, up to the present day, as a faculty member. Bischoff was a member of the League of Automatic Music Composers (with Jim Horton, Rich Gold, Tim Perkis and David Behrman) (Fig. 1) and the Hub (with Chris Brown, Scot Gresham-Lancaster, Tim Perkis, Mark Trayle and Phil Stone) [1]. With the publication of his CD *Aperture* [2], Bischoff's music has been embraced by a new generation of electronic, laptop and noise musicians, and audiences.

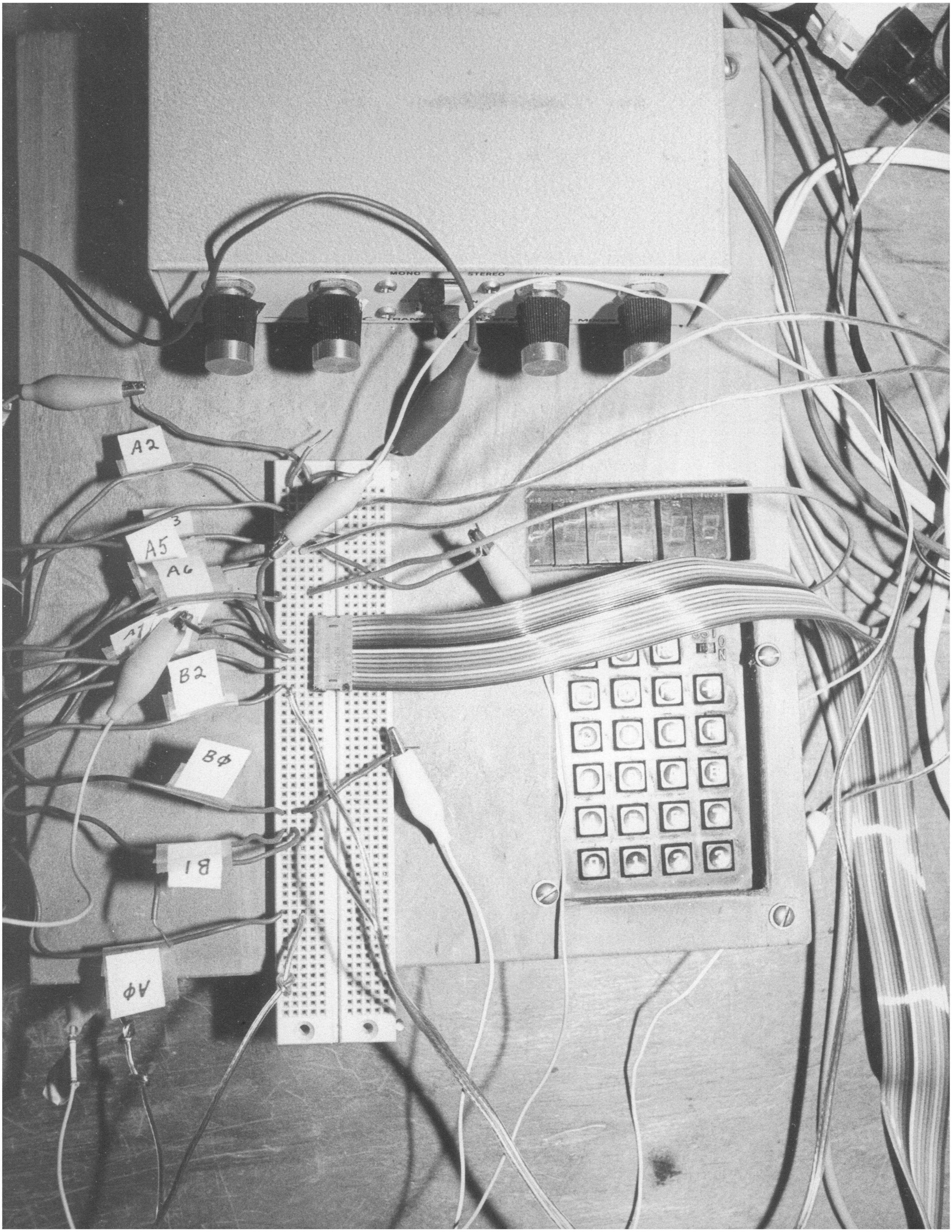
The following interview is not so much about Bischoff's music, however, as it is about the musical technologies that he employed during an especially auspicious historical juncture when institutionally privileged access to mainframe computers and early synthesizers gave way to the broader access of do-it-yourself electronics and, soon after that, the hardwiring of electronics began to contend with the programmability of the first microcomputers [3]. Pioneering mainframe composers, such as James Tenney and Jean-Claude Risset at Bell Labs, were dependent upon very restricted research-based access; to a lesser degree, a generation of students and composers were kept from the access they needed to the early synthesizers by the institutional demands on them and the prohibitive expense of individual ownership. As an undergraduate student at the California Institute of the Arts (CalArts) in Valencia, California, Bischoff was unable to gain hands-on access to the school's synthesizer; later, as a graduate student at Mills, he commandeered a room full of unused modular electronic gear in part to compensate for his limited access to the Buchla synthesizer. His efforts, in this respect, were similar to the activities of David Tudor, David Behrman, Gordon Mumma, Nicolas Collins, Ron Kuivila, Paul DeMarinis and others at the time. Indeed, hearing a recording of Tudor's performance of Cage's *Variations II*, with its "big blocks of noise," was a transformative experience for Bischoff, as was his experience at Mills assisting in the recording of Tudor's composition *Microphone*.

