Reviews: Alesis 1622 Mixer, Roland Computer Music System, Tascam MIDiiZER

Electronic Musician

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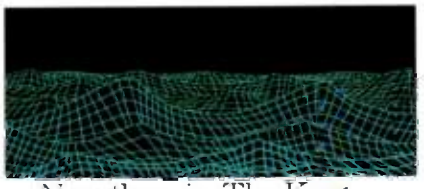

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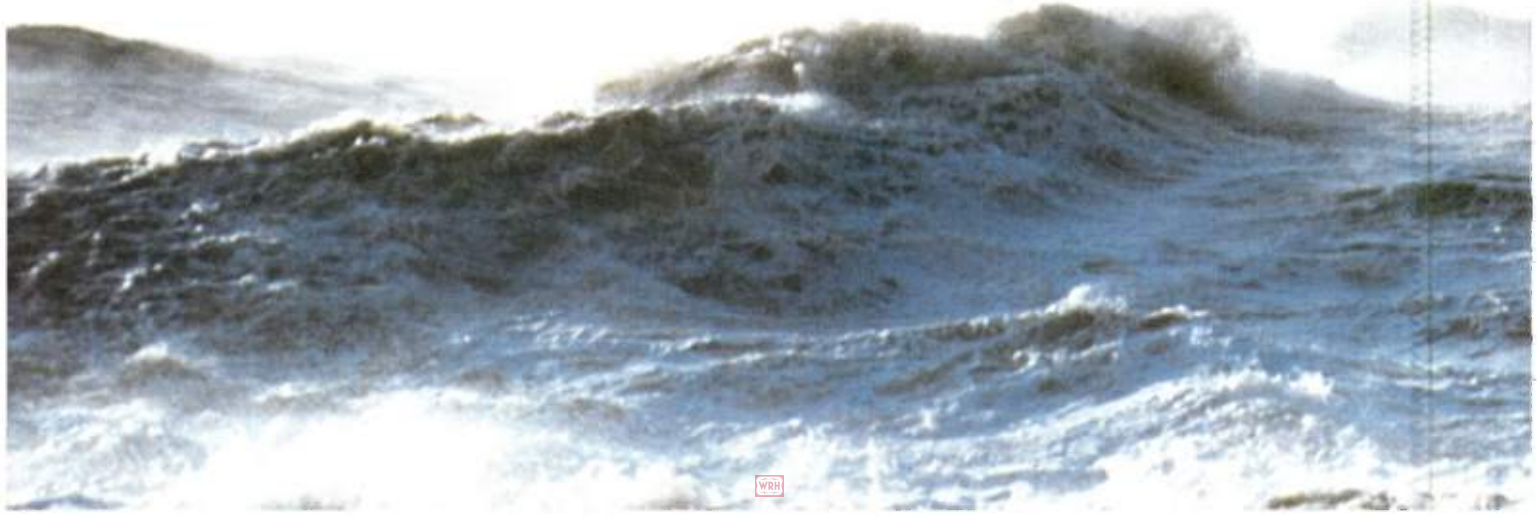

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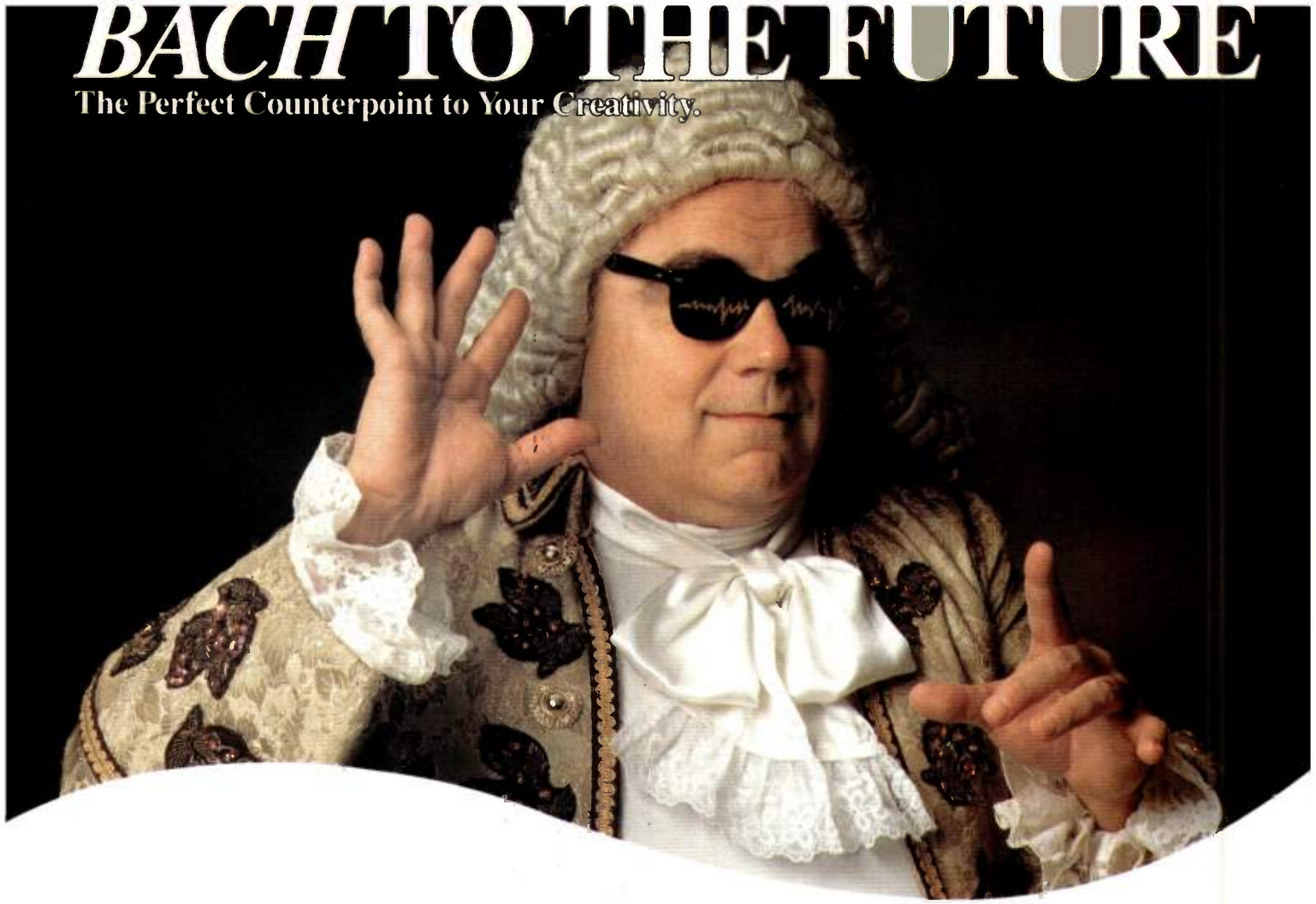

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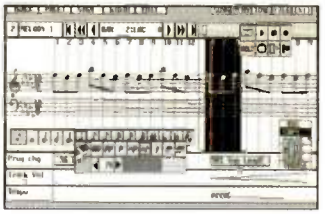
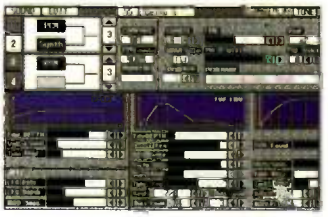
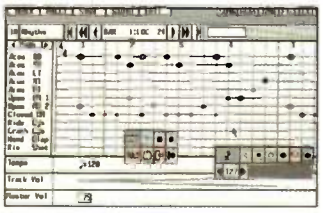
Song Mode There's no need for complex computer commands—enter notes or changes directly into the score with either a mouse or keyboard.



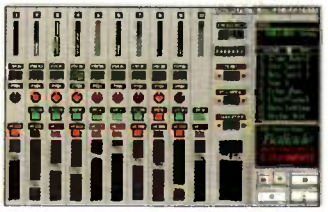
Tone Mode Bring to life the sounds you imagine, then save them to disk. Lets you see the tones graphically for quick, easy modification.



Rhythm Mode From tympani to tom-toms, you can mix and match a full range of percussion sounds in any rhythm or sequence.



Play Mode Create a full symphonic sound with 8 separate tracks. Lets you fully control playback speed, volume, panpot and reverb.



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Electronic Musician

AN ACT III PUBLICATION
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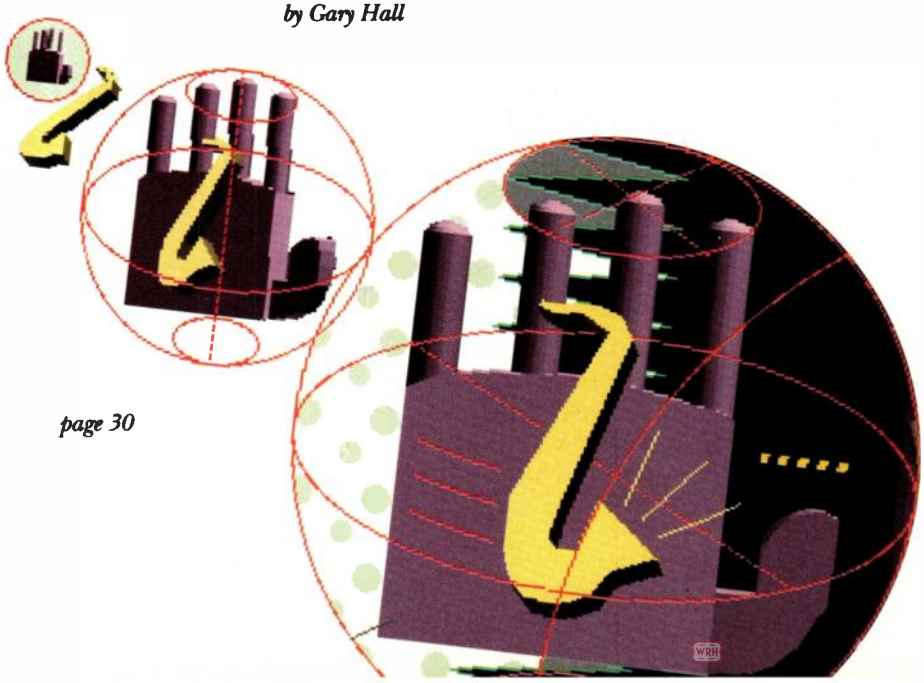
features



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Cover: Photograph by Jeffery Newbury. Special thanks to Jaron Lanier and VPL Research for use of the DataGlove.

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A Call to Action

The time is ripe to create a unified industry organization for manufacturers of high-tech musical instruments, music software, and recording equipment.

If you follow the activities of the high-tech segment of the music industry, you probably know changes are afoot. The marketplace for electronic music and recording products has begun to evolve and mature, and the primary difference seems to be that today's customer profile is dramatically different than the typical equipment-hungry professional musician of old.

But in spite of the apparent saturation of this pro-level market, tremendous opportunities lie waiting for electronic musical instrument, music software, and recording equipment manufacturers. In fact, there are probably still hundreds of thousands of potential customers who would love to jump into electronic music-making if they only knew where to begin.

Several manufacturers have recognized this large potential market, and a few of them (notably Roland and Yamaha) are actively pursuing it. But as noble as these individual efforts may be, it's going to take a unified industry campaign to really make the kind of impact the business needs to move beyond its current borders.

Unfortunately, unlike other segments of the musical instrument business, the high-tech companies lack an industry association to implement such a plan. The MIDI Manufacturers Association (MMA) provides some industry interaction but that is not, nor should it be, the organization's primary purpose. What's required is a true industry trade association, dedicated to the specialized and unmet needs of the high-tech and recording segments.

The benefits of such an organization could be enormous. In addition to efforts directed toward market expansion, a high-tech industry association could also fund industry-specific research projects; gather, analyze, and distribute existing sales figures; sponsor large booths at non-music industry conventions, such as COMDEX and CES; produce and present educational seminars for music educators, and other interested parties; act as a strong force when negotiating and/or interacting with NAMM, other industry groups, and the general media; and provide a forum where industry members could discuss common concerns and share ideas.

A great deal of time and energy (as well as a decent bit of capital) must be spent in order to get a worthwhile organization off the ground, even with enthusiasm from all parties. The creation and adoption of MIDI, however, proves that this industry is capable of achieving idealistic goals.

So, where do we start? An obvious point of departure would be to discuss the possibilities. **EM** is willing to act as an initial clearinghouse for ideas and comments about a possible organization, but we know full well that the only way substantial developments will take place is if the industry players begin a dialog of their own.

With the types of changes now occurring in the marketplace, there's an urgent need to band together as an industry to create a powerful organization that can benefit from the shared knowledge of its members. It's time.

▼▼▼

On an unrelated note, the entire **EM** staff is pleased to announce that the magazine recently received a Western Publications Association (WPA) Maggie Award, which is like a West Coast Emmy for magazines. **EM** won the Best Special Interest Magazine Award, an honor that recognizes overall excellence in editorial, art, and marketing, for the October 1989 issue. We also received nominations in four other trade magazine categories, including Most Improved Publication, Best Color Layout, Best Single Illustration, and Best Photograph.

