

III. Publications

THE AERIAL: A JOURNAL IN SOUND

Steve Peters, producer. Nonsequitur Foundation, P. O. Box 2638, Santa Fe, NM 87504, U.S.A.

Reviewed by Anthony J. Gnaazzo, 3840 Elston S., Oakland, CA 94602, U.S.A.

The Aerial, as described in producer-editor Steve Peters's introduction to *Aerial 1*, (*AER 1*) is "a journal in sound, an ongoing series of compilations to be published on a regular basis. . . . A place where different kinds of sounds that seem to go nicely together can do so". The journal is published quarterly.

The 32 selections in the first three volumes are, for the most part, original works produced, assembled, arranged or performed by their authors-composers.

The stylistic spectrum is broad with representative examples of text-sound, work for radio (*Hörspiel*), minimal drone electronics, warped blues, collage, 'start/stop' 1950s avant-garde, free improvisation, noise music (albeit mild), process pieces, documentary sound, sequencing, sampling and a couple of pieces that might be considered academic.

The instrumental combinations (or should one refer to them as sound sources?) are not those typically encountered on the insert cards of a compact disc (CD). Included are sources as diverse as solo cricket (Westerkamp: *AER 2*), *komungo* (a zither-like Korean instrument) (Kim: *AER 2*), long-string instrument (Fullman: *AER 3*), trombone-propelled electronics (Collins: *AER 3*), as well as didgeridoo, conch shells, gourds, synthesizers and the ever-present drum machine.

As one might expect, a collection as broad ranging as *Aerial* is certain to present a major quality-control challenge to the producer. Peters has done a good job of balancing the content of the individual volumes.

Malcolm Goldstein's "quemeragi: our breath as bones" and Rich Jensen's "Tolly" (*AER 1*) stand out as works for solo voice. Both are virtuoso pieces even though they inhabit opposite ends of the stylistic spectrum.

Goldstein's is a tightly organized text-sound work; Jensen's, a stream of con-

sciousness improvisation. Also notable in *AER 1* are Jerry Hunt's "Balabon (string)" and Christine Baczewska's "Day of the Dead". Other familiar names on this disc are author-composer Richard Kostelanetz, performance artist Stuart Sherman and poet Bern Porter.

Even though LaDonna Smith and Davey Williams's "Green Song" (*AER 2*) nearly continues too long, this parody of a warped blues vamp has a wonderful feel to it. Other familiar names on this disc are saxophonist Jon Raskin, composers Bob Davis, Jin Hi Kim and Anna Lockwood and environmental sound artist Hildegard Westerkamp.

The excerpt from Ellen Fullman's "Staggered Stasis" (*AER 3*) for her hybrid long-string instrument (wooden resonators fitted with long piano strings) is the most striking 'minimal' piece in the entire set of three CDs. A continuous drone, this piece restricts itself to an extremely narrow range, yet successfully explores a microworld of subtle nuance within this range.

Another familiar name on this disc is composer Nicolas Collins.

Nonsequitur Foundation also publishes *What Next? Recordings*, a series of CDs and cassettes exploring environmental sound, interactive electronics, new instruments and improvisation.

A 1-year subscription to *The Aerial* can be obtained from: Nonsequitur Foundation, P. O. Box 2638, Santa Fe, NM 87504, U.S.A., for \$40.00 (CD) or \$30.00 (cassette), add \$10.00 for overseas subscriptions.

NEWS OF MUSIC: ACCESS TO DISCUSSION AND INFORMATION

Music Program Zero, Bard College, Annandale-on-Hudson, New York 12504, U.S.A.

ELECTRONIC COTTAGE: INTERNATIONAL MAGAZINE

Hal McGee, ed. P. O. Box 3637, Apollo Beach, FL 33572, U.S.A.

Reviewed by Larry Polansky, Department of Music, Dartmouth College, Hanover, NH 03755, U.S.A.

When I was teaching at Mills College in Oakland, California, the graduate

students used the wonderful term 'music heroes' to refer to those among them who were always putting on complicated concerts, schlepping equipment, organizing performers and electronics for others' works, and, in general, perpetually exhausted but strangely happy while killing themselves for the pure love of music. The publications *News of Music* and *Electronic Cottage* fully deserve to be referred to by this same term.