Beginning in 1977, under the prodding of Jim Horton, Bischoff began composing on the KIM-1, one of the first microcomputers [4]. At $250 at the time, it was relatively inexpensive (a synthesizer still cost several thousand dollars), and after a period of apprenticeship it allowed composers full-time access, much like any traditional musical instrument. This development led to the widespread use of computers for music making today and helped move electronic and computer music composition from its neglect at the margins of Western art music to the array of cultural and subcultural sites it presently enjoys. The following interview took place at Mills College during the spring of 2003. An admirer of Bischoff's music, I requested the interview to better understand the genesis of the present-day practice of computer and electronic music and his role within it. I have edited the dialogue to allow Bischoff to describe his earlier development uninterrupted.

Fig. 1. The League of Automatic Music Composers (left to right: Tim Perkis, John Bischoff, Don Day and Jim Horton) rehearsing at the California College of Arts and Crafts, Oakland, ca. 1981. (Photo © Eva Shoshany)

Douglas Kahn (historian, theorist, educator), Program in Technocultural Studies, Art Building, Room 103, University of California, Davis, CA 95616, U.S.A. E-mail: <djkahn@ucdavis.edu>.

Frontispiece. Jim Horton's KIM-1 computer music system, ca. 1981. (Photo © Eva Shoshany) The KIM-1 is encased in a "Danish modern" wood panel with its small keypad showing through the rectangular opening. The wires labeled "A2," "B0," etc. are KIM data port connections patched to other microcomputers. The small box with black knobs at the top is an audio mixer.


MONO
STEREO
A2
A5
A6
B2
BΦ

John Bischoff: I had a traditional music background in some ways. I studied classical piano as a kid, but I was always interested in jazz. I took piano because I wanted to play like my uncle, who played a 1920s sophisticated kind of stride piano. Through high school I took classical lessons and listened mostly to jazz—I was a big Thelonius Monk fan.

My dad [Elmer Bischoff] was a painter. I would play him the jazz records I was listening to, and we would talk about it and other things on an artistic level. He played, too, a trumpet, in addition to painting. My older brother, Steve, who was 10 years older, was also interested in that kind of thing, but besides that I was fairly isolated; my friends weren't interested.

My high school teacher wasn't especially interested in modern music, but she was a good teacher and gave me the score and recordings of Arnold Schönberg's atonal piano pieces, and I started learning them. I listened to a huge amount of music at the time, 3 or 4 hours a day. I developed my own program to expand my listening horizons. If I was interested in a piece of music, I would read about it and listen to musicians in the same crowd, piece by piece, adding other people. I started with jazz and then with classical and early modern music. By the time I was a senior I started writing music myself. The first piano pieces weren't systematically 12-tone, but they were atonal. This escalated, and I knew I wanted to be a composer.

I went to the San Francisco Conservatory of Music and studied piano and composition for 2 years. During that time I listened to a lot of John Cage, Morton Feldman and Earle Brown. I really liked Brown's music; it was busier and denser than either the space nature of Feldman's work or Cage's randomness. I decided I was going to go study with Brown in my junior year at the Peabody Conservatory in Baltimore. However, he was going to be gone the first year and wasn't sure whether he'd be back, but he did tell me about CalArts. So I was there the first year it opened in 1970.