Bob O'Donnell

Electronic Musician

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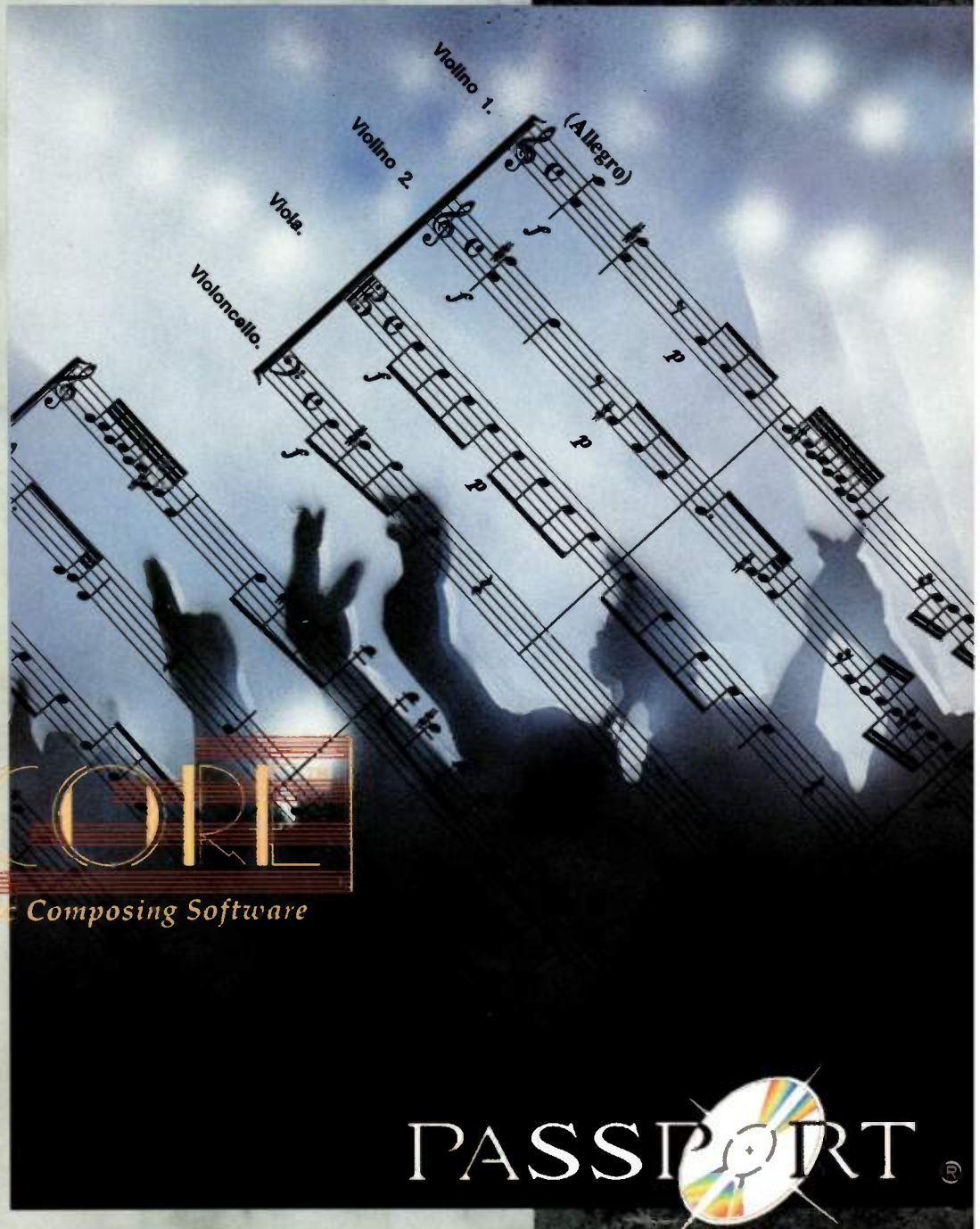

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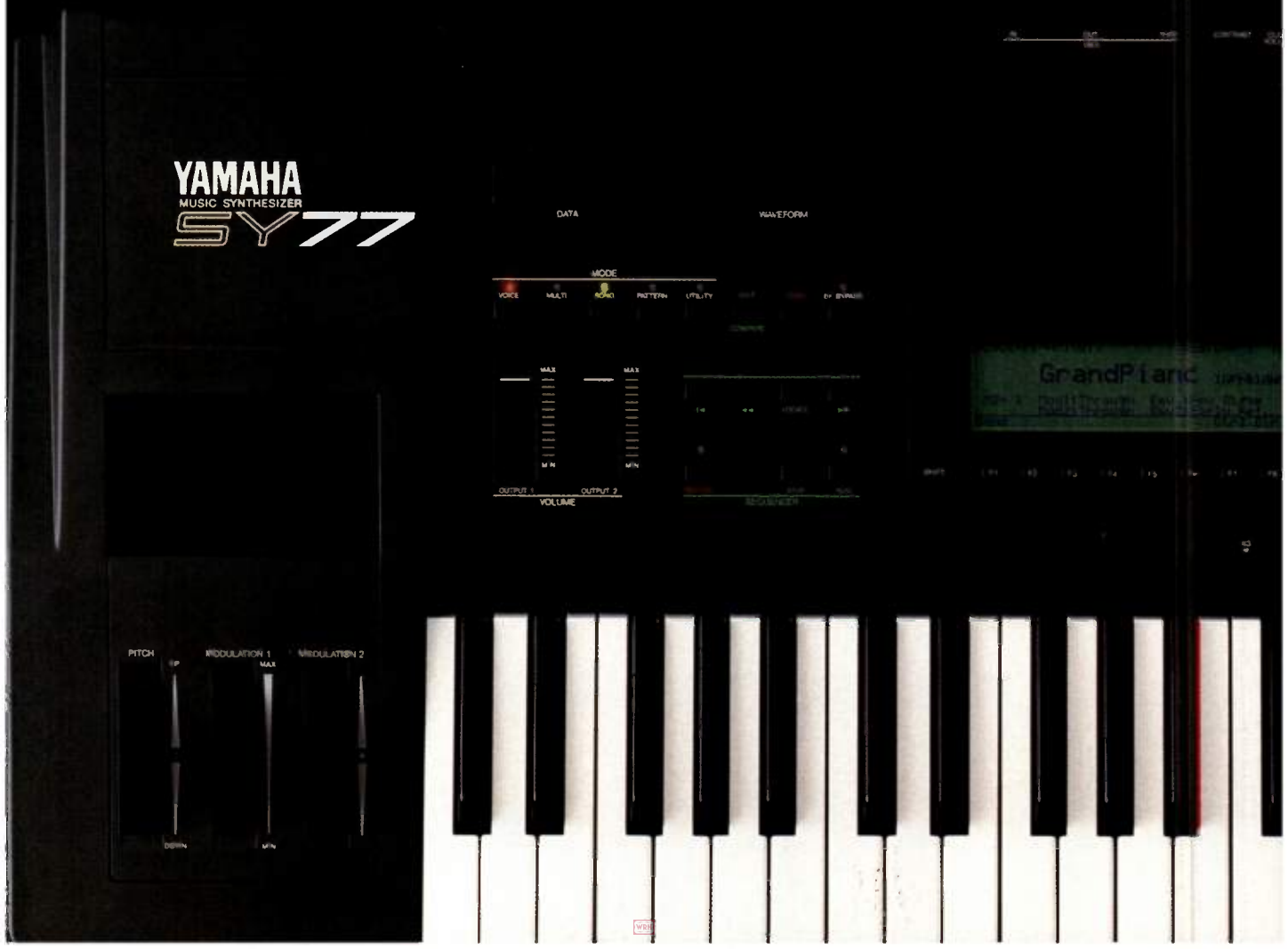


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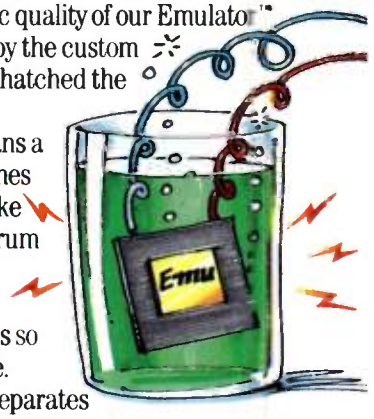

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Our readers inquire about damaged magazines, and discuss recording mixers, amplitude modulation, and *Encore.*

WRAPPED OR RIPPED?

I noticed that the last two or three issues were sent in plastic wrappers, which impressed me enough to renew the subscription (not to imply I disregard the magazine itself). I like the idea of being able to receive a quality magazine in quality condition through the mail.

As you may have already guessed, I received the April issue today. It was not in a plastic wrapper. The corners are mutilated, the top of each page is torn or creased, and the back few pages and cover are obliterated! Granted, this is not **EM's** fault. The finger of blame most likely goes to the U.S. Postal Service. Yet, I cannot complain to them; they don't care and won't change. But you should care, because I'm a paying customer. I enjoy this magazine immensely, but I can't pay for something that comes in this condition.

Ronald J. Zalecki, Jr.
Ohio

Ron—Thanks for writing; your letter brings up a number of points I'd like to address. First of all, any time you (or any other subscriber) receive a damaged issue, you're entitled to a complimentary replacement issue. Just call our circulation fulfillment company at (800) 888-5139, and we'll mail you one first class, in a sealed envelope. If you consistently receive damaged issues, you should contact your local post office to put a "postal watch" on your issue of **EM**, *and they will try to give each one a little more care.*

The issue of plastic bags, or "polybags," as they're called in the business, is a bit more difficult. We've had numerous in-house discussions about their pros (improving the condition of mailed issues) and cons (a negative impact upon an already suffering environment, and additional costs). At present, only the last two issues of a subscription are polybagged because we include subscription renewal notices with them that are outside the magazine itself. Environmental concerns are very important at **EM**, *however, so we don't plan on using polybags for regular issues. We are investigating a different means of bundling the issues before they're sent from the printer to the post office and hope this will help alleviate damage that's occurring to some copies.—Bob O'D.*

IN DEFENSE OF ENCORE

I must disagree with Wheat Williams' rating of *Encore* in the May, 1990 issue of **EM**. I do agree with him in part: *Encore,* at the moment, is not perfect, nor is it as notationally gymnastic or complex as programs like *Finale,* but most musicians seeking smooth-running notation programs are not writing Stockhausen-like scores. I feel *Encore* fills the niche of the "every man" composer in the main components of any piece of software: speed, accuracy, and friendliness.

One of the most important items Wheat mentions is often overlooked as a software feature: company support. As he says, "On the plus side, Passport is admirably responsive to user feedback." Even the best program can be frustrating, short-lived and useless without frequent (and free) updates and company support.

Wheat complains about the price ($595). In comparison, *Finale* is $749, *Personal Composer* for IBM $495, *Notewriter II* $495, and *Score* $795, to name some of *Encore's* competition. I would pay $595 for a program that, because of its speed and ease of use, will save me hours of hassle and burnt-out brain cells.

He complains, "In my experience it is problematic to try to create notation by importing or recording real-time MIDI data into *Encore* because its quantization and alignment methods are not reliable." So far, *Encore* has the best and fastest MIDI data and transcription interface I have used. True, there will be mistakes, but any user of any program must remember that translating human performance of audio signals into a 1,000-plus-year-old graphic representation of those signals is quite a jump.

In my experience, no notation program has the speed and intuitiveness of input as *Encore.* A local music teacher, with no experience on the Macintosh, was able to enter and print out music on her own with approximately 4 ½ hours of training. I am finding the yardstick for measuring the worth of a notation program to be how easy it is to manipulate note data and notated information once it is on the screen.

The bottom line: for a review that admits "*Encore* achieves speed... sequencer files are imported in seconds... window-scrolling and screen redraws are downright breezy... Encore impressed me by transposing the notes perfectly when the clefs were changed... *Encore* is intuitive... you can learn to use it in a couple of days, not months," and "not copy-protected," I feel an overall summary rating of 5 is unwarranted. I am certain that as the

program is refined even more, it will become the notation program of choice for many musicians.

Dan Van Oss
Iowa

Dan—Normally, we would ask the author, Wheat Williams, to respond, but I can answer you from my experience with Encore. *The program shows great promise, and much of what you say has merit. To start with, it's fast, easy to use, and not-copy-protected. As promised, Passport is slowly getting* Encore *where it should be.*

However, I worked with most of the same versions the author worked with, 1.0.5, 1.0.7, and 1.2 (which was reviewed). Before we published the review, I confirmed almost every complaint and "bug" reported in it (running Version 1.2 on both an SE/30 and a 68020-based Mac II). I have a hard time defending a program in which I had to save after nearly every action because it crashed so often when I used simple menu selections and click-and drag operations that I never knew when I would lose my work. As to MIDI files, I had occasional problems importing quantized MIDI files from Opcode's Vision, *yet Coda's* MusicProse, *among other programs, imported the same files with no problems.*

Wheat Williams endured an extremely difficult struggle with a not-quite-ready program and realized he would be heavily criticized for his work. Encore *will be a fine program, and my initial impressions of the latest version (1.2.9) are positive. In my opinion, although they are handling the situation with grace and class, the good folks at Passport served this wine before its time. Under the circumstances, while an overall rating of 5 is harsh, as the primary editor of the article, I'm willing to stand behind it.—Steve O.*

ALL THINGS IN MODULATION

In the March 1990 issue, p. 110 (the review of the Kawai K4), the author writes that "any waveform can be amplitude-modulated against another (ring modulation), providing sum and difference harmonics." Don't you mean "balanced" modulation?

Jim Riter
Texas

Jim—It turns out that this is a case where everyone is wrong. To answer your question first, a balanced modulator is a ring modulator, but a ring modulator is not necessarily a balanced modulator. The term "balanced" refers to a specific condition in which both inputs to a ring (four-quadrant) modulator are free of DC content. This results in the elimination of the input signals from the output, leaving only the modulation products. An inquiry to Kawai revealed that, although the manual repeatedly refers to the K4's modulation function as a "ring modulator," in fact, it is a one-quadrant digital amplitude modulator that operates on two unipolar input waveforms, with values from 0 to 100. A true ring modulator would have source and output signals with bipolar values, i.e. -50 to +50. The typical analog VCA-type modulator is a two-quadrant device that operates on a bipolar carrier (audio) signal with a unipolar modulation program. This may sound like nit-picking, but the resulting spectra are profoundly different in each case.—Gary H.

MIXERS ON THE ROAD

In his sidebar "Recording Versus Sound Reinforcement Mixers" (May 1990 **EM**, p. 58), Steve Oppenheimer states that "recording consoles... are less roadworthy than sound reinforcement boards due to the extra electronics." This is not true anymore for products from major manufacturers. That's a prejudice hanging over from long ago. There are plenty of recording consoles in daily use on the road, and the good ones hold up just as well as those designed for reinforcement only. (A number of us can testify to that from personal experience, as well as from customer feedback.) The main difference between recording and P.A. mixers is not ruggedness, but that a recording console has to route differently for tracking, overdubbing, and mixdown, while a P.A. board just needs to do mixdown.

Since most people can't afford two mixers, some manufacturers responded by designing "hybrid" consoles. These units have ¼-inch phone jacks on inputs and outputs for compatibility with stage equipment and mono outputs for P.A. Live engineers can use the multiple assignments (which normally feed tape tracks) as subgroups to a stereo or mono P.A. system, so all the vocals can be on one fader, all the drums on another, etc. The monitor section and PFL/solo keys are useful for tracking down problems and checking stage mixes. The tape returns act as additional mixer channels for effect returns and line inputs.

The expanded capabilities of a recording console, if you exploit them for a live situation, can really be useful. Using a P.A. console for recording, on the other hand, has lots of pitfalls and restrictions. So don't be afraid to put a recording console into a road case and take it with you when necessary.