The history of music publication in the United States is full of music heroes. William Billings, one of our first and greatest composers, published his own (highly experimental) works at his own expense. His *New England Psalm Singer* is said to be the first book of American music published in the United States (the paper was actually held up by the activities of the Boston Tea Party). Around the turn of the twentieth century, composer-activist Arthur Farwell and his pioneering Wa-Wan Press preaged the guerrilla activities of future composer-publishing endeavors like Cowell's New Music Editions, Ives's free 'public domain' issue of the *114 Songs* (now copyrighted and sold), Peter Garland's Soundings Press (which had its genesis in a class taught by Something Else Press founder Dick Higgins), my own Frog Peak Music (A Composers' Collective) and many others. All of these activities are money losing, backbreaking, frustrating, enormous fun and generally attempted by composers and musicians whose answer to practical questions is "how can I not do this?" or, to quote Ives, "It is a matter which lies between the composer and his own conscience, and I know of no place where it is less likely to be crowded."

The last 15 years have seen the growth of another type of experimental music broadside: independent publications about music, often published and edited not by composers but by committed music lovers. In a sense, these creative publications qualify as 'compositions' themselves. *OP* (published by John Foster and the Lost Music Network, hence the title: LMN-OP), which ran from the A through the Z issues in the late 1970s through the mid-1980s, established precedents for feistiness and original-

ity, and made do-it-yourself cassette production viable: everyone with a Portastudio (or worse) in their basement could be reviewed. *OP*'s coverage of 'independent' music (Foster's beautifully generic term) ranged from the most zonked-out post-punk surf-Nazi musicians in Dayton, Ohio, to more or less respectable college music professors in California. *OP* emphasized articles about music written by musicians. Regular authors included Peter Garland (on world music), Eugene Chadbourne, myself (on American musics) and many other active composers and musicians. No one believed that Foster would really stop with the Z issue (by that time *OP* had snowballed into a relatively major enterprise and had a fanatic following), but he did. *OP*'s progeny, *Opticon* and *SoundChoice*, have, in different ways, followed in Foster's visionary footsteps.

Today, literally thousands of fanzines crowd the alternative bookstores. Some exist only as electronic mail (like Fred Truck's *Performance Data Bank/Electric Bank*) or cassettes (like the *Telus* cassette magazine). Perhaps the mother of all fanzines is the awe-inspiring *Factsheet Five* (published by the indefatigable Mike Gunderloy), which exists as a kind of metapolemic of fringe-lore, a listing of everything. If you want to find out where to get a publication devoted solely to deconstructionist multimedia works about *Leave It to Beaver* on hologram-postcards, this is the place to look.

News of Music (published at Bard College, by the innovative Music Program Zero), falls somewhere between a photocopied fanzine and the *Journal of Music Theory*. Issues have included editors such as Sara Johnson, whose poetry and comments on visual art made the early issues particularly odd and enjoyable, and contributors such as Matthew Crain, Jill Borrer and Wayne Berman, and the coalition of Dan Sedia, Penelope Hyde and Tildy Bayar. *News of Music* has been influenced, but not dominated, by the ideas of Ben Boretz, represented in reprints and articles, since publication began. The editorial style is non-existent: anything goes. Material ranges from personal letters to drawings, scores, poems and concert and music 'reviews' that take quirky and refreshing forms. Some well-known and interesting composers and performers (like Guy Yarden and David Hender-

son) have passed through the ranks and left their marks, and non-Bardie kindred spirits like Warren Burt, Elaine Barkin and Kenneth Gaburo graced the pages of early issues. In fact, some of Burt's strangest and most revealing writings are in this publication.

What I like about *News of Music* is its refusal to impose style or restrict the form or even the subject matter of an article. When I read Sara Johnson or Penelope Hyde in the early issues, I rejoice at their complete lack of inhibition. Their writing makes me reflect on (and mourn just a bit) what happens to many artists as they move on to more 'serious' and 'carefully' produced endeavors. The most recent issues, No. 10 and No. 11, were the first to be (ominously) perfectly bound rather than stapled. They are (more or less) typeset and easier to read than their predecessors. They include more 'big names' than earlier issues (Gaburo, Barkin, Boretz, J. K. Randall, Carol Berge and others).

