The League of Automatic Music Composers 1978-1983

Notes by Tim Perkis and John Bischoff, August 2007

The League of Automatic Music Composers was a band/collective of electronic music experimentalists active in the San Francisco Bay Area between 1977 and 1983. Widely regarded as the first musicians to incorporate the newly available microcomputers of the day in live musical performance, the League created networks of interacting computers and other electronic circuits with an eye to eliciting surprising and new "musical artificial intelligences." We approached the computer network as one large, interactive musical instrument made up of independently programmed automatic music machines, producing a music that was noisy, difficult, often unpredictable and occasionally beautiful.

Cultural Background: Northern California in the '70s

The work of the League partook of the distinctive cultural atmosphere of the San Francisco Bay Area in the 70's and 80's, a rich blend of communal ideologies, radical culture, technical innovation, intellectual ferment, and a hands-on attitude that has been a hallmark of California life since the pioneer days. In the air then was a sense of new possibilities, and the feeling of the need to build culture from the ground up. For music specifically this meant redefining everything about how it's done, from the instruments and tuning systems to the musical forms, venues and social relations among players and audiences.

As yet unnamed, Silicon Valley was springing to life, where the almost daily announcements of new integrated circuits made possible the birth of a new subculture, where hobbyists and hackers outside of — or marginally connected to — technology industries were creating the microcomputer revolution. In the Bay Area, access to the new digital technologies and to the people who developed them was perhaps the best in the world. In these heady early days, many of these hackers were less focused on the potential riches following from this technology than on its revolutionary potential — a dream of a new society built on the assistance of artificial intelligence, and the free and open access to information.

From the American experimental music tradition, as represented by fellow Californians John Cage (1912-1992), Henry Cowell (1897-1965), Harry Partch (1901-1974) and Lou Harrison (1917-2003) came the sense of being far from Europe, and that our musical culture could draw equally on any of the world's traditions — musical and otherwise — for influence and inspiration. These composers also formed the basis of a West Coast tradition of instrument building, from Cowell's "Rhythmicon" (1930), a machine for exploring complex rhythmic relationships, to Harrison and Cage's garbage can and brake-drum orchestras and Partch's homebuilt microtonal instruments.

Also in the cultural mix of the time was a living tradition of noisy improvised music. Living outside of institutional or commercial support, and practiced by musicians coming from hippie jam sessions, free jazz, classical music and punk rock, it embodied a sensibility of exuberance, dissonance, free rhythm and collaborative composition.

Of no less importance were some of the intellectual currents of the time. A flowering of more-or-less scientific writing about the nature of complex systems and their behavior made strong claims that a new level of understanding of physics, biology and culture was just around the corner. Cybernetics (Norbert Wiener), complex systems theory (Prigogine), genetic algorithms (John Holland), synergetics (Buckminster Fuller), catastrophe theory (Rene Thom), neural networks (McCollough), chaos theory (Crutchfield et al.), cultural ecology (Bateson) — these writings all supported a belief of the moment, that complex phenomena can be understood by analyzing the dynamic interactions of relatively simple components connected in networks. (It's not much of a jump from saying we can analyze complex life-like processes into simple interacting components, to imagining that we can create complex, life-like behavior by connecting simple components – and do so in a musical context.)

Finally, the fact that there was a the lack of significant opportunities on the West Coast for the support and presentation of art music made composers in the Bay Area more likely to embrace experimental aesthetics. Since the audience was sparse, and opportunities for an actual career futile, why not spend one's efforts following the potential of fantastic ideas, rather than worrying about the practical applications of those ideas within traditional musical domains? Why not extend experimental ideas about communal composition, algorithmic music and emergent network behavior to the new electronic technologies? Why not risk creating music that may not succeed at being intelligible music at all?

CCM and League Beginnings

The Center for Contemporary Music (CCM) at Mills College in Oakland provided a unique focal point for all these cultural strands to meet. At that time the Center was housed at the college but had its own distinct identity and offered open studio access to musicians from outside the college community. Here was an opportunity for academic experimentalists, free improvisors, electronics hackers, rock musicians and other assorted oddballs to meet and create something new.

In the mid-70's, the scene around Mills was steeped in a tradition of experimentalism, and musicians there were busy building homebrew circuits for use in live electronic music performance; indeed, the design and building of specific circuits was seen as inseparable from the compositional process. For many composers, a new piece meant designing a new circuit: like a graphic score, the schematic diagram of a circuit determined the musical activity of a piece.