Dan Tinen
Tascam
California

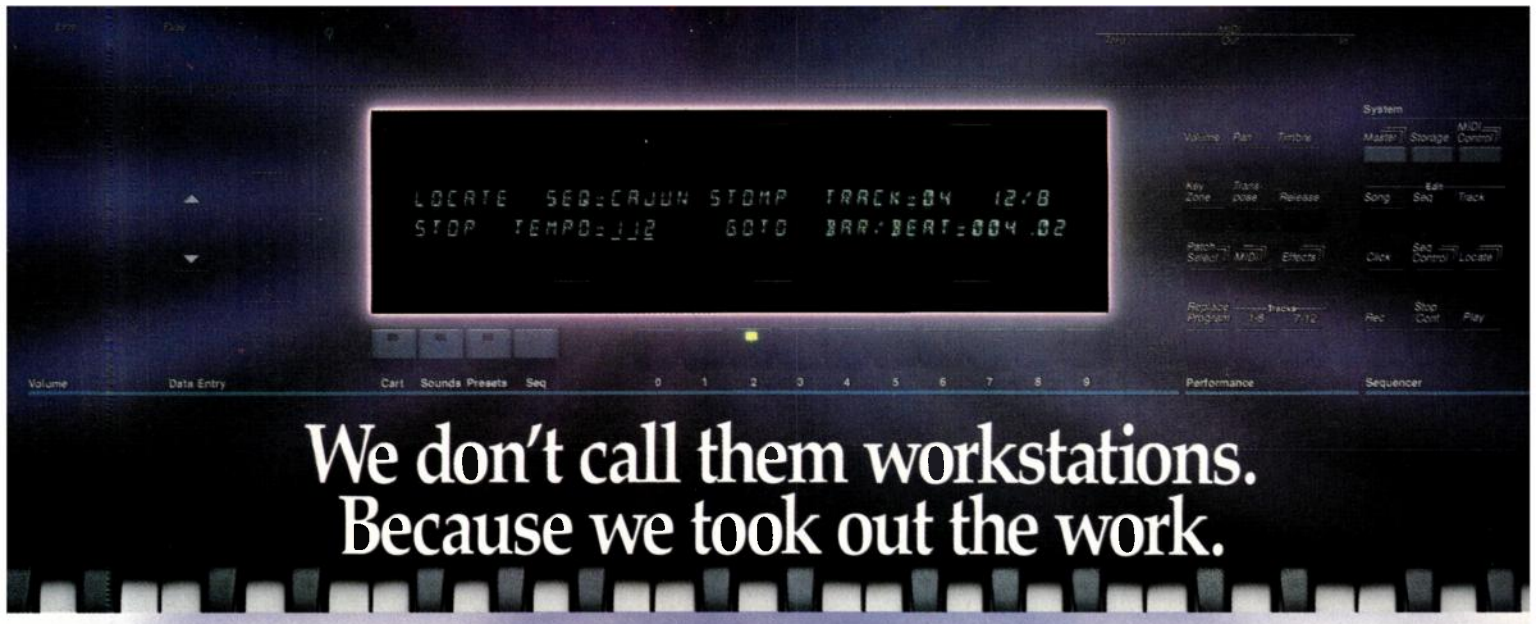
Dan—I never said that roadworthiness was the "main difference" between the two types of mixers, and I think we agree on what the main differences are. With regard to your primary point, I prefaced my remarks by noting "this is a rough generalization," and it's true that most recording consoles are roadworthy now. Hybrid boards are becoming common, too, and many of them are excellent. There are exceptions: According to David DeLeon of Soundcraft, sheer size (as much as fourteen feet wide) and number of connections makes some large recording boards poor candidates for the road unless they are installed in a mobile studio for remote recording. For the most part, though, my comment appears to reflect an outdated idea, and your point is well taken.—Steve O.

ERROR LOG

March, 1990, "The MIDI Volume Fader," p. 76: (a) The schematic shows two resistors labeled R6. The R6 that is connected to pin 21 of IC3 (the IM6402 UART) is actually R3, with a value of 1MΩ. (b) In the parts list, under "Semiconductors," the second entry should read, "XTAL...1MHz crystal." A typographical error caused this to appear as part of D1.

May, 1990, "The MIDIverb 'Echo Unit' Mod," p. 88: Figure 4 is misleading. The correct pad to which you solder the jumper from the MIDI thru jack may be found between the letters "I" and "D" of the designation "SOLDER SIDE" printed on the circuit board.

May, 1990, "Recording Versus Sound Reinforcement Mixers" sidebar, p. 58: "Snapshot animation" was supposed to read, "Snapshot automation." Also, on p. 56, the pull quote should read, "powered mixers." A "lowered" mixer is what you get when you hand the board down from the equipment van to the dolly. ■



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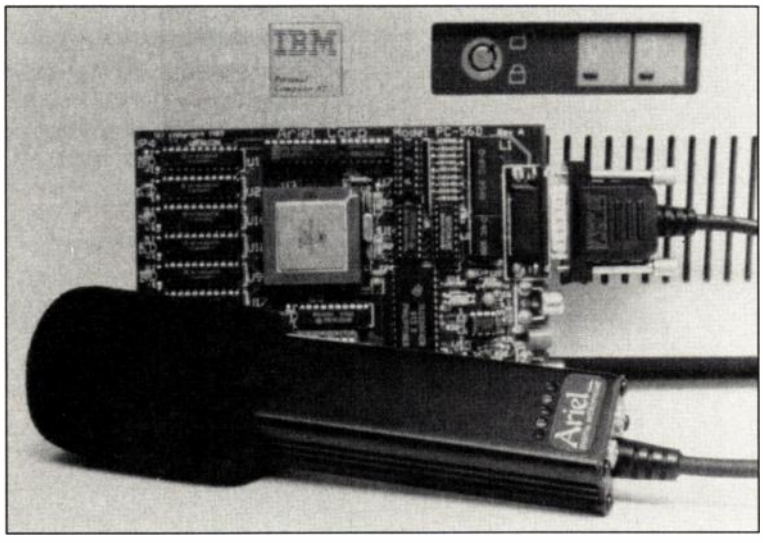
- Tune instrument to IPS-33B or vice versa
- String synthesis
- Two continuous controller inputs
- 32 character backlit LCD display
- Remote hand controller included
- 20 Hz to 20 kHz bandwidth
- 90 dB signal-to-noise ratio
- Less than 0.03% THD

Rent the Super Harmony Machine demo video for $10.00 refundable deposit. Send deposit to the address shown below.

DigiTech
5639 South Riley Lane
Salt Lake City, Utah 84107

DigiTech®
The Sound of the 90's
A Harman International Company

An innovative MIDI controller, an automatable switching system, rack-mount mixers, and a variety of software found their way into this month's bevy of new products.



Ariel PC-56D and Digital Microphone

SIGNAL PROCESSING

Ariel has announced two IBM PC cards, the **PC-56D** and **DAT-56** ($895 and $1,995, respectively), that use the Motorola 56001 digital signal processor (DSP). Both boards can connect to Ariel's DM-N digital microphone (see the December 1989 "What's New"). The PC-56D provides one 56001, 24-bit analog I/O, 192 KB of RAM, and a high-speed serial channel.

The DAT-56 is a DSP development system board that uses the AES/EBU interface in either coaxial or optical form. NeXT-style DSP port and a SCSI interface are optional. DAT-56 also comes with DSPnet, a parallel interface that allows connection of multiple DSP boards or other peripherals.

Ariel Corp.
433 River Rd.
Highland Park, NJ 08904
tel. (201) 249-2900

Aphex presents the **Expressor** compressor/limiter ($495), a single-channel unit with adjustable input, threshold, attack, release, output, and compression ratio, as well as hard- or soft-knee compression, link, and slave. The Expressor offers adjustable high-frequency expansion, a patented feature that counteracts the dulling effect of high compression ratios. The Spectral Phase Refractor feature, also present on

Aphex Expressor

Aphex's Aural Exciter Type III, increases the apparent bass energy level without actually boosting the amplitude of the bass frequencies.

Aphex Systems
11068 Randall St.
Sun Valley, CA 91352
tel. (818) 767-2929

ALTERNATIVE CONTROLLERS

Sensor Frame Corporation announced the **VideoHarp** ($4,500 to $7,500, depending on configuration and options), a controller that uses a single, optically sensitive, integrated circuit "eye" to scan ("see") the player's fingers. The VideoHarp then translates moving images of the fingers into MIDI data. The 15-pound, strap-on, harp-shaped controller does not contain a sound module but communicates via MIDI in, out, and thru ports and an optional RS-232 port. A VHS videocassette demo is available for $20.

Sensor Frame Corp.
4516 Henry St.
Pittsburgh, PA 15213
tel. (412) 683-9500

SIGNAL PROCESSING/ SWITCHING

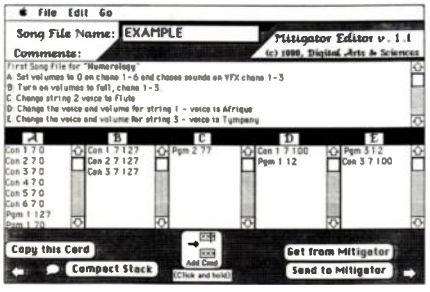
Uptown Technologies introduces **Flash** ($499), an audio switching, layering, and routing system that can be controlled manually or via MIDI. The unit has two opto-isolated, passive mixing buses, creating an 8 x 2 network. The unit's audio circuits are bidirectional, i.e., the same jacks may be either inputs or outputs, which permits sixteen configurations from the front panel and 256 via MIDI. In addition to carrying audio signals, Flash can switch voltages up to 50V (if the power is under 0.1W), so it can handle control voltages and route SMPTE time code. In addition to controlling the various switching functions, and muting, MIDI features include MIDI merge, local on/off, and selectable high/low MIDI range (which enables you to control two Flashes, independently, on a single MIDI channel). The unit includes a muting switch

(which can be configured as a momentary mute); a tuner output; front panel, level-adjustment pots with -10 dB trim button; and a jack for an optional, high-impact, remote footswitch said to be mechanically silent ($150). According to the manufacturer, Flash's noise floor is -108 dB (quieter than a compact disc), THD is too low to be measured, and switching is free of dropout, clicks, and pops.

Uptown Technologies, Inc.
PO Box 3111
Madison, WI 53704
tel. (414) 473-1088

SOFTWARE

Mitigator Editor 1.1 ($35 plus $2 s/h) is a HyperCard-based editor for Lake Butler Sound's MIDI Mitigator MIDI footswitch and pedal controller and the Macintosh computer. In addition to providing full-screen editing, the program allows the user to add comments of unlimited length to each setup,



Mitigator Editor 1.1

providing an automated documentation system. The program requires 1 MB of RAM and HyperCard 1.2 or later.

Digital Arts & Sciences
PO Box 21354
Oakland, CA 94620
tel. (415) 652-2867

Master Tuner ($99.95) provides visual tuning for acoustic instruments on the Macintosh Plus, SE, or II series computers (with System 6.02). Using an audio digitizer (such as Farallon's MacRecorder, which is not included), *Master Tuner* "listens" to the pitch and displays a tuning scale for the note. As you tune, a trace line shows how flat or sharp you are. The program supports modern and historical temperaments. An analysis feature displays the waveform. *Master Tuner* also provides reference tones with sampled (including user-sampled) sounds.

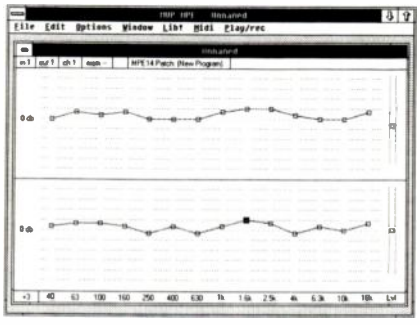
Andromeda Computer Systems, Ltd.
8043 33rd Ave. NW
Calgary, Alberta
Canada T3B 1L5
tel. (403) 247-5300

With *SysExGS* ($34.95), Apple IIGS users can transfer MIDI sysex messages up to 32 KB in length between the computer and their MIDI gear. A built-in text editor permits you to type in information for each message and save it to disk with a unique name. The program, which is not copy-protected, requires *GDOS* 5.0 or later and 768K of RAM, and works with both external and internal MIDI interfaces, using the printer or modem port.

Lindsay Hough
PO Box 212
Slingerlands, NY 12159

Playroom Software is shipping editor/librarians for the IBM PC and Yamaha C1. ***MVP-LXP5*** supports the Lexicon LXP-5 digital effects processor, ***MVP-MPE*** supports the Rane MPE-14 and MPE-28 MIDI-programmable equalizers, and ***MVP-KMX*** supports the KMX MIDI Central programmable MIDI patch bay. Each of the three programs allows you to edit up to eight patches simultaneously, and changes are made in real time for immediate audition. Undo and Compare features are provided.

Playroom Software
7308-C East Independence Blvd., Suite 310
Charlotte, NC 28227
tel. (704) 536-3093



Playroom Software MVP-MPE Editor/ Librarian

INSTRUCTIONAL VIDEOS

First Light Video has added two new instructional VHS videotapes to its "Shaping Your Sound" instructional series ($59.95 each for the individual study version, $119 for the professional version). Three tapes in this series were reviewed in the Sept. 1989 EM. ***Shaping Your Sound with Multitrack Recording*** is a step-by-step guide that demonstrates techniques for clean recording, creative editing, tape effects, and more. ***Shaping Your Sound with Mixers and Mixing*** discusses the features of recording consoles and the decisions and choices of a 16-track mixing session, including the use of EQ, reverb, and dynamics processing. Each 80-minute tape includes musical examples, demonstrations, and computer animations.

First Light Video Publishing
374 North Ridgewood Pl.
Los Angeles, CA 90004
tel. (213) 461-1085

SOUNDS

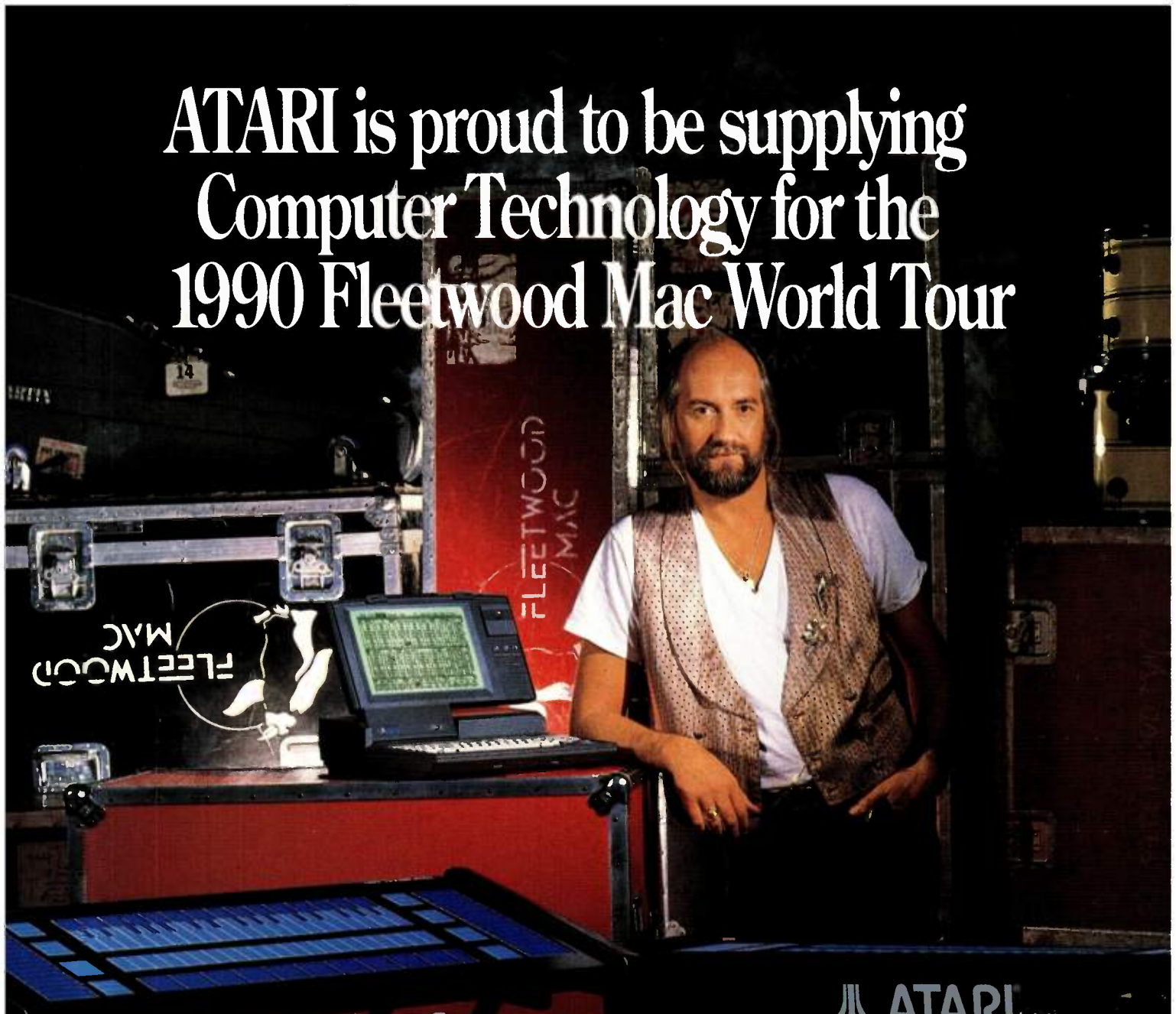
Stratus Sounds (formerly Miller/Blake Digital Samples) released a 60-disk sample library ($19.95/disk, $24.95/two-disk set) for the Akai S1000 sampler. Samples includes strings, brass, woodwinds, ethnic flutes, Steinway Grand Pianos, acoustic and electric guitars, synths, and percussion. A demo cassette is available for $5, or send a blank, formatted DS/HD disk to receive a free sample disk.