When I read the table of contents for No. 11, I felt a little sad until, near the end, I came across old friends like Matthew Crain (three short stories called "The Disease/The Lesson/The Tiny Spaces") and Sara Johnson (an illustrated story called "A Boy and His Dream"). I am glad that these two music heroes, and others like them, still live in these perfect-bound pages.

Where *News of Music* explores an almost childlike liberation from conventional musical bonds, *Electronic Cottage* blasts full-throttle into today's pluralistic, low-tech, hypermedia, telecommunicative electronic-music environment. Count the different typefaces (even on the covers), and you sense the music underground's lack of interest in comprehensibility or accessibility. In fact *Electronic Cottage* is about inaccessibility and the ascendancy of democratic music technologies (from the Portastudio to cheap MIDI devices and the modern). Each issue celebrates a different 'indie-cassette' mogul like Dave Prescott, Chris Phinney or Al Margolis. Articles are about groups and artists that I guarantee you have never heard of, with technological polemics like Mikal And's "Polyintermedia and a Strategy for Electro-magnetic Survival" (in which 'product' is spelled with a 'k'). If you are interested in groups like Illusion of Safety (an early *OP* stalwart) and Die Brucke Vivisection, companies like Harsh Reality

Music and Panic Records or experimental cassette-producing composers like Australia's brilliant Rik Rue or United States-based David Prescott, this is the publication for you.

Do not expect *Electronic Cottage* to provide explanation, readability or other concessions to the center. Editor-publisher Hal McGee is orthodox fringe, and *Electronic Cottage* reflects, in its editorial style and design, the catholicity of the media it chronicles. The design might be described as 'neo-pamphlet': turn a page, change a typeface. Freedom and pluralism are the foci and the intent might best be expressed by composer-guitarist Nick Didkovsky's simple credo: "move forward, move fast". Stapled copies of *Electronic Cottage* are in numbered editions of 1,000.

McGee, Hyde, Boretz and the others involved in these two publications are truly heroic. They do it from a sense of need, without regard for practicalities. These activities keep an important segment of our musical culture (barely) alive and (almost) well. Subscribe to them (*News of Music* seems to be free), ask your library to subscribe, buy extra copies, advertise in them—keep this heroic couplet going.

MUSICWORKS

Gayle Young and Lauren A. Pratt, eds. *The Music Gallery*. 1087 Queen St. West, Toronto, Ontario M6J 1H3, Canada.

Reviewed by Miguel Frasconi,
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Canada is a wide, open country. While its area is greater than that of the United States, its population is smaller than California's. And, of course, a large part of that population lives in cities (Toronto is more populous than Los Angeles). Even considering that two-thirds of the land is under ice and snow, that leaves a lot of wide, open space.

All that space cannot help but make an impression on a country's collective psyche. When I lived in Toronto in the late 1970s and early 1980s, the Canadian government was engaged in a great search for its cultural identity. Not that they were throwing money at everything new and different, but there was a certain openness and fearlessness that seems almost dreamlike compared to the

present age in this country. The funding bodies rewarded experimentation; the government embraced the cutting edge in all the arts.

This was the world into which *Musicworks* was born, 13 years ago. I hear from my friends up north that the government's cultural fearlessness is subsiding, but that is not apparent in recent issues of *Musicworks*. It is down to three issues a year, but each issue consists of a 70-page magazine and a 30-60 min cassette. Funding still comes from one provincial and two federal sources, but also from donations, subscriptions and advertising. To its credit, *Musicworks* has retained its openness; each of the issues I looked at (Nos 36-49) were filled with fresh and inspiring ideas.

The geography lesson supports these metaphors: Canadians can see farther distances than can Americans; they can hear sounds that are farther away; they can take in more varied and less extraneous information and get a larger overview of a situation. This, also, is what *Musicworks* does. It is not a 'new music' magazine but a 'journal of sound exploration'. It is not obsessed with its Canadian identity, but it selects subjects from around the world in a distinctively Canadian way. Most of the interviews I have read have been with American composers (Jerry Hunt, Nicolas Collins, R. I. P. Hayman and Pauline Oliveros, to name a few), but their nationality was not the point. These composers had in common a devotion to sound and a dedication to their work no matter how far from the mainstream it was.