At CalArts I studied with [James] Tenney. He was really incredible, far and away the best teacher I'd had up until that time, other than my father. Tenney led me back into the American tradition. I had been located partly in European and partly American, but I got interested in Charles Ives and learned some of his piano pieces. I hung out with Peter Garland, who was also studying with Tenney, and I can remember him, and maybe Tenney a bit also, criticizing Stockhausen and some of the other European composers at that time. I began to agree with them. Peter was a great colleague. He started *Soundings* then, and I co-produced that first issue. As part of that process we visited Harry Partch and Dane Rudhyar. So that was a very eye-opening time for me.

During that time I listened to a recording of David Tudor—inside the piano, feedback, contact mics—performing John Cage's *Variations II*. It completely turned my musical world around. Just big blocks of noise. At first I was aghast, shocked; I didn't even know if I liked it, but it was totally different than anything I'd heard. As before, when that would happen to me, I listened more and more and then began to like it. That's when electronic music got under my skin. But, because CalArts was just starting, the electronic music scene was in chaos. I took Morton Subotnick's class in which he explained things theoretically—basic acoustics and oscillators and voltage—but it was very difficult to get time on the synthesizer. You just can't learn anything without doing that; it was frustrating. If I had been a gearhead I might have just bullied my way in.

Then I went to Mills College for graduate school, in the fall of 1971. I had seen Robert Ashley give a talk in a composition seminar while I was still at the Conservatory. He talked for an hour straight, and I remember being incredibly impressed. I knew he was at Mills, so I applied and that's how I ended up here. I decided to pursue electronic instead of instrumental music, but I really had no practical background in it. Maggie Payne, who was a year ahead of me, showed me a few things on the Buchla synthesizer, but mostly we were thrown off the deep end and had to start swimming. I didn't have a natural affinity for it but I got caught up in the spirit and eventually figured it out. It was a really positive thing. You were allowed to approach the technology from wherever you were coming from. You didn't have to follow a certain course first; you just grabbed a soldering iron and started to do it.

Paul DeMarinis and Phil Harmonic were grad students the same year as me. The first year I worked on the Buchla 100, the original one that Don [Buchla] had made for the San Francisco Tape Music Center. There was a Moog, the new glamour machine at the time, but the Buchla appealed to me much more. I was interested in trying to get the machines to have a musical behavior, a personality that I would interact with or direct. Paul helped me build contact mics, and I got into mic'ing resonant objects, scraping them, building up and interrupting the resonances. Everything I did involved an element of real-time playing; that was very important for me. Unlike other people at the time, I didn't record things on tape and then carefully splice and edit it down.

During my second year, something happened that became formative for me. Ashley put the grad students in charge of

Fig. 2. John Bischoff performing with unidentified audience member in background at the event WPA-MUSIC (Phil Harmonic, Paul DeMarinis, Art Revolution, "Blue" Gene Tyranny and John Bischoff) at Potrero Hill Neighborhood House, San Francisco, 30 January 1975. (Photo © Peter Abramowitsch)

the concert production and tech. There was a loft above the concert hall that he took us to one time to teach soldering. In the loft there was a bunch of old electronic music gear like pre-amps, oscillators, signal boxes with big knobs, a ring modulator that was a separate box, and no one was using it. So I basically took over the loft. I started working with feedback—setting up microphones, sending the output through ring modulators, allowing it to be modulated with sine wave oscillators and come out of the speakers—and developing a configuration of modules so that I could change the feedback paths and tune them with the equalization controls on the pre-amps. The feedback was incredibly stable, not the sudden howling feedback you get when you move the microphone into a certain position. You can just crank it up. I liked the Buchla for the automatic self-modifying control structures you could get, but not so much the sound itself. These contact mics made these natural sounds in processing and feedback that created a much richer situation than one you could concoct by adding together synthetic waveforms. It was more akin to what Tudor was doing.

Douglas Kahn: Perhaps the synthesizer was voltage-controlled—control being the operant term here—whereas Tudor was like Cage, always interested in that point where you lose control.

Bischoff: That's right. I was trying to push the system behavior toward failure points, breakdowns, through a kind of the dirt in the system. It's quintessential Tudor. In Cage's *Variations II* he's inside the piano scraping the strings, generating a resonance, an incredible ringing, and at the same time he's interrupting it. You're creating this beautiful sound and throwing dirt in it, constantly. To have a sound open to interruption and regeneration at any moment would be hard to get if you were making a piece on the Buchla. The sound was more formalized. I could have tried to save money and buy a synthesizer, but they were really expensive at that time, and I was more interested in the idea of assembling units together with the idea that it would be configuring a piece that would have a certain musical character.