Stratus Sounds
7505 Steamer Way
Sacramento, CA 95823
tel. (916) 395-3365

CABLE PROTECTION

McManus Enterprises is shipping the **YellowJacket modular cable protector**, sometimes called a *cable ramp* or *bridge* (up to four 3-foot sections, $215 to $229 ea.; quantity discounts available). The lightweight, yellow-and-black, shallow-angled ramp is designed to withstand heavy vehicle traffic (including trucks, bulldozers, forklifts, etc.), yet can be easily traversed by wheelchairs and pedestrians. Comprised of 3-foot, interlocking sections (including angled sections for corners), the YellowJacket is available in 4- and 5-

ATARI is proud to be supplying Computer Technology for the 1990 Fleetwood Mac World Tour



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SUN 3	Concord
WED 6	Phoenix
FRI 8	Laguna Hills
SAT 9	Laguna Hills
SUN 10	Las Vegas
WED 13	Denver
THU 14	Denver
SAT 16	Kansas City
SUN 17	St. Louis
TUE 19	Dallas
WED 20	Houston
SAT 23	Atlanta
SUN 24	Charlotte
TUE 26	Columbus
WED 27	Chicago
FRI 29	Milwaukee
SAT 30	Minneapolis

JULY 1990

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THU 5	Detroit
FRI 6	Indianapolis
SUN 8	Toronto
WED 11	Canandaigua NY
THU 12	Hartford
SAT 14	Portland MA
SUN 15	Saratoga Springs NY
TUE 17	Pittsburgh
WED 18	Large/DC
FRI 20	Philadelphia
SAT 21	Philadelphia
MON 23	E. Rutherford
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McManus Enterprises
111 Union Ave.
Bala Cynwyd, PA 19004
tel. (215) 664-8600

MIXERS

Hill Audio released three new rack-mount mixers, the **MINImix** ($1,699), **MULTImix II** ($2,499), and **OMNImix** ($4,499). The MINImix is a 16 x 2 unit with balanced mic inputs and unbalanced 1/4-inch line inputs on each channel, 2-band EQ, four aux sends with master controls, channel and master muting, peak LED indicators, 12-segment master LED, 100 mm faders, headphone system with level control, and monitoring system. The remote power supply helps minimize noise. MULTImix II is a 16 x 4 x 2 mixer with many of the same features as MINImix but with 3-band EQ, 2 aux sends, pannable aux return with level control, 48V phantom power, direct channel and subgroup outs (the latter with +4 dBV/-10 dBm switch), and a regulated, rack-mount power supply. OMNImix is a 20×8×8×2 unit that features 3-band EQ with mid sweep; four aux sends with master controls; eight pannable aux returns with level control; twelve balanced, mic inputs with 20 dB pad and peak LED; twelve unbalanced, line-level inputs with peak LED; four stereo, line-level inputs with 2-band EQ, gain control, balance, and muting; insert points on all channels; direct outs on all channels and subgroups; phantom power; and much more.

Hill Audio, Inc.
5002-B N. Royal Atlanta Dr.
Tucker, GA 30084
tel. (404) 934-1851

McManus YellowJacket Cable Protector

REV UP

Opcode Systems (tel. [415] 369-8131) released Version 1.1 of *Vision* ($495), its professional sequencing program for the Macintosh. The update is free to owners who have the good sense to mail in their registration cards. Among the fourteen new features in V.1.1: automated moving faders; scrolling edit windows; "scrubbing" control in the graphic editing window plays for-

ward and backward by moving the cursor over the notes); program and note names with a Subscribe feature that allows patch names to be passed automatically from Galaxy to Vision; SMPTE cursor display in graphic editing; audible feedback in both graphic and list edit windows, allowing you to click on a note and hear it; Tap Tempo, which allows you to tap on the Mac keyboard or control tempo from a MIDI note in conjunction with MIDIKeys; and fader Scene Capture for copying fader setups to individual sequences. Coda (tel. [800] 843-2066 or [612] 854-1288) is now shipping IBM PC Version 1.0 of its ***Finale*** music notation software ($599 until the first update). The program requires an IBM AT or 100% compatible with 1 MB RAM (2 MB recommended), hard disk, and Microsoft Windows...Jim Miller (tel. [800] 446-8088 or [206] 236-4740) released ***Personal Composer System/2 V.3.3*** ($595; upgrades from V.2.0, $75). New features for Miller's IBM PC-based sequencing and transcription software include a mouse-driven interface with pull-down menus, on-line tutorial Hyperhelp, WYSIWYG PostScript printing that also supports printers using LaserGo's GoScript software, an integrated text editor that allows externally created text files to be edited from within the program, and importing of standard MIDI files. Automatic score transposition from MIDI sequences allows for various metric quantizations... Digidesign (tel. [415] 688-0600) released ***Q-Sheet A/V 2.0*** for the Macintosh ($995; Q-Sheet A/V upgrades $50; upgrades from Q-Sheet, which will now be discontinued, $395). When used with Digidesign's Sound Tools package, Version 2.0 lets the user add two independent tracks of digital audio to MIDI events such as sequences or samples, synchronized to SMPTE time code. You can trigger recording and playback of Sound Tools from any SMPTE location. Editing features include independent control over volume, stereo panning, and pitch-shifting for each event...Hybrid Arts (tel. [213] 841-0340) released ***Time Page*** ($695) time-compression and expansion software for its ADAP II digital audio recorder and editor. According to the manufacturer, the program allows ADAP II to stretch or shrink recordings by as much as 50% with no degradation in sound quality.

KEY CHANGES

Cool Shoes Software (tel. [617] 229-9942) has acquired publishing rights to Sound Globs ($175), interactive composition software for the IBM PC, formerly published by Twelve Tone Systems...**Kurzweil Music Systems** filed a petition for Chapter 11 protection, a move that has been rumored for months. Korean piano-maker **Young Chang** announced that upon court approval of the petition, it will purchase Kurzweil's distribution rights, technology, and other rights, including the right to manufacture and market musical instruments under the Kurzweil name. Young Chang says it will supply warranty service and customer support for the entire Kurzweil line, but it is uncertain which products will continue to be manufactured. ■

HOW TO MAKE YOUR PROJECTS LOOK GREAT

With a little extra effort, your homemade projects can have a professional "look and feel."

When making musical projects, I try to keep in mind that we are not hackers, technicians, or workshop warriors; we are (or at least *should* be) designers of fine musical instruments. In the same way that the charm of a good guitar lies as much in its beauty as its sound, an electronic musical instrument should appeal to the eyes as well as the ears. This applies just as much to homemade units as to commercial ones.

Over the years, I've seen a lot of projects that "worked," but it's worth striving for more than that. With just a little extra care and patience, do-it-yourself gear can look and feel good enough to be inspirational in its own right. In this article, we'll cover a number of simple tips that will help you achieve this goal.

OBTAINING FRONT PANELS: It's easy to fabricate rack panels without any exotic equipment, but first you need to obtain a blank rack panel. Commercial ones are readily available, but the price is high: a 1U panel (1¾ × 19 inches) can cost $10 or more. To save money, I have the folks at the local sheet metal supply house cut blank panels for me from ⅛-inch aluminum stock for around $1.50 each. I usually stock up on a dozen panels or so at a time; standard sizes to keep on hand are 1¾ inches, 3½ inches, and 5¼ inches.

You will have to cut your own mounting slots or holes, but five or ten minutes with a drill, hacksaw, and file will do the job. Considering that you're getting a blank rack panel for about 20% of the normal price, this is a pretty good deal.

LAYOUT AND DRILLING: Once you have the panel, mark where holes will be drilled for the various controls and jacks. To simplify the layout process, lay down some strips of masking tape on the front panel. Then use a ruler and drafting pencil to mark where to cut the various holes and slots. At this point, don't be afraid to experiment with the panel's human engineering aspects. It's a lot easier to move holes around now than after they're drilled.

By Thomas Henry

LESLIE COBER

I recommend adopting some standardized measurements. For example, I allow 1½ inches between pots (this leaves some thumb and finger room once the knobs are installed) and one inch between jacks and switches (both slide and mini-toggle).

After you're satisfied with the layout, start drilling the holes and cutting the slots, but above all, remember that *metal is dangerous!* Clamp the panel *securely* to a piece of scrap wood on your workbench and always wear safety glasses when using a power drill. To keep the drill bit from sliding around on the panel's smooth surface, use a metal center punch and hammer to make a starting divot (also called a dimple). Drill a small (1/16- to 1⅛-inch) pilot hole for each hole, then change bits and drill the hole sizes needed to accommodate the various components.

For example, potentiometers typically require ⅜-inch holes, although nowadays 5/16-inch is becoming more common. Quarter-inch phone jacks require a ⅜-inch mounting hole, miniature toggle switches and LED holders like a ¼-inch opening, and a ⅛-inch bit works for #4 hardware. Slide switches take a bit more work. Drill two 3/16-inch holes next to each other, then use a small flat file to square up the opening (with aluminum stock, this isn't as hard as it sounds).

FINISHING AND PAINTING

When you've finished drilling, de-burr any loose metal shavings around the holes with a rat-tail file or deburring tool. Strip the masking tape off and use an electric sander loaded with fine grit paper to sand the panel. This will remove any major blemishes or scars. Be sure to go over the four edges as well—you don't want the panel to act like a knife edge. When the panel is smooth and glossy, give it a once over with 000 (that's "triple-aught") steel wool.

Wash the panel with ordinary soap and water to remove any leftover grit from the steel wool or sandpaper, then rinse it thoroughly. To remove any residual soap film, clean the panel with a cotton ball soaked in 99% alcohol; now you're ready to start painting.

Begin by applying gray primer to the prepared panel. The primer provides a good "grip" for the upcoming layers of paint, and fills any small imperfections in the aluminum surface. Allow the paint to dry for 24 hours, then bake the

panel at 225 degrees for one hour to drive out any remaining oils or moisture in the painted surface. (You can bake the panel in an ordinary oven. Simply preheat the oven to 225 degrees, then turn it off. Put the panel in and allow the oven to cool naturally.)

Now select an epoxy spray paint (as commonly used on major appliances) whose color fits in with your color scheme. Epoxy paint dries rock hard and is very resistant to scratches. Regarding color, I like to use harvest gold or almond, since dry transfer letters show up well against these. Spray paint several layers, letting each layer dry before applying the next one, then after letting the finished panel dry for 24 hours, bake it again using the same technique described above.

LABELING

After the panel is dry, apply your labels. I use 8-point, Futura Bold, dry transfer letters (available at most stationery stores) for the alphanumeric labels. For symbols (circles, lines, boxes, etc.), try an indelible laundry marker and templates. For example, instead of labeling an output "sine wave," drawing a sine wave below the jack is more intuitive as well as attractive.

To preserve the labeling, apply several layers of clear plastic spray over the panel. To keep the indelible ink mentioned above from dissolving and running, begin by applying three light sweeps of plastic spray, then let the panel dry. Next apply four sweeps and let it dry. Then five, six, and so on. In this way, the plastic slowly covers the ink and eventually seals it in completely.

Allow the panel to dry overnight and then give it one final baking. If you've taken your time and really applied your best artistic principles, you ought to have a panel worthy of inclusion in the world's ritziest synthesizer. Of course, the same techniques can be applied to the crafting of aluminum boxes or chassis.

For more details on the processes described above, check out the chapter "Planning the Synthesizer," in my book, *Build a Better Music Synthesizer* (TAB Books, Inc., 1987). By the way, since it is now almost universally acknowledged that spray cans using CFC compounds as a propellant are detrimental to the environment, seek out alternative ways to spray paint that do not use CFCs.

RACK ENCLOSURES OF THE GODS

Making professional-quality rack enclosures isn't very difficult, and the savings are even greater than making your own panels. Rack boxes may cost hundreds of dollars if purchased from a commercial supply house, but you can make a fine, vinyl-covered one for twenty bucks

What often differentiates a slapped-together box from, say, a nicely built guitar amp are the "extras."