The idea of using the electronic system itself as a musical actor, as opposed to merely a tool, had started with composers like David Tudor (1926-1996) and Gordon Mumma (b. 1935). For example, in Tudor's work Untitled (1972), the composer would interconnect a table full of small, mostly homebuilt boxes containing analog electronic circuitry: amplifiers, attenuators, filters, phase-shifters. The autonomous behavior of these circuits — with only minor and occasional adjustments by the performer — defined the character of the music.

From Tudor — who visited Mills as composer-in-residence during this period — came a powerful notion, soon widely accepted there: that the primary job of a musical composer/performer during performance was listening, rather than actually specifying and creating every sound that happens in the performance. His style of music asks of us, whether playing the role of composer, performer, or audience member, to attend to a sonic representation of the behavior of an autonomous network; the interest of the work lies in nothing more than perceiving and enjoying that system's complex behavior.

In the mid-1970s the first personal computers hit the consumer market. These machines, called microcomputers because of their small size compared to the mainframes of academia and industry, could be bought for as little as $250. Their availability marked the first time in history that individuals could own and operate computers free from large institutions. To the composers in this community it was a milestone event: here was a radically more flexible and powerful component to incorporate into the electronic musical assemblages that made up their individual work at the time.

Horton and the "Silicon Orchestra"

The composer who first saw the microcomputer's potential most clearly was Jim Horton (1944-1998). Horton was a pioneering electronic musician and radical intellectual who was first out of the blocks in purchasing one of the new machines: a KIM-1 in 1976. Horton's forward-looking enthusiasm for the KIM quickly infected the rest of the community. In a short time many acquired KIMs and began teaching themselves to program them in 6502 machine language. The machines were quite primitive; programs were entered directly into the KIM's 1K of memory via a hexadecimal keypad, and saved onto audio cassette, a flaky proposition at best. There was a strong feeling of community among the composers who were learning to program these

tiny computers, a shared spirit that was particularly helpful when it came to getting a foothold on the more esoteric, and sometimes pesky, aspects of KIM-1 operation.

Horton was an improvising flutist and analog synthesizer player who had earlier worked building large, self-modifying analog synthesizer patches, sometimes interconnecting his synthesizer with those of his friends, building the largest, most complex patch possible and letting it play for eight hours in all-night concerts

Rich Gold (1950-2003), one of the founding League members, recalls:

> Jim Horton was a genius…brilliant, sharp, conspiratorial, a poverty-stricken artist who lived in cheap, book-filled apartments that smelled of Bugler tobacco. He was wracked with pain from crippling arthritis, and it was from the pain that I believe he eventually died. I first met him as one of the earlier purchasers of the Serge Synthesizer (he had saved his welfare money by not eating.) He was also the first person to make serious music with the KIM-1 and the force behind *The League of Automatic Music Composers*.

Tim Perkis:

> Meeting Jim Horton for the first time was immediately a liberating experience for me. Horton would show up at a gig with his tangle of loose wires and electronic components in a dresser drawer he would temporarily press into service. With my head full of hesitations born of half-digested conventional wisdom about audio circuitry, it was mind-blowing to see someone just go directly to the heart of the matter, twisting bare wires together, connecting anything to anything, and doing the deeply conceptual musical work which drove him without waiting for the right equipment to appear. He lived in a poverty that never seemed like a limitation to him, and worked with whatever means he had at hand.

In 1977, it was Horton who first introduced the idea of a microcomputer network band. John Bischoff:

> A number of us got together on a regular basis to listen to the music we were creating, some of it made by our KIMs and some by analog circuitry in conjunction with other instruments. I remember a discussion one evening where Horton talked excitedly about the possibility of building a "silicon orchestra" — an orchestra of microcomputers linked together into an interactive array. The concept sounded impossibly far-out to me at the time.

Later that year, Horton and Gold collaborated on a piece in which they linked their KIMs together for the first time in a performance at Mills College. Gold interacted with an artificial language program of his own creation while Horton ran an early algorithmic piece based on the harmonic theories of 18th century mathematician Leonhard Euler. Early in 1978, Horton and John Bischoff developed a duo piece for their KIMs where the occasional tones of John's machine caused Jim's machine to transpose its melodic activity according to Bischoff's "key" note. And in the spring of 1978, Horton, Bischoff and Gold performed as a networked trio at the Blind Lemon, an artist-run space in Berkeley.