Musicworks is about sound and all that sound involves, from the scientific to the social, from that which is considered ordinary in one culture to that which is considered bizarre in all cultures.

There have been articles about folk fiddlers from Newfoundland, the perception of long-distance sounds, sound archetypes in music, copyright issues involving sampling, Kurt Schwitters's sound poetry, the music of the Innuit, sounds and gestures, the folk performance art of Shaanxi, China, along with a regular column on time by filmmaker Steve Brakhage. This list may seem eclectic, but each issue is shaped around certain general themes, such as 'Globalization', 'Politics of Music', 'Phonomenascapes', 'Women Voicing' and 'Sounds of Invention'. In the most

recent issues, the themes seemed a bit obduse to the actual content, but this did not detract from the articles.

Nothing detracts from the cassettes. They have not been made merely to support the text. The examples are so well chosen, one could easily think of *Musicworks* as an audio magazine with text added. I am overjoyed to be able to *listen* to the music that I am reading about rather than having to intellectualize about what it *might* sound like.

The wonderful thing about the cassettes, and about *Musicworks* in general, is that they make available audio examples of these musics that would be impossible to find elsewhere, at least impossible commercially. There also is the larger strategy of grouping varied musics under one general theme. On the 'Globalization' cassette (No. 47), John Oswald's "Plunderphonics" uses musics from Michael Jackson to Stravinsky as sound sources for Oswald's own compositions; in "The Folk Artists of Shaanxi," music from the Chinese end of the Silk Roads, the first trading route between Europe and Asia, is embedded with old and established cross-cultural influences; and finally, a *gamelan* piece by composer Jody Diamond combines a traditional Javanese song and contemporary New Zealand poetry in a performance by an American ensemble, Gamelan Son of Lion.

As wonderful as *Musicworks* No. 47 is, the magazine takes the subject of globalization even further. Diamond's article, "There is No 'They' There", argues that it is no longer a case, in ethnomusicology, of 'us', from the West, studying 'them', non-Westerners. As our arts become influenced by 'them', some of us are shocked when 'they' are influenced by us. For better or worse, the borders are being blurred; we study them studying us studying them. . . . An article by South Indian master-drummer Trichy Sankaran about his two compositions for *gamelan* ensemble is accompanied by an excerpted score for one of his *gamelan* pieces. After an in-depth look at the folk instruments and artists of Shaanxi, there is an interview with master organ-builder Gabriel Kney. The issue ends with six pages of short reviews from various places in Canada and some from Europe.

To state it flatly: there is no better magazine covering the human interaction with sound.

SOUNDINGS PRESS

Peter Garland, publisher. P. O. Box 8319, Santa Fe, NM 87504-8319, U.S.A.

Reviewed by Carter Scholz, 2665 Virginia St., Berkeley, CA 94709, U.S.A.

Peter Garland's Soundings Press has been an important voice in American new music for two decades. Its publications include Colton Nancarrow's *Studies for Player Piano*, Paul Bowles's *Selected Songs and Concerto for Two Pianos*, *Winds and Percussion*, Jaime de Angulo's *The Music of the Indians of Northern California* (compiled by Garland), and 16 volumes of the periodical *Soundings*, which has chronicled new music by strongly individual composers who have little in common but their heterodoxy.

The earliest issues of *Soundings* reflect its origins in 1972 at the California Institute of the Arts (CalArts). Modeling *Soundings* to some degree on *Source: Music of the Avant-Garde*, Garland declared his intention to be even more eclectic by opening his pages to the currents of musical thought all around him, implying that 'the' avant-garde is a fiction: there are as many avant-gardes as there are composers.