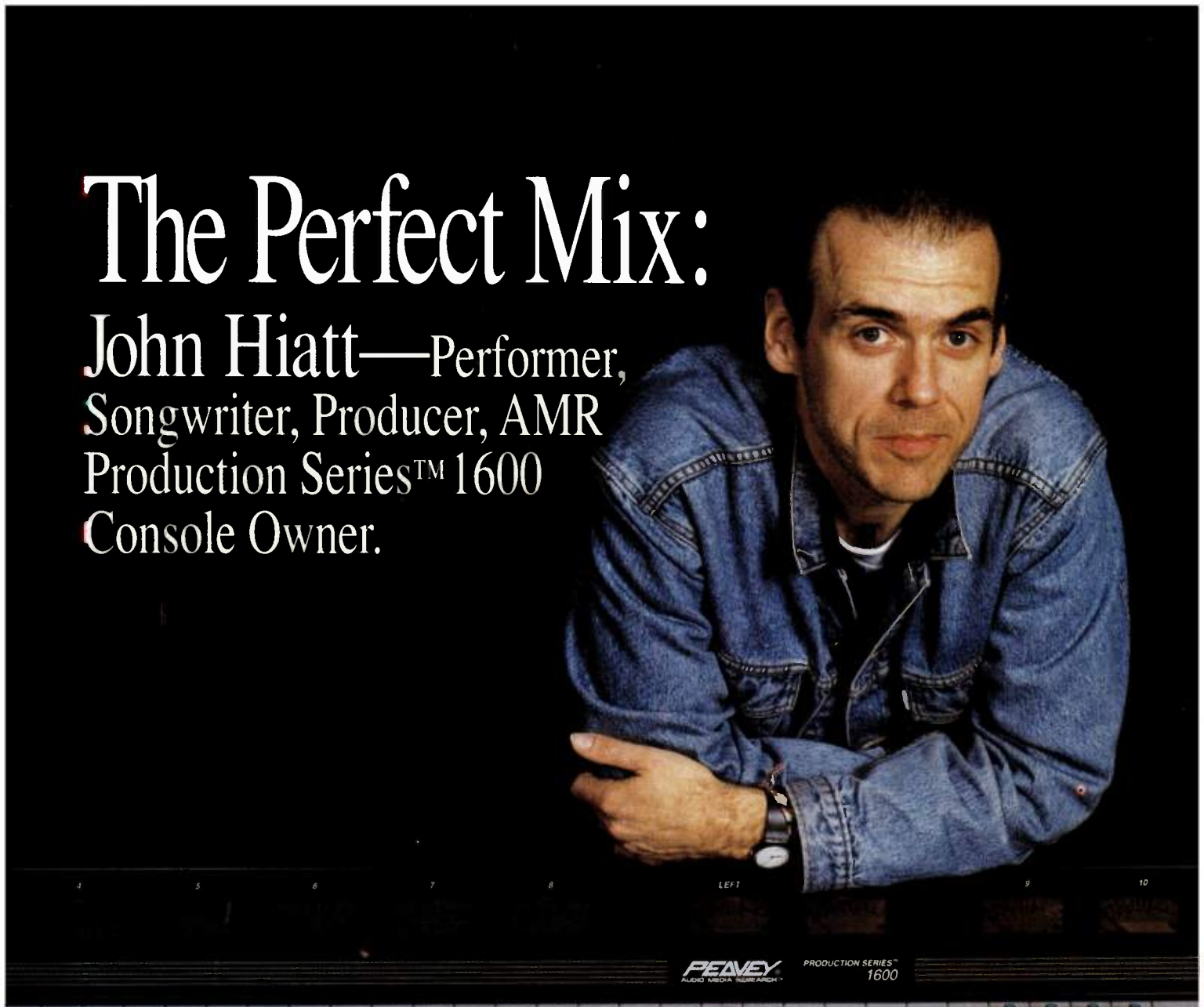
or less. I've already covered this in full photographic detail in my article, "Do-It-Yourself Rack Enclosures" (September 1985 **EM**, pp. 39-41), but here are a few additional tips.

What often differentiates a slapped-together box from, say, a nicely built guitar amplifier are the "extras" such as handles, metal corners, feet, cup washers, and so on. Handles are always important, as they help make a unit more transportable. You can sometimes find handles at lumber yards or hardware store, but they generally are ugly and/or expensive so I prefer to order from mail order electronics houses. Over the years I have found some great handles from Star-tronics (PO Box 683, McMinnville OR 97128) and have never paid more than a buck for them. When you do find a deal on an attractive handle, buy lots of them for future use. (This is the secret to having fun with electronic music and saving money at the same time: build up your own warehouse of commonly used parts, buying them only when on sale.)

Rubber feet add a touch of class to any project and keep your cabinet from sliding around. Radio Shack sells some stick-on-type feet, but these generally aren't large enough or sturdy enough for major cabinets. Again, I've found some great ones, all the way from a ¼-inch size on up to a 1-inch size, from

The Perfect Mix:

John Hiatt—Performer, Songwriter, Producer, AMR Production Series™ 1600 Console Owner.



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Package # 9011V

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CDA Computer Sales

Star-tronics. These can be affixed to a box or cabinet with sheet metal or wood screws.

When you're covering a rack enclosure and the vinyl doesn't meet snugly or wrinkles at the corners, simply cover up the mess with metal corners. These handy fixtures are available at most any hardware store. Besides covering up any goofs, they also add a certain amount of strength to the box and make accidental smashes into the wall less harmful. (At least to the box; the health of the wall is another matter altogether.)

SECRETS OF NEAT WIRE DRESSING

A neatly wired project only costs a few pennies more than a project that uses a rat's nest of wires. Not only will it look better, but a neatly wired project is much simpler to troubleshoot and tends to be more reliable.

When wiring the front panel, always use stranded wire, preferably 22 gauge. Stranded wire is much more flexible than solid, and hence easier to route, bend around parts and keep free of kinks. Before soldering the wire to anything, strip and tin (i.e., heat and add a small amount of solder to) the ends. While some people think that tinning is a waste of time, a tinned wire is easier to connect to terminal lugs, has no frayed strands to cause short circuits, and is easier to solder. Use a variety of insulation colors; this makes troubleshooting easier since it simplifies chasing down a wire from one location to another.

For shielded cable, I use Radio Shack's "miniature, braided, shielded cable," part number 278-752, which is extremely flexible. Remember when connecting a circuit board to a front panel with shielded cable that you typically ground the shield at one end only to avoid ground loops (see "Getting Wired: A Power Primer," in the April 1990 **EM**, for more information on avoiding ground loops).

With any type of wiring, always allow enough length for wires to be bundled together or bent to make right angle turns where required. Bundle the wires together with standard nylon wire ties. You can find these at Radio Shack, but surplus electronics stores often carry wire ties at much lower prices. When bundling, remember that a slight amount of capacitance will exist between wires. Don't bundle high-gain inputs and outputs together, or noisy digital lines (such as high-frequency

clocks) with sensitive audio lines, as signals may "leak" from one lead to another.

When making connections between modules, I like to use twisted pairs and triples. For example, when connecting the power supply wires (one hot and one ground) to a circuit, use a twisted pair instead of just two dangling wires. Here's a tip for making your own professional-looking twisted pairs: cut two wires of the desired length and clamp one pair of ends in a table vise. Grab the other pair in the chuck of a variable-speed electric drill and pull the wires taut. Now slowly turn the drill and voilà—a uniformly twisted pair. This works for triples and quadruples, too.

It's worth noting that a twisted pair provides almost as much shielding as shielded cable (assuming, of course, that one of the leads is grounded) and can be used to minimize hum in all but the most critical audio lines. Also, if you're providing power to tube filaments, twisted pair is *de rigueur* to minimize hum.

Speaking of power supplies, use a distribution bus (**Fig. 1**) if you expect to expand your setup. The terminal strips and bare bus wire mount inside your rack enclosure; when you need to install a new module, simply hook its power supply leads to the distribution bus and solder in place. You can disconnect a set of leads equally easily, without screwing up any of the other modules. This system offers a low-cost alternative to expensive multi-pin power connectors and has found its way into every synth cabinet I've ever built.

Don't forget to use rubber grommets in your wiring work. If you ever need to feed some wires through a metal panel for any reason, use a grommet for a sleeve. Not only does it look good, but it will keep any burrs or sharp edges on the metal from slicing through the insulation.

HARDWARE FOR THAT FINISHED LOOK

Do yourself a favor and browse in a well-stocked hardware store—you'll find a variety of neat accessories that can help professionalize your next project. Here are some items that I have found indispensible.

Number 4 (#4) hardware seems to be right for most front panel work, whether it be mounting slide switches or affixing circuit boards. I keep a supply of ⅜-inch, ¾-inch, and 1-inch, #4 panel head bolts on hand at all times, along with some #4 lock washers and nuts. Circuit board standoffs are handy, too, and are also useable with #4 hardware. Radio Shack carries an assortment kit of standoffs and spacers, part number 64-3024. If you need a standoff in an emergency but find that your parts box is empty, hacksaw off the appropriate length from the clear plastic end of a Bic pen.

Cup washers are great for holding rack panels in a cabinet. I recommend the #10 cup washer for this purpose, and you will want to use a #10 oval head

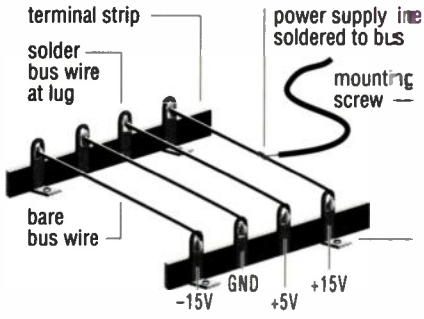

FIG 1: Power supply distribution system.

wood screw or bolt (depending on whether the mounting rails are wood or tapped metal). Number 4 (#4) cup washers can also be useful should you need to mount some small item to a panel. Avoid aluminum cup washers as they are easily deformed and wrecked stick with the nickel-plated variety which look better anyway.

I could go on, but by now you're probably getting the idea. The perfect project requires more than a working circuit; it also requires some attention to detail. In our everyday work, we usually get caught up in the electronics side of things and fail to take in the "gestalt" of the entire project. But, as I hope this article has demonstrated, there are many details that can enhance the value, utility, and aesthetic appeal of a project—all of which helps the music-making process. After all, who wouldn't want to play a Stradivarius instead of a pawnshop fiddle?

Thomas Henry, *who started writing electronic music articles in 1979, taught himself electronic design by poring over the pages of* Electronotes. *In 1984, he was awarded a master of arts degree in mathematics from Mankato State University. His outside interests include etymology, amateur astronomy, and bird watching.*

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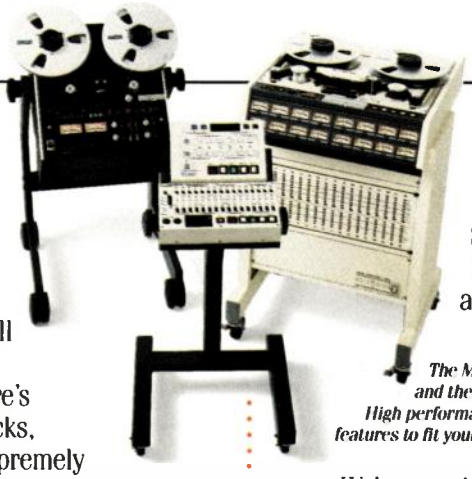

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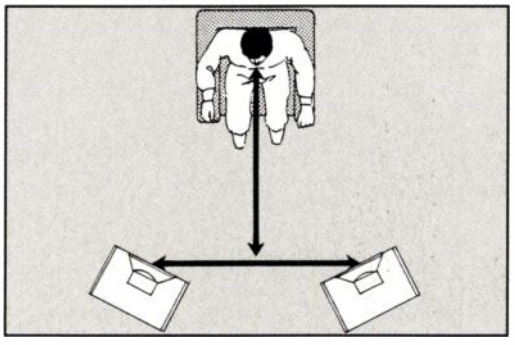

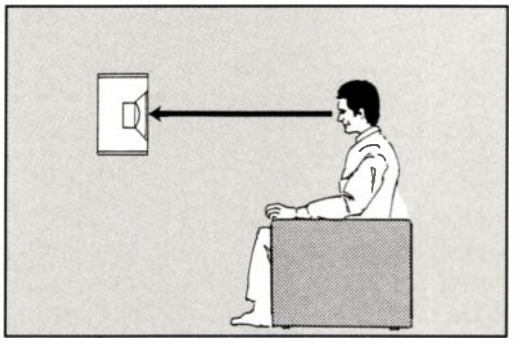

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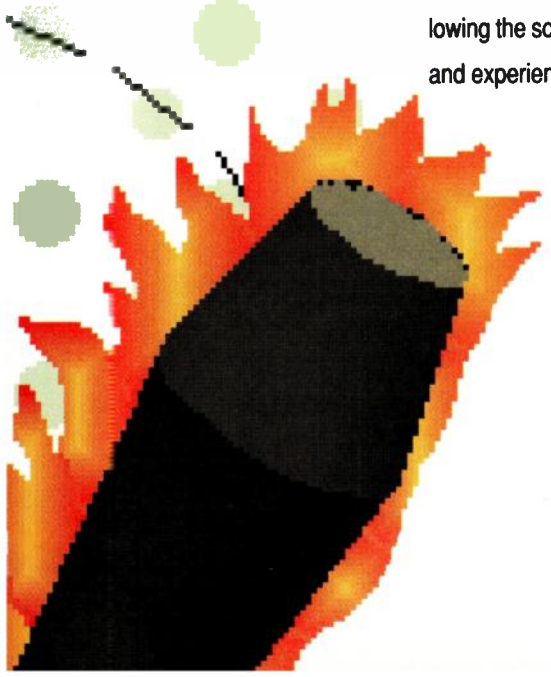
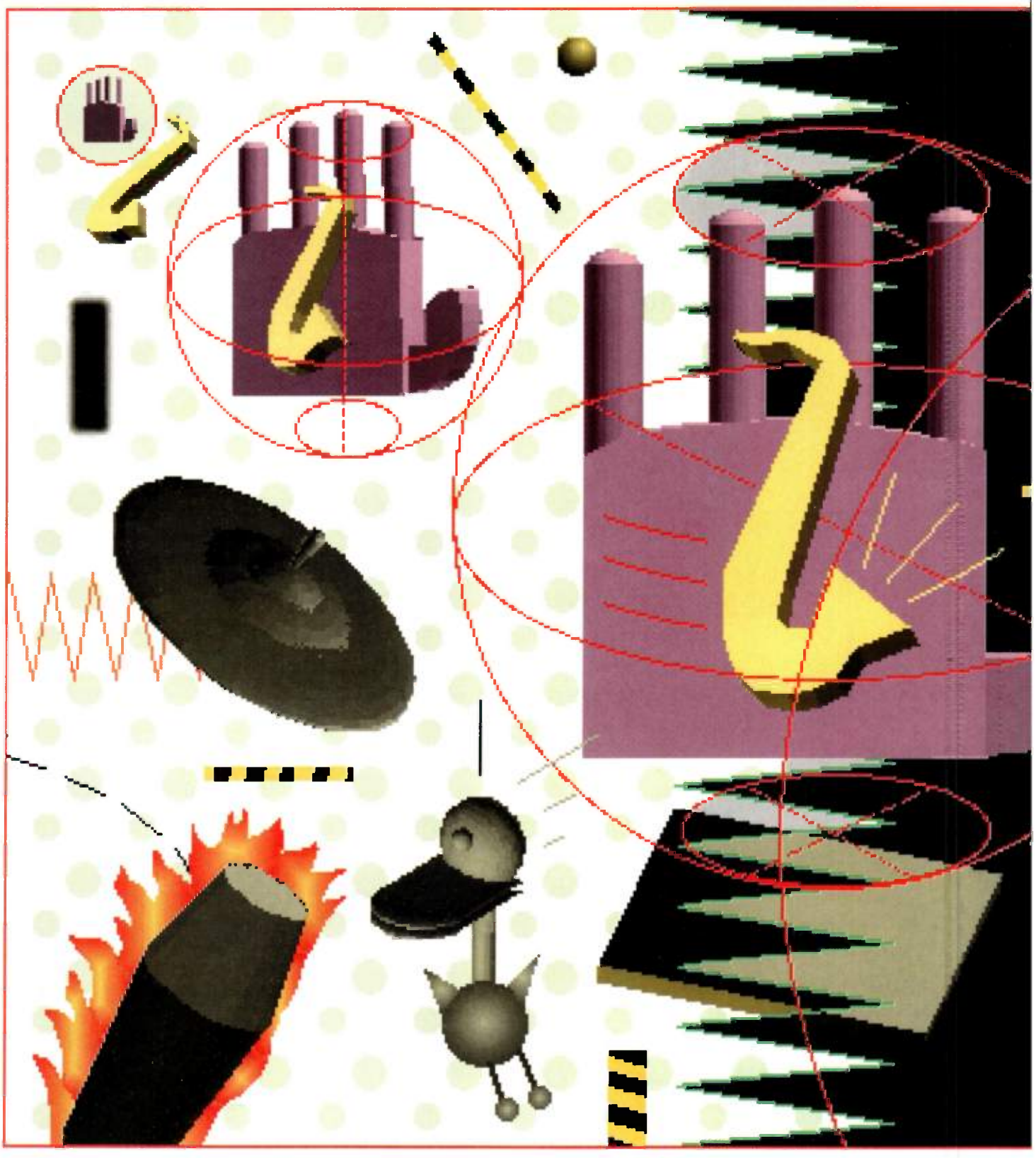
This month, our feature articles cover some of the most exciting new-technology concepts for electronic musicians at every level. You can conduct a MIDI orchestra with a wave of the hand, graphically create your own programs, or read about Stravinsky's composition techniques while listening to, and following the score of, the appropriate passage of his *Rite of Spring*. The process of performing, composing, and experiencing electronic entertainment will never be the same.—*The EM Staff*