The trio were soon joined by David Behrman (b.1937), who had moved west to become Co-Director of the CCM at Mills. (Gold and Bischoff were Behrman's students at Mills; Horton was never officially affiliated with the college.) Behrman was to provide one of the key techniques which shaped the League's work over the following years. Previously he had developed pieces wherein electronic circuits would "listen" to the playing of live performers and accompany or mark particular pitch events (*On the Other Ocean*, 1977); many of the subsequent arrangements of machine interconnections followed this principle, of one player's machine detecting and emphasizing a harmonic event produced by one or more of the other players.

It was this quartet that first performed under the name "The League of Automatic Music Composers", in November 1978. The new group name was in part a reference to the historical League of Composers started by Aaron Copland and others in the 1920s. It also sought to convey the artificial intelligence aspect of the League's activities as they began to view half the band as "human" (the composers) and half "artificial" (the computers). As stated in concert programs of the time, "the League is an organization that seeks to invent new members by means of its projects....MUSICAL VALUES SIMULATED AND EXPOSED."

By 1980 Gold and Behrman had left the group to pursue other projects, and composer Tim Perkis joined the band. Tim had been a graduate student in video at California College of Arts and Crafts in Oakland, was an active player in local gamelans and a just intonation enthusiast, having collected examples of dozens of alternate tuning systems from around the world, and had created electronic musical instruments to play them.

The trio continued with this membership, concertizing regularly in the Bay Area for the next four years. In keeping with common Bay Area musical practices, there were many sessions involving collaborations with other acoustic and electronic musicians active in the Bay Area at the same time, including video artist Donald Day, trombonist Ron Heglin, and electronicists Brian Reinbolt and Kenneth Atchley.

Bischoff:

> Every other Sunday afternoon we spent a few hours setting up our network at the Finnish Hall in Berkeley and let it play, with tinkering here and there, for an hour or two. Audience members could come and go as they wished, ask questions, or just sit and listen. This was a community event of sorts as other composers would show up and play or share electronic circuits they had designed and built. An interest in electronic instrument building of all kinds seemed to be "in the air." The Finnish Hall events made for quite a Berkeley scene as computer-generated sonic landscapes mixed with the sounds of folk dancing troupes rehearsing upstairs and the occasional Communist Party meeting in the back room of the venerable old building.

League Aesthetic and Work Procedures

It is perhaps misleading to modern ears to even call these first microprocessors we were using "computers" at all. With processing power less than that of a 21st century coffeepot or computer mouse, they share little with the computers of today, and the programs the League wrote for them were nothing like the vast infrastructure of software that supports current professional music production.

21st century computer usage in music production descends largely from the practices and aesthetic of institutional computer music of the 70's and 80's, in which entire musical worlds, consisting of both newly created sounds and simulations of physically produced sounds, are manipulated and reproduced all within the computer. The emphasis is on control, perfection, and the taming of complexity.

The League's approach could hardly have been more different from this prevailing tradition of computer-generated tape music of that time. As Perkis wrote at the time:

> I see the aesthetic informing this work as perhaps counter to other trends in computer music: instead of attempting to gain more complete control over every aspect of the music, we seek more surprise through the lively and unpredictable response of these systems, and hope to encourage an active response to surprise in the playing. And instead of trying to eliminate the imperfect human performer, we try to use the electronic tools available to

enhance the social aspect of music making.

For us, the music was never "in the computer." The microcomputers were always just components with particularly interesting behavior to incorporate into our networks which included other electronic circuitry, as well as human beings. The heart of the work was in physical *bricolage* or *assemblage*, an essentially sculptural musical practice. While sometimes the microcomputers were used as direct audio devices, generally they were used to control other analog or digital soundmaking circuitry. (They had insufficient processing power to create anything other than distinctively noisy and abrasive digital sounds, which were sometimes used to good visceral effect, but which had distinct material limitations.)

We felt our work was more akin to that of our mentors and friends building gamelans (Lou Harrison and Bill Colvig), mechanical or electro-mechanical musical instruments (Tom Nunn, Chris Brown), or incorporating hacked versions of electrical and new electronic musical toys into their work (Paul DeMarinis, Laetitia Sonami), than to the contemporary institutional computer music. There was always the sense that the music arose out of the material situation, out of idiosyncratic individual players and the anarchic, ad-hoc arrangements they made.