CalArts was (and is) home to an innovative electronic-music program, to Javanese and Balinese *gamelan*, and to experimental theater and film departments. It would have been easy, even natural, for *Soundings* to narrow to the chronicling of this particular scene. But from the first, Garland kept a larger perspective by including work by an older generation of composers, including Dane Rudhyar, Lou Harrison, Harry Partch, Conlon Nancarrow, Silvestre Revueltas and Julian Carrillo. The common thread was their fierce independence. It is Garland's sure instinct for such authenticity that has kept *Soundings* significant for 20 years.

The composers published by *Soundings* over the years are incredibly diverse: Charles Amirkhahan, Robert Ashley, Jack Brice, Harold Budd, Malcolm Goldstein, Daniel Goode, Sarah Hopkins, Ingram Marshall, Gordon Mumma, Larry Polansky, Jim Pomeroy, Steve Reich, David Rosenboom, John Zorn—a complete list would take 10 times this space.

Garland's masters include Varèse, Nancarrow, Cowell, Partch, Cage and Tenney—composers whose work has

Centered on the reinvention of musical form by a close study of the material and, in a sense, the technology of music (in the sense of *techné*: art, skill, craft in work, or system thereof, not in the sense of up-to-the-minute machinery). There is a concomitant Undercurrent of social critique in much of this work (of Cage and Bartch most obviously), for to compose is to make an order, which implies a critique of other orders.

For me, the highlights of Sounding Press's career are the Nancarrow stu-

dies; Garland's own book of essays, *Americas* (now out of print); and *Soundings 13*, a 300-page issue devoted to the music of James Tenney, which is still the single most valuable resource on this important composer and his work.

Alas, *Soundings 16* is the last volume. Garland will stop publishing after two more books: his own *In Search of Silvestre Revueltas: Essays 1978-1990* and *Henry Cowell: Songs*. A recent issue of *Soundings* carries a poem by Leonel Rugama, a Sandinista leader

IV. Software

eters can be handled independently. For example, one can write a repeating rhythm as a loop, even if its pitches do not repeat.

Note-playing processes use '\$-words' to play notes and chords. A single word starts a MIDI note, computers the 'time-advance' to the next note and then ends the note. Other note parameters are obtained from local variables and auxiliary processes. '\$-words' also call FORMULA's synthesizer managers in order to allocate notes to MIDI channels, based on priorities supplied by the user. This can ensure, for example, that melody notes are not preempted by accompaniment notes.

Note-playing processes can be collected into groups. Any of these groups or processes can be controlled (e.g. killed, suspended or resumed) or given values for parameters such as tempo or volume. The user can supply values through the interpreter while processes are playing music. All note-playing and group

processes have 'slots', each of which can contain an auxiliary process. These are attached to a note-playing process either by embedded definitions at compile time or by interactive assignment (or deletion) from the interpreter in real-time.

There are three types of auxiliary processes:

1. Sequence generators supply a sequence of note durations.
2. Shapes supply volume control and articulation, and are defined as functions that evolve from an initial level to a final level over an interval of time. Larger shapes can be made by concatenating smaller shapes. Since shapes are procedures, they can compute their own parameters, use control structures and call other func-

FORMULA
(FORTH MUSIC LANGUAGE)
by David Anderson and Ron Kuivila.
Bradley Forthware, P. O. Box 444,
Mountain View, CA 94040, U.S.A.
\$85.00.

Reviewed by Jim Horton, 1914 Channing Way, #1, Berkeley, CA 94704, U.S.A.

FORMULA is designed for three basic but overlapping applications: programmed score interpretation, algorithmic composition and real-time interactive performance.

FORMULA is built on the Forth programming language and runs on Atari ST and Macintosh personal computers. Forth is a compact, efficient and extensible language that is well suited for music programming.

FORMULA adds many new functions and control structures to Forth, most notably event scheduling and concurrency. FORMULA typically controls an external synthesizer via Musical Instrument Digital Interface (MIDI).

FORMULA views music as a system of multiple concurrent processes. These are implemented by a software technique called multi-tasking. The computer switches quickly among different processes to give the effect that they are all running simultaneously. There are (1) background processes such as the Forth interpreter, (2) input processes that parse and respond to MIDI input, keyboard and mouse actions, (3) note-playing processes that compute and play sequences of pitches and (4) auxiliary processes that are attached to note-playing processes in order to generate duration, amplitude, articulation and tempo variations.