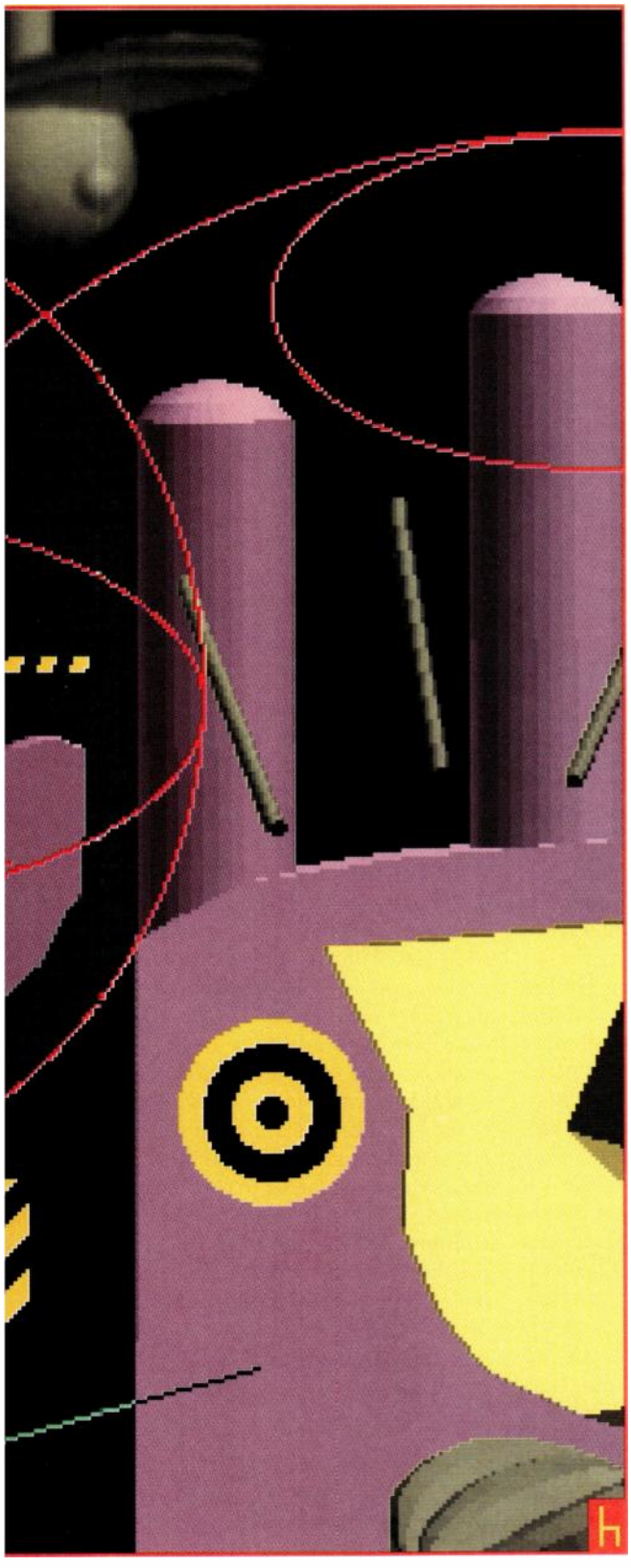
Advanced tools and communication technologies are changing the way we think about the process of making music.

Computer systems can now create complete visual and audible environments that offer startling new



JOHN HERSEY

ways to interact with music technology.



Into New Worlds

Virtual Reality and the Electronic Musician

You're ready to enter an alternate reality. You slip on a pair of headphones, a helmet with a tiny video screen for each eye, and a special glove. Three-dimensional, computer-generated images are projected onto your eye screens. Video "hands" match the movements of your own limbs. Sound seems to be coming from all around, not just inside your head, as you'd normally expect with 'phones.

There's a mixing console floating before you. The music is coming from an apparent distance of a couple yards, but when a channel is "soloed," that sound moves to a point inches from your ear, while the rest of the mix stays put. By grabbing the edge of the board and pulling, you get as many input channels as you need, stretching away to infinity.

This isn't as far-fetched as you might think. In fact, this technology exists today at NASA-Ames Research Center and other labs. The concept, called "virtual reality" (VR for short), gives us a new way to think about the use of electronic and computer systems.

Virtual reality takes you places you've never been and lets you interact with your surroundings in ways not possible in the real world. In these new spaces, physical laws can be modified or ignored. The computer/user interface, until now bound by keyboards, mice, and video display terminals, makes the jump from our desktops to inside our heads, while our bodies begin to enter our machines.

THE CHALLENGES

Virtual reality poses a real challenge to our imagination. Cast into unfamiliar territory, there is a danger that we'll restrict ourselves to old ideas and needlessly limit ourselves. "The sooner we discard our old concepts and treat virtual reality as a new medium, the further we'll go with the idea," says Mark Bolas, president of Fake Space Labs, a consultant to the Virtual Environment Workstation (VIEW) project at NASA-Ames. "VR can free us from old concepts," continues Bolas. "For instance, the reason we use knobs in the physical world is not because they're the best way for people to interact with equipment. It's the physical requirements of their function that dictates their form. With VR, the link between form and function can be severed."

No sudden breakthrough has made virtual reality possible. In fact, most of the components have been available for some time. So, before we get into applications, let's look at the parts that make up a typical VR system.

Sight is the sense most often stimulated by VR systems (see **Fig. 1**). To help the user feel like a part of the virtual environment, a helmet fitted with LCD video displays (one per eye) is worn. Three-dimensional video is created by showing a slightly different image in each eye. These head-mounted displays generate images that nearly encompass your entire field of view. The system incorporates a means of sensing and responding to the user's head position, so that stationary objects behave as they would in the real world. Objects in your view pan to the right when you turn your head to the left and vice versa.

If sight is viewed as input to the user, then human gesture could be considered the primary input to the VR system. A common gestural input device is the VPL DataGlove (**Fig. 2**). VPL builds VR systems that incorporate the DataGlove and the Eyephone, a head-mounted video display. The glove is wired with fiber-optic cable that refracts light differently depending on whether each finger is straight or bent. A magnetic sensor, called the Polhemus 3-Space tracking device, determines the location of the glove in space up to fifteen times per second. Technically speaking, six axes of movement can be determined by the DataGlove: X, Y, and Z position, as well as roll, tilt, and pan.

Gesture and the sense of touch are important, since music performance always involves gesture. The tactile feedback we get from real instruments is an important part of controlling these gestures, but virtual instruments don't provide a real object to touch. Some prototype VR systems can simulate the sense of touch, a concept called "force feedback." Research is being done in this area, and tactile feedback is becoming a realistic goal for VR systems.

SOUND IN VIRTUAL REALITY

In the NASA-Ames virtual system, a device called the "Convolvotron" creates three-dimensional sound within a pair of normal stereo headphones. Up to four discrete audio channels can be individually placed and/or moved in an imaginary sphere surrounding the listener (see **Fig. 3**). As with VR video displays, the perceived location of the sound remains constant regardless of head position. The Convolvotron is a two-board set that works with IBM PCs.

Work on this device began in 1986, when Scott Fisher, project leader for the VR VIEW system at NASA-Ames, asked perceptual psychologist Elizabeth Wenzel about the feasibility of adding 3-D sound to NASA's VR system. Dr. Wenzel decided that it was possible and enlisted the aid of Professor Fred Wightman (currently at the University of Wisconsin) and Scott Foster, president of Crystal River Engineering, to develop the system. Professor Wightman was known for his highly accurate measurements of the ear canal, while Scott Foster had the necessary background to design the hardware. Besides functioning as a 3-D sound source for VR use, the Convolvotron also was designed as an aid to psychoacoustical research.

Before jumping into details on how the Convolvotron works, you need to understand some basic psychoacoustic principles (see "An Ear for Processing" on p. 66 for more). We locate sounds in space by using small differences in time, phase, and amplitude of the sound that reaches each eardrum. These differences are caused by several factors: the direction we are facing in relation to the sound source, the acoustic space surrounding the listener and source, and the shape of each person's outer and inner ear. The end result is that none of us hears things in quite the same way. (For more info on how stereo hearing works, read "Real World Stereo in Your MIDI Mixes" in the February 1989 issue of EM).

Although differences in each person's inner and outer ear were long suspected to be significant, they were hard to quantify. By using Fred Wightman's precise measurements, the Convolvotron can account for them. To make the measurements, the user is seated in an anechoic (echo free) chamber, and a tiny probe mic is placed inside each ear

JARON LANIER/VPL

FIG. 1: The view inside a virtual reality being used in Stanley Jordan's "What's Going On" video.

ADVANTAGES OF VR

Gesture control devices (i.e., virtual musical instruments) are free from the restriction of physical laws. New musical instruments can be designed and replicated without the costs and limitations of physical hardware. Instrument design can be placed in the hands of more users, and these instruments could be traded and modified.

Re-assignability: Virtual systems invite the user to reconfigure the environment to suit the task at hand. Complex equipment could be accessed more efficiently by virtual panels than by hundreds of dedicated knobs.

Easy three-dimensional representation: VR encourages us to think beyond the confines of a 2D "desktop" and expand our horizons to the 3D world around us.

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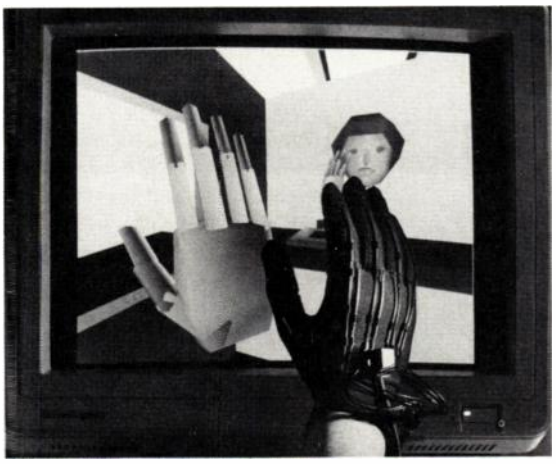

COURTESY OF VPL

FIG. 2: With VPL's DataGlove and virtual reality system, a virtual hand will mimic the movements of a user's hand.

canal, next to the eardrum. Then a test tone is played from 144 different locations surrounding the subject, and the "impulse response" at each eardrum is measured. The impulse response completely characterizes the direct and reflected sound reaching the eardrum. The sum of these measurements, called a "Head Related Transfer Function" (HRTF), contains the aural cues used to determine sound location. The HRTF of a specific user can be fed into the Convolvotron and used to synthesize 3-D sound.

The four sounds going into the Convolvotron are processed through one parallel array containing 128 multiply/accumulators that are configured as tapped delay lines. Each sound is "placed" in space by a Finite Impulse Response filter whose settings are determined by the HRTF measurements. When a sound is moved, it does not "snap" between measured points. Instead, the four nearest measured points are used to interpolate the response for the unmeasured points, allowing smooth motion of sounds.

Inside a virtual reality, the Convolvotron can make sounds seem to come from within an object. Also, localized (3-D) audio cues can be used to highlight information in a crowded visual field, such as an air traffic control display. Real-world sound can be processed, as can synthesized sound generated by the MIDI capabilities of NASA's Auditory Display System (more on NASA and MIDI later).

According to Scott Foster, the Convolvotron can simulate some aspects of room acoustics more accurately than conventional digital reverbs. Instead of using recirculation (feedback) to create reverb, the Convolvotron calculates every direct and reflected path that reaches the user's ears. One program supplied with the system is called "The

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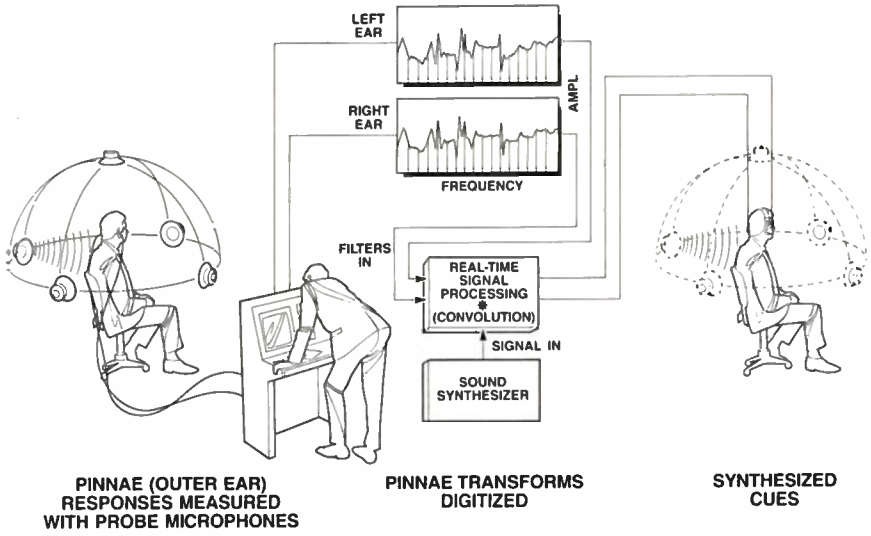


COURTESY OF NASA VIEW

FIG. 3: The Convolvotron allows you to determine the three-dimensional location of a given sound within a virtual reality.

Reflection Kit." With it, you can move several reflective surfaces (walls) while monitoring the resulting virtual room sound in real time. There are some limits to the size of room that can be dynamically changed, but nearly any room can be simulated statically. The Convolvotron is capable of phase vocoding, pitch shifting and other effects, as well as 3-D sound manipulation.