Kahn: What about computer music, which, of course, would have been a mainframe affair at the time?

Bischoff: I didn't really pay much attention to it. There was one student at Mills, Howard Moscovitz, who told us about a summer workshop he took at Stanford, but it seemed very austere and abstract. More importantly, Ashley and the Mills tradition in general was based on live electronic music, whereas computer music at that time was all on tape. So just that fact in itself kept me from being interested in it.

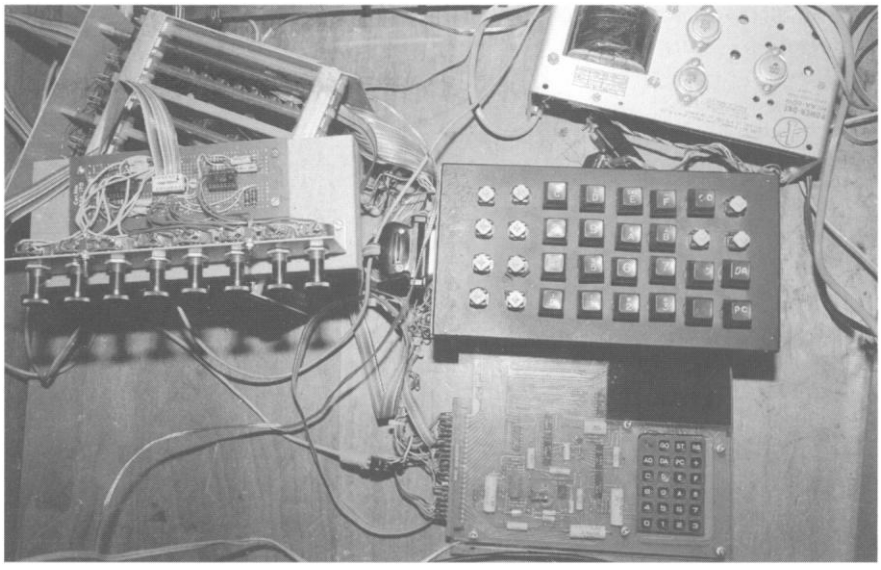


Fig. 3. John Bischoff's KIM-1 computer music system, ca. 1981. (Photo © Eva Shoshany) The KIM-1 computer is on the lower right, its top half partially obscured by the external keypad box. The circuitry on the left expanded the KIM's capabilities. The silver unit at top right is the power supply.

Kahn: So you've left the notes behind and, having abandoned the synthesizer, you're not trafficking a poetics of the patch, or rather, having gone to separate components you've deconstructed the patch. It's obvious you were trying to get down to some type of materiality, but what type? Did you have some sense that this is the sound of electricity itself?

Bischoff: Well, I think so. If I had to put it into words I'd say I was drawn to a music that sounded as if you were hearing the heart of the electronics, of electricity as a material. That meant a huge range of tones and noise and interruptions, unpredictable events and unpredictable control. But it also meant going down into the heart of it, where it's blossoming. That's what Tudor was doing, burrowing down.

Kahn: In your writing you've made the distinction between an acoustic performer who is the source of the sound, as opposed to music made in an environment where electrical activity is the source. The former must be enunciated or originated, whereas the latter is a force that's already in existence. Why is that appealing?

Bischoff: That's right; it's already moving, already acting. There is something unsettling in the move from acoustics to electronics about letting loose, but in exchange you step back one little half step and become an influencer rather than an initiator. To me, that seems to be very critical in understanding the nature of working with electronics as an artistic material. The payoff is surprise, a wonderful unpredictability that can have very high aesthetic value that I never would have arrived at normally.

Kahn: Back to the time line, when you were using the separate components. . . .