These processes can easily express concurrent musical voices, and param-

and poet cut down in his 20s by So-moza's National Guard. Rugama's last words were adopted by Garland as a motto: "Surrender? Me? Up yours!" No one is shooting bullets at composers in the United States, but the financial and cultural pressures toward various types of conformity are just as threatening to creative life. On the back of *Americas*, Garland quotes Parich: "The rebellion against this sort of thing constitutes a thoroughly moral stand. How can it be misunderstood?" *Soundings* will be missed.

tions. The volume of notes played by '\$-words' is the sum of up to two local volume shapes, two global shapes and a local variable, '\$-volume'.

3. Time deformations control tempo fluctuations or rubato via procedural concatenation. If different deformations are supplied to a note-playing process and its parent group, the output of the first is the input of the second. Therefore, every musical line and group of lines can have its own fluctuating virtual time.

There is a high level of well-thought-out detail implemented in FORMULA, which is described in the manual's 57 pages.

FORMULA has several strengths as a music language. The source code is supplied, and since almost all of its features are executable statements, they can be modified or extended by the diligent programmer-musician. It has a sophisticated event scheduler, which permits a highly efficient level of real-time interaction. New note-playing processes can be created quickly, and their output begins immediately. FORMULA's multitasking extends to the operating system, so that editing, disk access and even compilation can go on while MIDI events are being received and sent. This is especially important during rehearsal when networks are being debugged. FORMULA's main disadvantages are that the composer must have a high level of expertise in the Forth language, and sometimes it is difficult to debug interacting multitasking processes.

HIERARCHICAL MUSIC SPECIFICATION LANGUAGE

by Phil Mark, Larry Polansky and David Rosenboom. Frog Peak Music, Box A-38, Hanover, NH 03755, U.S.A. \$295.00

Reviewed by Peter M. Yodanis, Academic Computing Center, University of Virginia, Charlottesville, VA 22903, U.S.A. Email: pmj@virginia.edu

Most Musical Instrument Digital Interface (MIDI)-oriented music software is intended for persons unskilled in computer programming. Many musicians and composers working with computer-aided music are best served by such 'plug-and-play' programs, which are easy to use and produce results quickly. There are many such programs available, ranging in capability from toys to fully professional systems. However, each of these programs, no matter how capable, is necessarily infused with the biases of its designer or its perceived market, with little or no allowance for user-designed expansion or enhancement.

Hierarchical Music Specification Language (HMSL) is different. It is an extensible computer-programming language in which a composer can express and implement musical ideas and processes. Most important, the composer can add features to HMSL as needed. HMSL is open-ended and customizable and is not limited to MIDI; it can control any piece of equipment that might be plugged into the computer. There is, of course, a catch: in order to use HMSL effectively, the composer should be a fairly competent programmer—or know one. The idea behind HMSL is to provide programming composers and musicians with an interactive work environment that provides a set of general elements, yet encourages and facilitates customization as the needs of users grow. Thus, HMSL comes small from the factory but expands virtually infinitely to accommodate the imagination and ambitions of the individual user and the HMSL community.

Technically, HMSL is an object-oriented dialect of the Forth programming language, with a wealth of tools for the creation, management and scheduling of musical (and other types of) events and processes. Composers who want to learn HMSL should begin by learning Forth, then the basics of object-oriented program-

ming and, finally, HMSL itself. The HMSL Reference and User Manual contains many short tutorials and illustrative examples that will both brief the experienced programmer and serve as a fun introduction for the beginner through a learn-by-doing approach.

Central to HMSL's structure and function is the notion of hierarchy, i.e. a chain of command from higher, containing entities to subordinates or constituents. Particularly relevant to HMSL is the analogy of the orchestra. An orchestra consists of musicians, each of whom plays an instrument and reads from a score. Each musician has exclusive use of his or her instrument and score. The orchestra's conductor, in turn, directs the orchestra, setting the tempo, indicating changes in dynamics and so forth.