The music was always live, with no sequences pre-planned. Each player's “station” played its own composition, had its own sound-making equipment, and would send and receive information to and from the others. The meaning of this information might be completely different on one end of the exchange and the other: a pitch indication from one player might be controlling the rhythm of the other, for example. No one station would fulfill an executive function, or have an overall score. Any musical form that would emerge often came very mysteriously, out of the interactions and mutual influence of the separate stations.

A typical League session would consist of setting up our computer systems in a living room and laboriously connecting them together. With wires running everywhere and our computer programs finally debugged, after several hours we would eventually get the system up and musically running. Then we would play, tuning our systems and listening intently as our machines interacted. When surprising new areas of musicality appeared, we took notes on the parameter settings of our individual programs with the hope that recalling those settings in concert would yield similar exciting results. The structural form of our concerts was essentially an agreed upon series of such settings, the moment to moment details, of course, always remaining in interactive flux.

Conclusion

By 1983 Horton's rheumatoid arthritis had become crippling, and performing became difficult. The League's activities slowed to a halt and the group finally disbanded later that year.

All through the League's years of activity, there was a grandiose utopian underpinning, a youthful sense that we were on the threshold of a new man/machine consciousness, a whole new stage of human culture. We thought of the group not as a band with fixed membership, but rather as the vanguard of a new style, a new social practice, and a new way of making music: a cybernetic and revolutionary cousin to jazz, perhaps. As more composers in our community and elsewhere started working live with computers, we thought our practice would eventually spread beyond our immediate circle.

Bob Gonsalves, a composer and Mills student in the late '70s writing in the local experimental music magazine EAR in March 1978, expressed the dream of the time:

> A hush falls over the audience as the musicians file out on the stage. The performers pick up their instruments and plug in the data lines, 8 by 8, until all handshaking controls indicate agreement. The Robomasters tune to the Master Oscillator, all circuits synced, memories write enabled, the lights dim....Sound

> familiar? If it does, you're living in the future, buster!

After the demise of the League, we (Perkis and Bischoff) continued the work, trying to normalize the messy and difficult process of interconnecting systems by building a standard interface box for musical computer systems that we called The Hub. The intention at that time was to make it easier for other players to engage in the practice, again not with an eye to creating a fixed ensemble of players, but to promote the development of a new musical practice that others would engage in. However again this work led to a new fixed ensemble, also called The Hub, in which we were joined by Chris Brown, Scot Gresham-Lancaster, Phil Stone and Mark Trayle, a group which has worked together intermittently now for over 20 years.

It is only in recent years that the notion of a general practice of computer networked music has really achieved any currency (see bibliography.) While the revolutionary spirit of those early days is tempered, and our goals have become more modest, at times it's nice to dream that Jim Horton's only partially ironic vision may come to fruition:

> When the programs are running autonomously, slightly beyond my comprehension, playing music I probably wouldn't have thought of left to my own devices, I like to imagine they are precursors to uplifting, slightly alien musical AIs (artificial intelligences) of the twenty-first century. Oh, how I hope and wish that contemporary cyberculture will lead to a beautiful utopian compassionate world of Good!

Producer's Notes (by Jon Leidecker)

The story of how this music came to be released nearly thirty years after it was performed has a simple enough beginning. After an afternoon spent recording improvisations with my friend Tim Perkis at his home in the Summer of 2004, I asked him why the infamous League had never released an album – surely some of that music had been recorded. He laughed, walked across the room, took a small shoebox off the top of his bookshelf and brought it back over to me, opening it to reveal perhaps 30 tape cassettes and a small walkman with a built-in speaker. Popping a tape into the walkman and pressing play, he said "The problem was that there were too many recordings." Less than thirty seconds of Automatic Music had sounded before I offered to produce a compilation for release – this was not merely music of historical interest, it was very much alive and ready to be heard. I took the shoebox home with me, and soon afterwards procured another 15 cassettes after a visit to John Bischoff's office at Mills College.

It wasn't impossible to understand why they hadn't managed to compile an album for release during the actual lifespan of the group. The focus needed for musicians to improvise often precludes the ability to confidently choose from recordings of those same improvisations for a definitive representation, especially with so many recordings to choose from: for every cassette document of a public performance, there were three more recorded at home during one of their countless Sunday marathons. Several extremely well engineered tapes from professionally recorded studio sessions do exist, including their contribution to the Lovely Little Records compilation released in 1980. But nothing matches the performances or the mix of sounds that I found on the later cassettes from 1980 and 1981, which, fortunately, had held up quite well over the years.