Bischoff: After I got out of Mills in 1973, I began to build my own little boxes, partly because Paul DeMarinis had begun to build his own circuits, and he built some things for Bob Ashley. Paul's the most far-out gadget guy I've ever met [*laughter*] and it was fun going to school with him and being in that environment. Tudor was a gadget guy too. He was at Mills in the summer of 1973 on a Ford Foundation recording grant, and I got to work with him. "Blue" Gene Tyranny was the recording engineer, and I was an assistant. I got to spend 12-hour days with Tudor for 2 weeks. It was fantastic. He had this one box and he wouldn't even tell us what was in it. It was a real black box! I believe Gordon Mumma had designed it for him. The piece was called *Microphone* and it was released on the Italian label Cramps [5]. From the recording booth at Mills he ran mic and speaker cables down the hallway to a reverberant stairwell, which he used as a feedback reverberation chamber. There was a series of boxes in the loop, and I was playing a phase shifter. He would fill up tracks by waiting maybe a minute on a stopwatch and then slowly open up gates, the feedback would start roaring, and he would twist knobs to change the modulation,

processing the sound, I would change things on the phase shifter, then he'd close it down [6]. He'd set the knobs in such a way that when he increased the gain a very unpredictable thing would occur, that he'd react to. It was just the type of thing that I had been working with myself, so it was an incredible opportunity. From 1973 to 1977, the year I got the KIM, I kept building and working with separate boxes (Fig. 2).

Kahn: Could you talk about how you began using the microcomputer?

Bischoff: I started teaching at City College of San Francisco and taking care of the electronic music studio in 1975. I met Jerry Mueller, an instructor there, who was about 10 years older than me. He was one of the first people, along with Jim Horton, who began talking about getting a personal computer. I was not someone who knew this was coming, so it completely took me by surprise. Jerry got an IMSAI 88; it actually had binary toggle switches on the front! I remember very vividly seeing the KIM-1 for the first time on Jim's kitchen table. It was like science fiction. It was the size of a piece of paper, lightweight and no case, with a small glowing LED display (Fig. 3 and Frontispiece). I could hardly believe it was a computer. I'd never seen a mainframe but I pictured computers as being really huge. I kept thinking, "This is his own computer! He just plugs it in and can do whatever he wants."

Jim was a composer [7], but he was still trying to figure it out and get sounds out of it. He was proselytizing for KIM. I was just getting to know him, but he would show up at my door uninvited and start explaining to me how it worked. He wouldn't even have the KIM with him and would still start explaining it to me, the program counter, the locations, the data at the locations, the instruction set (Fig. 4). It was hard to retain much of it. Still, it was shortly thereafter that I decided to buy one. I think they were $250.

The CPU on the KIM was an 8-bit 6502, so you would write 6502 machine code. Shortly after it appeared, someone wrote an assembler [8] for it, but I never did run one, so I was entering the hexadecimal equivalent of a binary machine code. Not having an assembler, if you had a huge program and wanted to insert a line, you couldn't just move everything down automatically. So I ended up writing complicated programs, patching in something that would jump to another location and add code, and so on. There were patches like these all over the place, which made it nearly impossible to follow. The first piece I composed was called *Audio Wave* [9]. It developed over about a year and half, beginning from a piece with Phil Harmonic to one with pianist Rae Imamura that used two KIMs [10]. It was performed live with instructions sent in through the hexadecimal keypads.

Kahn: In the programming you were no longer dealing with a materiality of electricity; you now had a waveform representation harboring code. The wonderful thing about it is that, because you were required to lay everything on the motherboard, so to speak, so many instructions at one instant, the code did not simply form the sound: it deformed the sound. It is reminiscent of Pauline Oliveros when she said she "loved all the negative operant phenomena of systems" [11].

Bischoff: Yes, the control and housekeeping instructions. You couldn't just program a waveform and say that it will give you a certain overtone spectrum. What is more important is all the code piled up on top that's constantly coming in and going out of play and perturbing the thing. It's a glitch. What was a real surprise was perhaps more formal. It became apparent that the program excursions were simply a map of the way the speaker cone moves in and out, so the code was driving the cone and I was able to get down to the roots of the instrument. It felt like the entire chain, from the code all the way through the output to the far end of the speaker, was continuous and unbroken. Not all the code directly influenced the sound, but it still felt immediate and unbroken. I didn't filter it, envelope it or shape the amplitude. I just let it loose. It was exhilarating. I never felt that with any of the feedback pieces.

Because of the simplicity of the KIM there was a one-to-one relationship that becomes much more difficult once you get layer upon layer of programs happening like with a laptop now. With the KIM it was still possible to trace the route. It wasn't like a patch on a synthesizer; it was more like building the circuits from the ground up, then patching them together. One big difference, however, is that in an analog environment there was an initially given behavior that had richness, whereas in digital you had to shovel in more and more code to get a similar richness, where it [the KIM] actually had some lively behavior on its own. It's a different situation now because there are so many built-in features, but back then it was a real slog: more and more code. Tim Perkis and I would commiserate about that.