HMSL operates in a somewhat similar fashion. The composer arranges multidimensional 'shapes', analogous to scores. (A familiar musical 'shape' might use one dimension for melody, one for rhythm, one for harmony, one for articulation. The generalization of the 'shape' encourages less familiar uses as well.) These shapes are assigned to 'players', who are also assigned 'instruments'. These players can then be placed in 'collections', and these collections placed into larger collections (sections within orchestras, perhaps). Altogether, there are about eight major classes of hierarchy constituents, each of which specializes in a particular type of behavior. In addition, the user can create custom classes, either derived from existing ones or designed from scratch.

Another important aspect of HMSL is that of interaction. While HMSL is telling 'players' to play, it is also listening and responding to what it 'hears'. HMSL can read data from MIDI devices (e.g. an instrument's keyboard), from activity on the computer's screen (e.g. clicking a button with the mouse), from cues generated within the HMSL program itself or from any device attached to the computer. HMSL comes with a couple of screen displays for interactive control via the computer's mouse, and the user can design custom displays. HMSL's capacity for directed response to any detectable stimulus, combined with its hierarchical morphology, makes it ideal for live human-machine collaborative performance as well as composition and experimentation in the studio.

HMSL runs on Commodore Amiga and Apple Macintosh computers with at least 1 megabyte of memory. Some features of the current HMSL release include: graphic objects for the design of custom screens, a score entry system, a multitrack MIDI sequencer, standard MIDI-file support, user-determined scheduling (timing), including event buffering, support of Amiga local sound, support of Apple MIDI Manager (for sharing data with other Macintosh MIDI applications) and the ability to 'turnkey' applications so that they can run alone, without the HMSL environment. Full source code is supplied.

MAX: INTERACTIVE GRAPHIC PROGRAMMING ENVIRONMENT

by Miller Puckette and David Zicarelli. Opcode Systems, 3641 Haven Park, Suite A, Menlo Park, CA 94025-1010, U.S.A. \$395.00.

Reviewed by Richard Zornar, 11641 Amanda St., Studio City, CA 91604, U.S.A.

Max is a graphical music programming environment for people who have hit the limits of the usual sequencer and writing programs for MIDI equipment.

—Miller Puckette

I had long since hit those limits in my own work. I had been performing interactive computer music with the Macintosh for 3 years, trying to do interesting things with the pedestrian sequencer programs of the day. I was anxious to recapture the fluidity and serendipity of the electroacoustic improvisation I had been doing through the 1970s and early 1980s, using modular analog synthesizers and signal processors. But although programming tools did exist, I was shy of such powerful (yet arcane) development systems as Hierarchical Music Specification Language (HMSL).

Max swept away my diffidence the moment I saw it. The graphical programming interface insisted, "You can do this." I stopped using other Musical Instrument Digital Interface (MIDI) software almost entirely and concentrated on building my own software tools for live performance. That this can be done interactively and in real time is an essential part of the experience (Fig. 1).

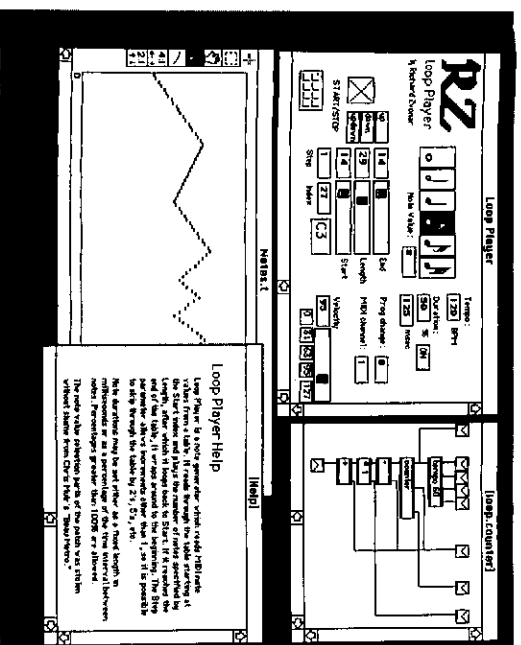


Fig. 1. View of computer screen showing loop program designed through Max, an interactive graphic programming environment.