Though it sounds futuristic, the Convolvotron is available today. A typical system costs around $25,000, not including the host computer or head-tracking equipment. Crystal River is working on a new product, incorporating many of the same features, that is expected to sell for under $10,000.

Tying together all the video gear, sensors, and sound processing equipment are computer hardware and software (and some pretty thick cables). High-end workstations are capable of meeting the computational and graphic rendering demands of virtual reality, but hardware capable of generating shaded solid objects at 15 frames per second (one for each eye) will cost you plenty. Simpler "wire frame" drawings can be generated at sufficient speeds on a PC.

VIRTUAL REALITY APPLICATIONS

The space program was an early user of virtual reality, both for training simulators and as a way to efficiently display cockpit information. The number of controls astronauts had to monitor was growing at an alarming rate. By displaying a "virtual panel" on a video screen, only the controls needed for the current operation were displayed, in an arrangement best suited for that task. This reduced the clutter of unrelated controls and, when needs changed, the virtual panel could be instantly reconfigured.

Electronic musicians are faced with a similar problem: Many instruments have hundreds of controls hidden behind a few buttons and a small, cryptic display. A virtual panel could get us back to the days of one function, one knob, and make synth programming a more intuitive task. Patch editor programs are an existing example of virtual panels, although most are not configurable. Newer "universal" patch editors (see "Complete Control: Universal Editor/Librarians," p. 54, in the June 1990 issue of EM) are very close in concept to VR configurable displays.

We may be seeing the beginning of a trend towards panel-less equipment. For example, DSP cards for computers cannot be physically touched when installed. In this case, the virtual panel is the only choice and can easily customize a general purpose device to look like any one of the more specific tools we're used to working with, such as samplers and reverbs.

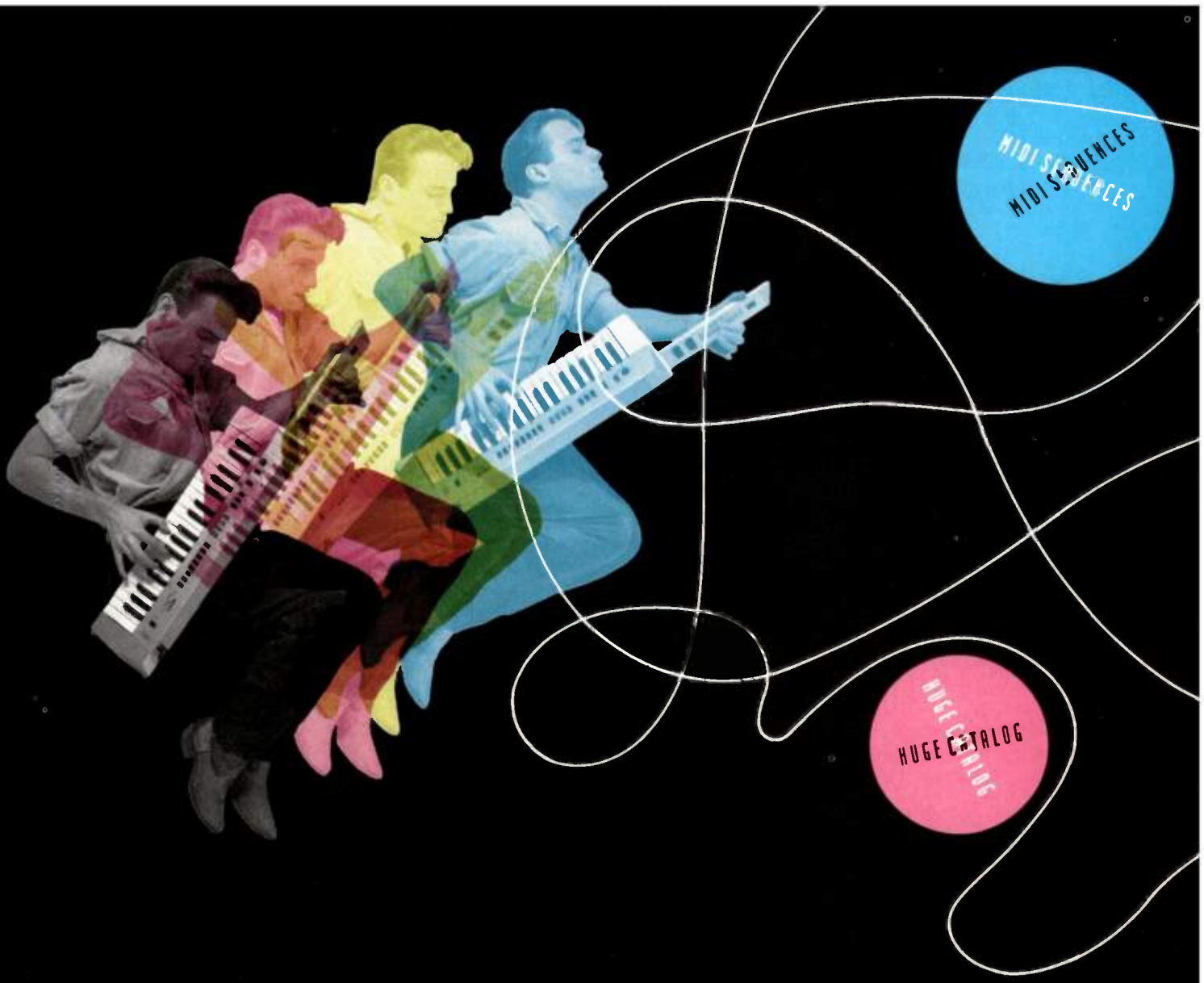
LOOK MA, NO HANDS!

VR technology can't mimic the sensation of touch (yet), so most virtual instruments developed so far are played with free, dance-oriented gestures. The first instrument that could be played without being touched was the Theremin. Invented by Leon Termen (usually translated as Theremin) 70 years ago, the instrument was first demonstrated at the Eighth Soviet Congress around 1920. (See the March 1920 issue of EM for a review of that performance.) The instrument is played by changing the distance between your hands and two antennae. A vertical antenna controls pitch while a horizontal one sets volume. The instrument is monophonic, and the pitch is actually a difference (or beat) frequency between two high-frequency oscillators. RCA started making Theremins in 1929 and even made a record player with a Theremin built in! The instrument has been used by many, including Edgard Varèse, The Beach Boys ("Good Vibrations"), and Led Zeppelin ("Whole Lotta Love," *The Song Remains the Same* soundtrack).

THE NASA VIRTUAL MIDI THEREMIN

In 1988, Phil Stone of Sterling Software, a NASA subcontractor, began work on a virtual Theremin at NASA-Ames Research Center. He was joined by Mark Bolas later that year, and the instrument they developed is among the first of its kind.

NASA's instrument eliminates the need for the antennae of a normal Theremin (see sidebar "Look Ma, No Hands!" for more on Theremins). Instead, geometric objects are swept in free space, with X, Y, and Z location determining their sound (see **Fig. 4**). This visual representation of sound is an important feature of the NASA instrument.



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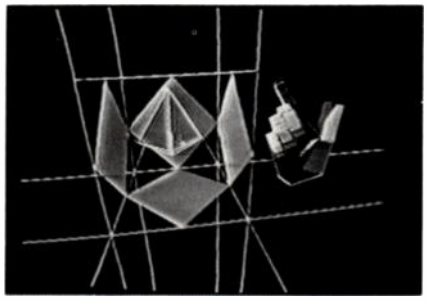
By raising a finger, a new object is created in the center of the VR view. This object represents an oscillator whose pitch is determined by its left-right position, its amplitude by distance, and its timbre (filter cutoff) by height. The object follows the movement of the user's arm and hand through space, so as it moves its pitch, loudness and brightness change correspondingly. The system itself doesn't create any sound, but instead generates MIDI controllers, which are used to play connected MIDI modules—in this case, a pair of Ensoniq ESQ-Ms.

By repeating the raised-finger gesture, another object can be made to appear, again in the center of the view area. With this scenario, both oscillators follow the user's motion in parallel, and the two pitches beat against each other as they are swept through the frequency, amplitude, and timbre space. Additional objects can be created, with each sending data on its own MIDI channel.

Another NASA instrument could be considered a virtual drum kit. With this instrument, MIDI notes are triggered when the user's hand passes through the surface of a floating drum head. These heads can be arranged in any 3-D pattern, allowing a wave of your hand to trigger a number of sounds with a single, sweeping gesture. Plus, it's pretty novel watching your hand pass through the skin of a drum head as if you were dipping it into a pool of water.

The virtual Theremin and drum were both designed to demonstrate the use of sound in VR. They were built using a more general tool, the Auditory Display System. The ADS is capable of generating MIDI messages, or small sequences, in response to specific conditions in the VR, where audio is used to reinforce video information. An example: Audio cues (the same ones guitarists use to tune up) help direct a remote robot hand in the assembly of an electronic device. As the hand lines up a circuit board with a small slot, two pitches drift towards the same frequency. When the part is correctly aligned, the notes are perfectly in tune. In addition to generating MIDI data, the ADS also integrates the Convolvotron with NASA's system



COURTESY OF NASA VIEW

FIG 4: NASA's Virtual MIDI Theremin lets you generate MIDI data by waving a DataGlove or similar device in a manner similar to playing a real Theremin.

A REALITY BUILT FOR TWO (RB2)

"Technology should be viewed primarily as a tool for communication between people," says Jaron Lanier, founder of VPL Research. He believes that human interaction is limited by what we control in real time, namely our powers of speech and gesture. With systems that allow two users to simultaneously share and modify one virtual reality, users could communicate through "spontane-

ously improvised, shared dreams." But how do you improvise the contents of the world as quickly as you speak or move? "There's one shining precedent for this kind of real-time control and that is musical instruments," concludes Lanier. "Here you have this tight-coupled interaction between a person and a device that they're using, in a very eloquent manner, with their whole body. I think it's a model of what interaction with computers will be in the future. This will lead to a very interesting era in which we won't be viewing music as one application for technology, but rather we'll be using music as an area that has a great deal to contribute to technology."

AND NOW, THE REST OF THE STORY

An unfortunate limitation of current VR systems (I experienced the NASA system) is lag time, which can be seen as slow redraws when moving your head or hand. In fact, these delays are large enough to make the present systems difficult to use for musical applications. The delays (up to a few hundred milliseconds, total) are primarily related to the positional tracking sensors, as well as graphics redraw time and operating system overhead. But remember, systems like NASA's are at the cutting edge of technology. Many of the components used in VR were adopted from other industries, and as the next generation of components specifically designed for VR applications become available, performance will continue to improve.

In my own opinion, 3-D displays, while useful, are not as important to electronic musicians as 3-D gesture control devices, the first of which to be released was Palmtree Instruments' Airdrums (reviewed in the June 1988 **EM**). Currently, however, there are at least two other 3-D gesture controllers that could be useful with or without the other components of a VR system.

Computer music pioneer Max Mathews has developed a very responsive 3-D gesture controller. Although the device has not been used in a VR application, it easily could be.

The Boie Drum (the radio transmitting and receiving component of the instrument was designed by Bob Boie at AT&T Bell Labs) resembles a small whiteboard, similar to the kind used with dry-erase markers, about 2 × 1½ feet. Embedded in its surface is an array of radio antennae. Transmitters are

mounted at the end of mallets, drum sticks, or are hand-held. The instrument scans the X, Y, and Z (up to 2½ feet high) location of these transmitters once each millisecond, many times faster than typical 3-D input devices. This location information is output as analog voltages to an A-to-D converter, and then converted into any MIDI message desired. While the Boie Drum has 3-D capability, most applications use it primarily in a 2-D context.

One application written for the instrument is the Mathews *Conductor* program. "The basic principal of the program is that I put the non-expressive parts of the music, i.e., the fixed parts, in the computer," explains Dr. Mathews. "In most cases, that's the sequence of notes. Then I can devote all my attention to the expressive parts."

The conductor program allows the Boie drummer to accompany other musicians, matching their tempo and intensity. This is in stark contrast to the more traditional method of performing with a sequence: forcing the soloist to follow the accompaniment. Dr. Mathews believes that non-musicians could use the drum and conductor program to gain deeper insight into music, a concept he calls "active listening."

The drum can also be used with the *Max* language (see "Programming For The Rest Of Us" on p. 42). I saw a very musical videotape of the drum and *Max* performed by percussionist Andy Schloss. A number of pieces have been composed for the instrument, and an earlier version of the drum was featured on the *Nova* TV program "What is Music?" The program features a duet for Boie Drum and the Mathews Electronic Violin, another instrument designed by Dr. Mathews.

The Boie Drum is not yet a commercially available product, but Dr. Mathews is working with two companies who are interested in producing it. Stay tuned.

Fake Space Labs has rewritten the NASA virtual Theremin and drum software to run on a standard IBM PC. Using a relatively inexpensive 3-D input device called the String Thing, the Theremin or other virtual instruments can be used with a normal 2-D video display. The String Thing tracks the user's hand in three dimensions, with a fast response time. While the current version of the device requires an IBM PC, MPU-401, and A-to-D card to generate MIDI, the company is working on a version that outputs MIDI directly. In addition, Fake Space is bringing out a MIDI interface for the Mattel Power Glove, a Nintendo accessory that costs $79.95 at most toy stores.

The PC versions of the virtual instrument software are not as fancy looking as their NASA counterparts, but the real-time performance on an average PC is as good or better than the NASA-Ames system. Of course, the Fake Space versions are not doing nearly as much graphic computation as the NASA VR system, but trading better graphics for faster real-time performance may be a reasonable exchange.

Fake Space is looking at developing other VR tools, including a simple 3-D virtual MIDI mixer, but one goal of the company is to encourage others to create virtual instruments that use the String Thing or other 3-D input devices. "I'd like musicians to be able to create virtual instruments and exchange them like public domain software," says Mark Bolas. The String Thing and virtual MIDI software will be available soon, although pricing is not available.