Choosing the selections for this release was an extended process. First, roughly 40 hour long cassettes were transferred into a Pro Tools HD system over several weeks. The tapes ranged from audience and board recordings of concerts, radio interviews on KPFA FM that often featured carefully chosen excerpts from pieces, set pieces with fixed durations performed live in studios, and home recordings of long improvisations. Many of the more interesting tapes were simply filled with non-stop music, often leader to leader – someone had been just alert enough to occasionally remember to turn the cassette over and press record again. As the tapes were being transferred, I'd leave the music to play while going about other tasks, occasionally taking down notes whenever the music appeared to peak or take on a particularly distinctive texture. Using those notes, the forty hours were quickly pared down to ten. Sustained listening to those ten hours revealed stretches which seemed self-contained enough to be excerpted, and these sections were lifted out to join the discrete compositions from the radio & concert tapes. These candidates and a potential track sequence were then mailed to John and Tim, and after several changes we settled upon the material featured on this album. Though there's a lot to be said for the fully immersed listening offered by the hours worth of unedited music, this disc's goal is simply to present a selection of the group's best performances and the widest variety of approaches and sounds taken from the cassettes.

As this is improvised music, almost all of the pieces here are presented with no internal edits. Two invisible cuts were made to 'Martian Folk Music' to include all the material of a fifteen minute composition within an eight minute track. A handful of coughs and other audience noises were carefully removed from the room recording of 'Pedal With Twitter' (though this piece was performed and recorded many times, there was no way around including this version, without a doubt the definitive take of one of their most evocative pieces). The improvisation from May 25th, 1981 stretches with no break in sound over track 6 and 7, though the transition between tracks represents a cut of about seven minutes. Save for a minimum of equalization and noise removal processing, all other tracks are presented as they were recorded onto the cassettes in real time.

By the late 70's, Computer Music was over 20 years old, decades since the pioneering work done at Bell Labs, and years since John Chowning's discovery of FM Synthesis. Pieces by James Tenney, Jean-Claude

Risset, Curtis Roads, Michael McNabb & François Bayle (among others) had already established the extended computer sound palette to such a degree that the League's embrace of machines only capable of 8-bit synthesis seemed to some like an unacceptable loss of two decades of progress. But in a discipline which required a musician to code their compositions entirely in advance, sound unheard, and then wait for hours if not days for the computer to produce an audible result, the freedom to control and play with sounds in real time (and in collaboration with other living people) might have seemed more like a forgotten luxury than one of the most important prerogatives of musical practice. If the League had returned to the initial vocabulary of Computer Music's first sounds made in the late 50's, they did so to regain the use of the computer as a musical and social instrument. Even in recorded form, it is clear that this was music that had been performed live.

In the decade that followed the work of the League, those 'primitive' 8-bit sound engines were adopted by the first wave of arcade and home video game consoles, and the character of the tunes and sound effects of these games embedded themselves in a generation of listeners. The sounds in the Williams' games Berzerk amd Defender, the home game systems by Atari and Nintendo, and the infamous SID chip designed for the Commodore 64 home computer then infiltrated electronic dance, pop and hip-hop music of the 90's in sampled form, usually for simple nostalgic effect but often appearing in abstract contexts -- for the sake of the sounds themselves. The cult of 8-bit went into overdrive in the early 00's, with an explosion of artists, CD compilations, hardware and software simulators and even annual musical festivals exclusively devoted to music made from 8-bit technology. The sounds the League used by necessity have been vindicated by the broadened tastes of the generations that followed.

Against this background, it shouldn't be surprising that when software synthesis programs such as MAX/MSP and SuperCollider found a wider user base in the late 90's, low bit rate & digital aliasing techniques made a huge return to the vocabulary of experimental computer music. The work showcased by the Austrian record label Mego, as exemplified by composers such as Florian Hecker and Peter Rehberg, explicitly utilizes & explores these basic sounds as raw material – taking a direct interest in the basic characteristics of digital audio sound reproduction. If Newman Guttman's "Pitch Variations" , composed at Bell Labs in 1957, was a nascent shot in the dark that unearthed a range of glitchy digital sounds that his colleagues instantly shied away from in favor of other techniques allowing greater control & smoother sounds, the aesthetics unearthed with that piece were investigated again by the League using their KIM-1's as musical improvisers, and again later by modern digital computer music artists designing sound generating patches from scratch on their laptops. The improvised recordings of the League most likely sounded more primitive in 1981 than they do now, given how familiar these sounds have become to modern ears. But not too familiar – for all we've heard before, these recordings suggest a trio of video game consoles, all jamming their way through a burning brain, playing just-intonation free jazz and beyond. I love listening to these tapes and I'm happy they're finally available for other people to listen to as well.