Max is a software construction kit for real-time musical processes. It resembles a cross between an erector set and an object-oriented graphics program. The constructions that one builds with Max are called patchers,

and these are created within standard Macintosh windows. When a patcher window is open for editing, it displays a palette of object icons. Objects are selected from the palette and placed on screen by dragging them into position. They are connected to other objects by drawing a virtual patch cord from the outlet of one object to the inlet of another. Anyone who has patched a modular analog synthesizer will understand instantly how Max works.

Originally developed by Miller Puckette at the Institute de Recherche et de Coordination Acoustique/Musique (IRCAM) in Paris, current development is in the hands of David Zicarelli, with contributions by Chris Muir, Adrian Freed and others. Max is named in honor of computer music pioneer Max V. Mathews. Its modularity and patching design owe much to the unit generators of Mathews's 1960s Music V; its real-time emphasis owes much to his 1970s Groove software (one of the first interactive computer music and graphics performance systems).

Max includes more than 150 objects, ranging from simple arithmetic and logical operators to timing functions and complex mechanisms such as a 32-track event sequencer and a score follower. A number of objects are dedicated to handling MIDI data. Other objects are dedicated to user interface functions; these include sliders, knobs, switches, buttons, pop-up menus, a piano-style keyboard and

visual display objects like light-emitting diode (LED) indicators and a scrolling graphic window.

Objects communicate with one another by passing messages, either through graphic patch cord connections or by means of 'send' and 'receive' objects. A message can be a single number (integer or floating point), a list of numbers, a text string, or a 'bang' (a simple trigger or timing command). Text messages, such as 'start', 'stop' or 'clear', are understood as commands by certain objects. There are objects to generate and format messages, and objects to capture, store and retrieve messages. Numbers, bangs and text messages can be freely mixed in many cases, and an object can both accept a variety of message types in its inlets and send different message types out different outlets.

This flexibility of message handling is one of Max's most powerful features—as are encapsulation and extensibility. Any group of objects can itself be used as a Max object. It can be embedded in another patcher and connected to other Max objects or subpatchers. One can thus build a personal library of custom objects. And if some need cannot be met by encapsulating stock Max objects, one can create 'external' objects in the C programming language; development materials are provided for this purpose. External objects have been written to control such non-MIDI hardware as the Apple CD-ROM drive, the Pioneer 4200 laser disc player and various Motorola 56000-based digital-signal processors, including Digidesign's Sound Accelerator and Audiomedia cards. Any device that can be con-

trolled by a Macintosh can be controlled by Max, provided someone creates the necessary interface object. The 563-page manual contains an excellent tutorial with demonstration files on disk, a reference section in which each of Max's objects is explained in detail and an appendix, "Writing External Objects for Max." Despite its size, the manual is clearly written and sensibly organized.

Even without the manual, Max is easy to learn and use, thanks to a complete set of online help files. If at any time you need information on a particular object, simply option-click on that object. This will open a 'help' window containing explanatory text and a fully functional patcher that illustrates the object in question. In addition to the help files, each object has optional 'assistance', which identifies the function of an inlet or outlet whenever you position the cursor over one of them.

What kinds of things might one create with Max? Recently I have marveled at a control interface for the TC 2290 digital delay, which allows all of its sampling and signal-processing parameters to be controlled via system-exclusive messages triggered from the Macintosh keyboard (Zvonar); a patcher that permitted soprano Pamela Z to control the motion of her own image on a laser disc by singing certain tones into a pitch-to-MIDI converter (Zicarelli); a sound spatializer that permits the performer to circulate sounds from two samplers through an eight-channel sound system, controlling levels in four MIDI-controlled mixers (Packer); an interface between a Mattel Power Glove and a speech synthesizer, that lets the performer control voice inflection by hand gesture (DeMarinis); and a pattern-recognition network that can recognize and respond to the ornamental pitch inflections of an acoustic stringed instrument (Wessel).

The biggest problems I find with Max are: (1) copy protection, (2) large memory requirements and associated load times and (3) the lack of a compiler for Max developers to create stand-alone applications.

However, as one who has used Max for more than 2 years and who has watched it grow from a rather funky alpha version to the current release, I have abiding faith in the development process.