Kahn: In that transition from analog to digital, why would you have subjected yourself to shoveling more and more code just to get a sound? There must have been an element of faith involved that held you over a long period of self-education.

Bischoff: That's right. It wasn't that digital devices had interesting failure modes; they didn't have any. They didn't do anything. And not everyone took up the call to move to digital. I felt that it was an imperative. I was 27 or 28, and this thing comes down the pike that is a challenge, sure, but one that promised a completely

Fig. 4. The League of Automatic Music Composers (left to right: Jim Horton, Tim Perkis and John Bischoff) preparing for a concert at Fort Mason, San Francisco, ca. 1980. (Photo © Peter Abramowitsch) The KIM-1 and its expanded circuitry to the right are being operated by Bischoff as Horton and Perkis adjust equalization and mixing levels.

new situation where you could implement almost any idea you could dream up. That was very attractive. Once you got over the learning curve, after around 2 or 3 months, you began to think, yes, I could probably do that. Also, in the scene I was in here in the Bay Area, people were not trying to implement known musical results given a certain set of instruments. Instead, they were interested in creating unknown and unthought-of musical results. The fact that no one knew what was actually going to come out of our efforts was a huge plus.

Kahn: Experimental and electronic music was once not-so-benignly tolerated at the margins of Western art music, but it has over the last decade or so moved toward a central position as something of the soundtrack to digital culture. Where it was once merely tolerated it is now much more engaged and doesn't have to apologize to anyone. Do you see any of the priorities of that initial scene socialized now with the widespread use of laptops for music making?

Bischoff: There were democratic ideals. We thought that more people should be able to get these machines and do whatever they wanted to do; it was creative empowerment. And there was an openness in that beginning community that is still a strong component in different scenes today. Some people at the time talked about the social and political potential, but I was focused more on the music itself. Yet I saw a similar social scene develop with the cassette underground that came afterwards. So it wasn't so much computers, but people making their own music of whatever type and exchanging it on cassettes. That was the same spirit as the laptop and noise and new electronic music scene now, which I really support.

References and Notes

1. See Scot Gresham-Lancaster, "The Aesthetics and History of the Hub: The Effects of Changing Technology on Network Computer Music," *Leonardo Music Journal* **8** (1998) pp. 39–44.

2. Released by the San Francisco organization 23Five Incorporated. John Bischoff, *Aperture*, 23five006 (2003).

3. These transformations are discussed in Thom Holmes, "Music from Mainframes: The Origins of Computer Music," in *Electronic and Experimental Music*, 2nd Ed. (New York: Routledge, 2002) chapter 10, pp. 211–236.

4. See Jim Horton's "History of Experimental Music in Northern California" at <www.o-art.org/history>.

5. David Tudor, *Microphone*, Cramps CRSCD 116 (1973).

6. Increasing the volume level above a certain threshold in a feedback circuit produces sustained tones that ring at the resonant frequencies of the circuit/room as a resonant system. Changing modulation settings or other factors in the circuit once this occurs will cause the tones to shift in pitch and number.

7. See "Unforeseen Music: The Autobiographical Notes of Jim Horton" <mitpress2.mit.edu/Leonardo/lmj/horton.html>.

8. An assembler is a program that translates programming code from assembly language (names and numbers) to machine language (numbers only).

9. Composed 1978–1980; recorded and released on the CD *Artificial Horizon*, Artifact Recordings CD ART 1003 (1989).

10. See John Bischoff, "Software as Sculpture: Creating Music from the Ground Up," *Leonardo Music Journal* **1** (1991) pp. 37–40.

11. Heidi von Gunden, *The Music of Pauline Oliveros* (Metuchen, NJ: Scarecrow Press, 1983) p. 52.

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Douglas Kahn is director of Technocultural Studies at University of California, Davis, and a member of the Leonardo Music Journal *editorial board. He writes on the history and theory of sound in the arts, the arts and technology, and auditory culture. He coedited* Wireless Imagination: Sound, Radio and the Avant-Garde *(MIT Press, 1992) and wrote* Noise, Water, Meat: A History of Sound in the Arts *(MIT Press, 1999).*

John Bischoff (b. 1949) is a pioneering composer of live computer music. He is known for his solo constructions in real-time synthesis as well as his collaborative work in creating computer network bands. A solo album, Aperture, *was recently released on 23Five. He is a lecturer in computer music and on staff as studios coordinator at the Center for Contemporary Music at Mills College in Oakland, California.*