Track Notes by Tim Perkis

The League of Automatic Music Composers: Recordings, 1978–1981
(produced by Jon Leidecker, mastering by Xopher Davidson at Mixture 181)

1 – ***Oct. 14, 1980*** - "Dense Drone" 3:20
home recording. Jim Horton, John Bischoff, Tim Perkis.
As in several of the tracks, Perkis' station is configured as a virtual network of nine units, each of which controls one voice, and decides what to play next based on the state of its neighbors and the recent activity of Horton's voice. The pitches are chosen from a set of just-intoned possibilities. Jim Horton's station plays part of Max Meyer's psychological theory of melody, using a different 29-tone to the octave justly intoned scale. Bischoff's program constantly checks for the accidental occurrence of certain harmonies between Perkis and Horton, and marks or emphasizes the relationship by chiming an accompanying chord. This activity is typical of one of the basic strategies of League music: using mutual automatic "listening" or data communication to provide a layer of coordination to the "sub-compositions" that each player develops independently and brings to the group context. All sounds are square waves, filtered and run through analog envelopes in Perkis's case, and paired in slightly detuned chorusing voices in Horton's voice.

2 – ***Mar. 28, 1980*** - "Martian Folk Music", Ear Magazine benefit 7:40
home recording. Perkis/Bischoff/Horton.
As on several tracks, Bischoff's station is running his piece "Audio Wave", which does direct 8-bit audio sound synthesis with the KIM-1. "Audio Wave" was developed as a solo performance composition/instrument, and adapted for use with the League. The original performance gestures of pressing hexadecimal keypad keys are simulated by parallel port lines from Perkis' machine, which is running code similar to track 1, but with envelopes set to form percussive pulses rather than longer tones. Horton's melodic engine is interrupted and sent into glissandi by triggers from Bischoff.

3 – ***Feb. 18, 1979*** - Finnish Hall concert 3:38
Rich Gold, Paul DeMarinis, Jim Horton, John Bischoff
In this early recording, the founding trio is joined by guest Paul Demarinis, who was filtering both Gold's and Horton's voices through a band of computer-controlled analog filters. Gold was running his "Terrain Reader" KIM program, in which a virtual traveler traversed a loop through a virtual terrain at audio rates, and the elevations of this terrain defined an audio waveform; changes in this orbit were controlled by Gold manually and from data lines from Horton and Bischoff. Bischoff is running an early version of his pitch matching program (see notes track 1.)

4 – ***Oct. 18, 1980*** - part one - no title, home recording 5:38
Horton/Bischoff/Perkis
In a variation on the basic setup described in track 2, Perkis has added another voice of analog timbral punctuation, while the data lines connecting players in each station have been reconfigured to cause starts, stops and repetitions of each player's activity, defining a different and unpredictable phrasing structure. Analog tape echo has been added to Horton's voice.

5 – ***1981*** ?? (recovered from KPFA aircheck with no back announced info) 2:58
Horton/Bischoff/Perkis
Perkis has added Phase Lock Loop hardware, which attempts to harmonize with Bischoff's voice, at a pitch interval set by computer control. It does so imperfectly, sometimes failing to find the pitch and sliding in an attempt to lock on.

6 – ***May 25, 1981*** - part one - no title, home recording 3:21
Horton/Bischoff/Perkis
Similar to track 5, with Perkis tracking Horton instead of Bischoff.

7 – ***May 25, 1981*** - part two - no title, home recording 4:24
Horton/Bischoff/Perkis
This is an example of the mysterious emergence of patterns of influence beyond the intentions of the players. For configuration, see diagram [[League_dia.tif]].

8 – ***Nov. 26, 1978*** - Blind Lemon concert 5:18
David Behrman, Rich Gold, John Bischoff, Jim Horton.
This recording is from the first concert performance under the "League" name. Gold, Bischoff and Horton are performing software similar to track 3; Behrman is running a computer-controlled analog filter bank, which silently sweeps through the Horton and Gold's audio signals, and emits 'knocking' sounds and pulsed chord sequences based on the frequency distribution detected. (See diagram [[Lemon_BLemon_color.gif or League_BlindLemon_flyer.tif]])

9 – ***Mar. 28, 1980*** - "Pedal w/ Twitter" New College, EAR Magazine benefit 11:23
Horton/Bischoff/Perkis
Live concert recording. (Voices are inattentive audience members!) Horton plays a slow bassline.

10 – ***Oct. 18, 1980*** - part two - no title, home recording 6:51
Horton/Bischoff/Perkis
Here Perkis' state machine orchestra (see notes track one) plays in a scale derived from Javanese Gamelan, with Bischoff's "Audio Wave" tracking pitches.

Total time = 54:31

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Boundary Layer, the Hub, upcoming release Tzadik (2008)

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Biographies

James Horton (1944-1998) composer, electronic musician and philosopher, studied music in the early 1970s with Robert Ashley, and performed extensively with non-keyboard analog synths in the mid-70s. From 1976 until his death in 1998 he created a body of interactive algorithmic real-time computer music. He was a co-founder of the League of Automatic Music Composers, a member of RotaLeague, and a founding member of the Just Intonation Network and of the Cactus Needle Project. In 1995 he compiled a documentary history of contemporary and avant-garde music practice in northern California, available online at **http://www.o-art.org/history**.

John Bischoff (b. 1949) has been active in the experimental music scene in the San Francisco Bay Area for over 30 years as a composer, performer, teacher, and grassroots activist. He is known for his solo constructions in real-time synthesis and the pioneering development of computer network bands. He was a founding member of the League of Automatic Music Composers (1978) and he co-authored an article on the League's music that appears in *Foundations of Computer Music* (MIT Press 1985). He was also a founding member of the network band The Hub with whom he has performed and recorded from 1985 to the present. In 1999 he received a $25,000 award from the Foundation for Contemporary Arts (NYC) in recognition of his music. Recordings of his work are available on Artifact, 23Five, Lovely, and Tzadik. He is currently an Assistant Professor of Music at Mills College in Oakland, California.

Tim Perkis (b. 1951) has been working in the medium of live synthesized sound and video for many years, performing widely in North America, Europe and Japan. He is also a well known performer in the world of improvised music, having performed on his electronic improvisation instruments with over 100 artists and groups, including Chris Brown, Eugene Chadbourne, Fred Frith, Elliott Sharp, Leo Wadada Smith and John Zorn. Ongoing groups he has founded or played in include the League of Automatic Music Composers and the Hub — pioneering live computer network bands —and Rotodoti, the Natto Quartet, Fuzzybunny, and Wobbly/Perkis/Antimatter. Recordings of his musical work have appeared on a dozen European and American recording labels. (see www.perkis.com). He is also the director of *Noisy People* (2007), a feature-length documentary film on improvised music. (www.noisypeople.com).

Rich Gold (1950-2003) was an artist, composer, designer, lecturer and writer — equally at home in the worlds of avant garde art, academia and business. He worked at times for Sega, Mattel and Xerox PARC. His book, The Plenitude: Creativity Innovation and Making Stuff, edited by Marina LaPalma, was released in September 2007 from MIT Press.

David Behrman (b. 1937) has been active as a composer and artist since the 1960s. Over the years he has made sound and multimedia installations for gallery spaces as well as musical compositions for performance in concerts. Most of his pieces feature flexible structures and the use of technology in personal ways; the compositions usually rely on interactive real-time relationships with imaginative performers. Together with Robert Ashley, Alvin Lucier and Gordon Mumma, Behrman founded the Sonic Arts Union in 1966. Sonic Arts performed extensively in North America and Europe from 1966 until 1976. He was co-director of the Center for Contemporary Music at Mills College in 1975-1980. From the Foundation for Contemporary Arts he received two grants, one for music in 1995 and the John Cage Award in 2004.

Paul DeMarinis (b. 1949; guest artist on track 3) studied electronic music with Robert Ashley at the Center for Contemporary Music at Mills College and later worked with David Tudor. One of the first artists to use microcomputers, DeMarinis has worked since the late 1970's in the areas of interactive software, synthetic speech, noise and obsolete or impossible media. He is currently an Associate Professor of Art at Stanford University.