ADDRESSES

For more information on companies involved in VR, contact:

- Crystal River Engineering, 12350 Wards Ferry Rd., Groveland, CA 95321; tel. (209) 962-6382
- Fake Space Labs, 4037 El Camino Way, Palo Alto, CA 94306; tel. (415) 363-3463
- VPL Research, 656 Bair Island Rd., Suite 304, Redwood City, CA 94063; tel. (415) 361-1710

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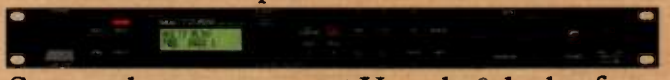

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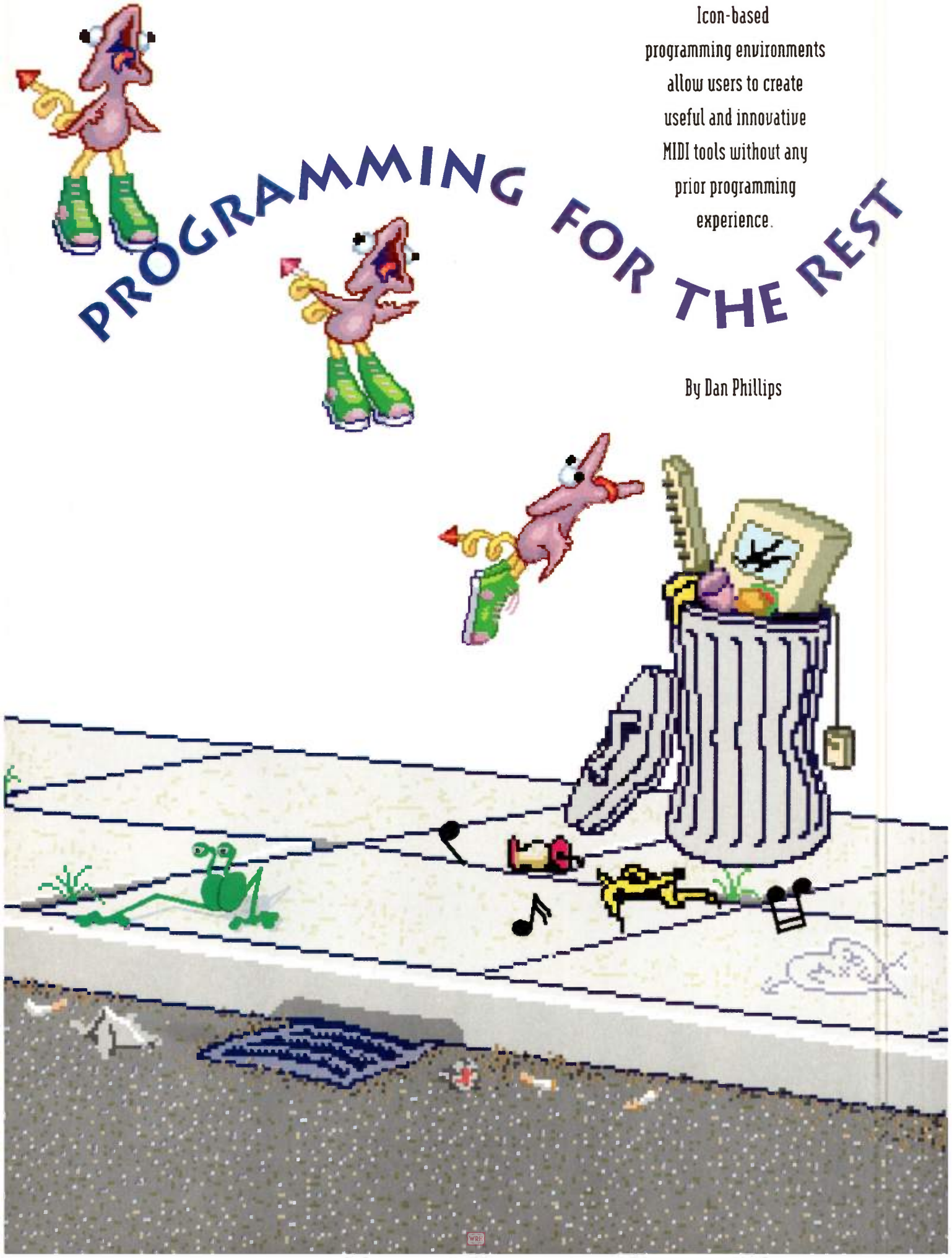
PROGRAMMING FOR THE REST

Icon-based programming environments allow users to create useful and innovative MIDI tools without any prior programming experience.

By Dan Phillips



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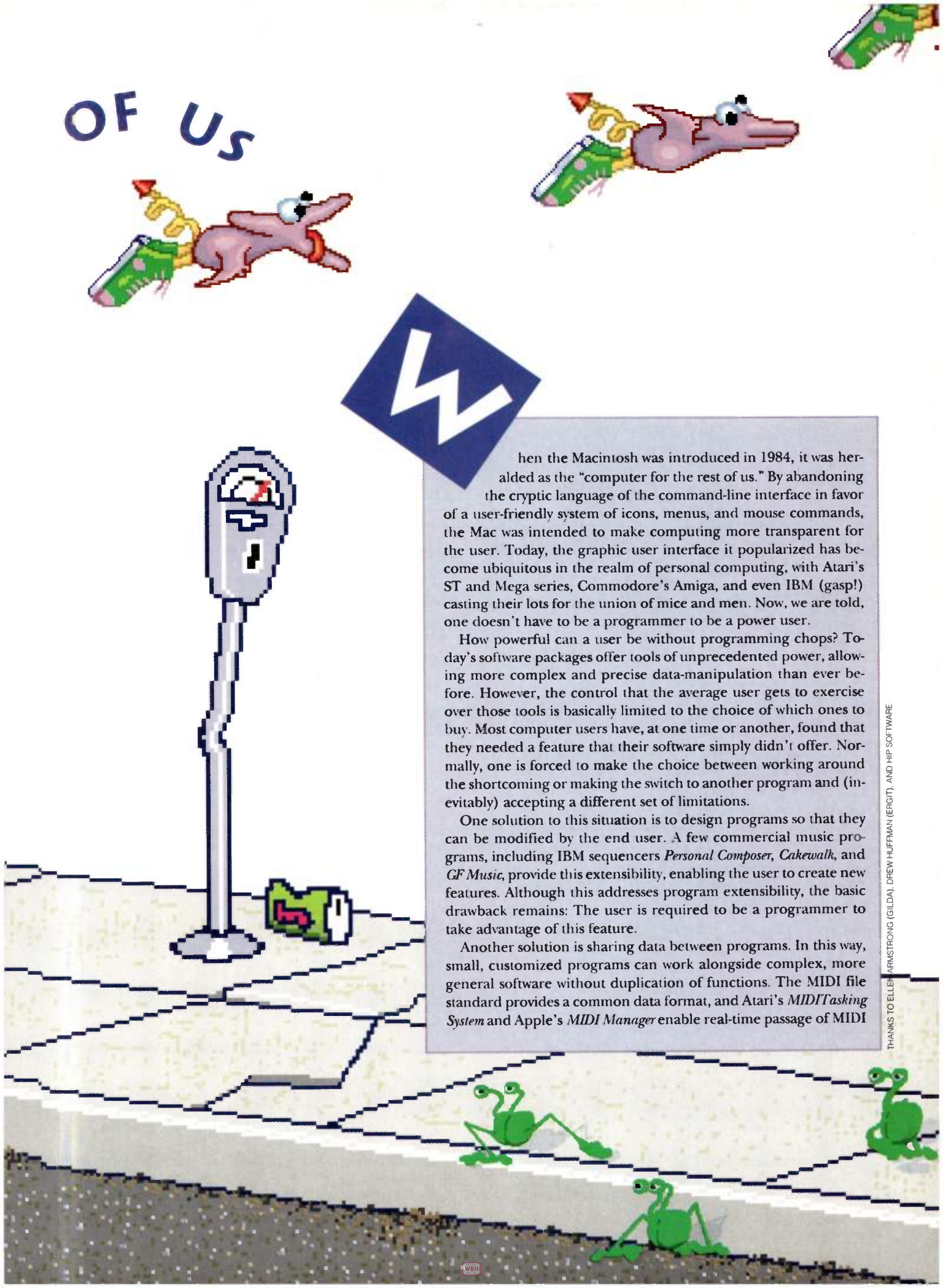

When the Macintosh was introduced in 1984, it was heralded as the "computer for the rest of us." By abandoning the cryptic language of the command-line interface in favor of a user-friendly system of icons, menus, and mouse commands, the Mac was intended to make computing more transparent for the user. Today, the graphic user interface it popularized has become ubiquitous in the realm of personal computing, with Atari's ST and Mega series, Commodore's Amiga, and even IBM (gasp!) casting their lots for the union of mice and men. Now, we are told, one doesn't have to be a programmer to be a power user.

How powerful can a user be without programming chops? Today's software packages offer tools of unprecedented power, allowing more complex and precise data-manipulation than ever before. However, the control that the average user gets to exercise over those tools is basically limited to the choice of which ones to buy. Most computer users have, at one time or another, found that they needed a feature that their software simply didn't offer. Normally, one is forced to make the choice between working around the shortcoming or making the switch to another program and (inevitably) accepting a different set of limitations.

One solution to this situation is to design programs so that they can be modified by the end user. A few commercial music programs, including IBM sequencers *Personal Composer*, *Cakewalk*, and *GF Music*, provide this extensibility, enabling the user to create new features. Although this addresses program extensibility, the basic drawback remains: The user is required to be a programmer to take advantage of this feature.

Another solution is sharing data between programs. In this way, small, customized programs can work alongside complex, more general software without duplication of functions. The MIDI file standard provides a common data format, and Atari's *MIDITasking System* and Apple's *MIDI Manager* enable real-time passage of MIDI

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data between applications (see "Musical Multitasking" in the April 1990 EM). Still, creation of complete new functions requires considerable programming skill on the part of the user.

HyperCard is an example of an application designed for novice accessibility. It offers an easy-to-learn language (HyperTalk) combined with a powerful toolkit of ready-made, basic functions, such as buttons and text fields. The programmer doesn't have to re-create commonly used features from scratch. *HyperCard* stacks are, by nature, rather easy for the end user to customize for particular needs. Most importantly, it is not necessary to be a master programmer to produce useable results. However, *HyperCard* still requires authors to deal with a text-based interface, the precise artifact that the Macintosh was to have vanquished.

ICONIC INTERFACES MAKE SOME PROGRAMMING FUNCTIONS MORE ACCESSIBLE TO THE NOVICE.

THE ADVENT OF ICONS

While text-based programming is appropriate for many situations (and indispensable for low-level hardware interfacing), it is not necessarily the best representation of certain types of programming and certainly is not the simplest paradigm for novices. Beginning in 1963 with Ivan Sutherland's *SketchPad* (MIT), and continuing with Borning's 1977 *ThingLab* (Xerox PARC), computer science researchers have explored the possibilities of graphic, icon-based programming environments.

This style of interface is especially appropriate for object-oriented systems, in which messages are passed between semi-independent processes, much like a signal in an old-style analog synthesizer or a guitar effects chain. It also has the advantage of relative transparency to the user. When different processes and the flow of data are represented by boxes and wires, it's easy to get a sense of what's going on. The end user easily can analyze a given function and add or delete modules to suit particular purposes.

Many musicians are familiar with Digidesign's *Turbosynth* program for the Mac and ST, in which various digital audio processes such as delays, filters, and envelopes are represented by icons and "patched" together with "wires" to form composite effects. From an audio standpoint, it seems natural that each of these processes be carried out by a separate object; even multi-effects products present themselves to the user as a number of virtual effects boxes. This modular approach makes any particular chain relatively easy for the user to design, alter, and manipulate.

Iconic interfaces make some programming functions more accessible to the novice, and protocols for inter-application communication make small, specialized music programs a viable possibility. Discussed here are five programs, all providing graphic interfaces: *Max*, *HookUp!*, *Megalomania*, and *Interactor* for the Apple Macintosh and *MusicBox* for the IBM PC.

What *Turbosynth* does for digital audio, these programs do for MIDI. They provide for the processing and creation of MIDI data streams, with iconic objects that may be linked together like an effects chain, to create "patches" that carry out these tasks. With these objects, the user may create anything from small utilities such as MIDI delays and event filters to complex applications such as algorithmic composition tools (with user-created algorithms, not just user-defined parameters), patch editors, and interactive, structured improvisations between the computer and live musicians. Those that are compatible with MIDI files, or use *MIDI Manager*, can be used in conjunction with mainline sequencers, offering users the opportunity to customize their computer music environment. At the present, none of these programs offers the ability to make stand-alone applications. Any processes written using the environments must be run from within them—a minor limitation, in view of the benefits.

So far, I have been using the terms "programming environment" and "application" interchangeably with regard to these products. Some of these products, specifically *Max*, *HookUp!*, and *MusicBox*, offer capabilities extensive enough to qualify them as high-level languages. *Interactor* and *Megalomania*, on the other hand, are more specifically designed for their tasks, with correspondingly less flexibility or access to

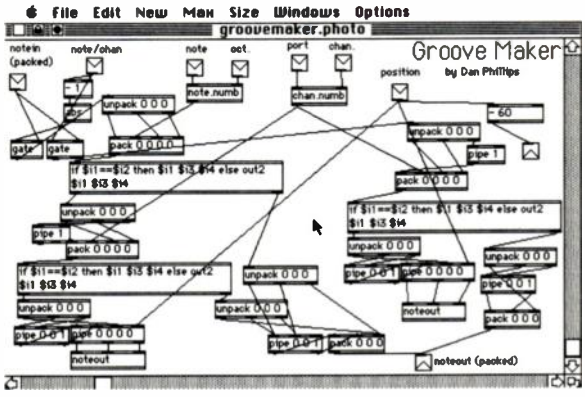

FIG. 1: The Max patch for a "feel" generator. Several generators are used as objects in the larger user-interface patch. Note the generic inputs at the top, provided for input from the sliders and menus, as well as interfacing with other modules.

lower-level operations. This leads me to think of them as programs—admittedly a hazy distinction at best. David Levitt of Hip Software, designer of *HookUp!*, speaks of his intention to "blur the line between developers and users," and that is precisely what these products are accomplishing.

MAX

Originally developed at IRCAM, the French musical research facility, *Max* is optimized for real-time control over MIDI. Named after electronic music pioneer Max Mathews, its main programmer was Miller Puckette. Currently, it is being prepared for commercial release by David Zicarelli, of Intelligent Music *JamFactory* and Opcode *DX Editor* fame. It provides a hefty variety of programming objects, ranging from low-level arithmetic and logical operators to complex sub-programs, such as a graphic sequencer and a user-configurable patch librarian. Like *HyperCard*, *Max* makes the construction of slick, professional-looking user interfaces quick and simple by providing the programmer with ready-made sliders, buttons, pop-up menus and the ability to

Iconic vs. Object-Oriented Programming

Object-oriented programming, or OOP, is one of the hottest buzz-words in software engineering. In OOP, the individual parts of a program are partitioned into independent "objects" that are essentially self-contained and interact with other objects only in highly specific ways. The advantage for the programmer is that objects, once created, can be easily reused in other programs. The advantage for the end-user is ease of use and potential for easy modification.

While OOP is a good approach for creating iconic-programming environments, programming with icons is not necessarily OOP. In some ways, the iconic programs discussed here are similar to the OOP paradigm. Much like an effects chain, OOP packages data with the process that acts upon it instead of storing the data in a separate place: a flanger processes only audio that passes through it, not the signals stored on a tape. Message-passing, in which the processes of objects are triggered by signals that tell them what to do but not how to do it, is an OOP concept that these iconic programs embrace in a limited way.

An important OOP concept absent from these programs is inheritance, in which a new object is defined as a modification or sub-class of an existing object. The class "Human," for example, is a sub-class of "Mammal," which is in turn a sub-class of "Animal." OOP languages providing full use of inheritance allow the user to easily create additional sub-classes, such as "Musician." This saves redefining all of the common characteristics. Even *Max*, which allows users to add entirely new objects, does not provide for inheritance.

OOP is a complex subject, well beyond the scope of this article. For a more in-depth introduction to OOP, pick up the March 1989 issue of *Byte*, or the January 1990 issue of *MacWorld*.

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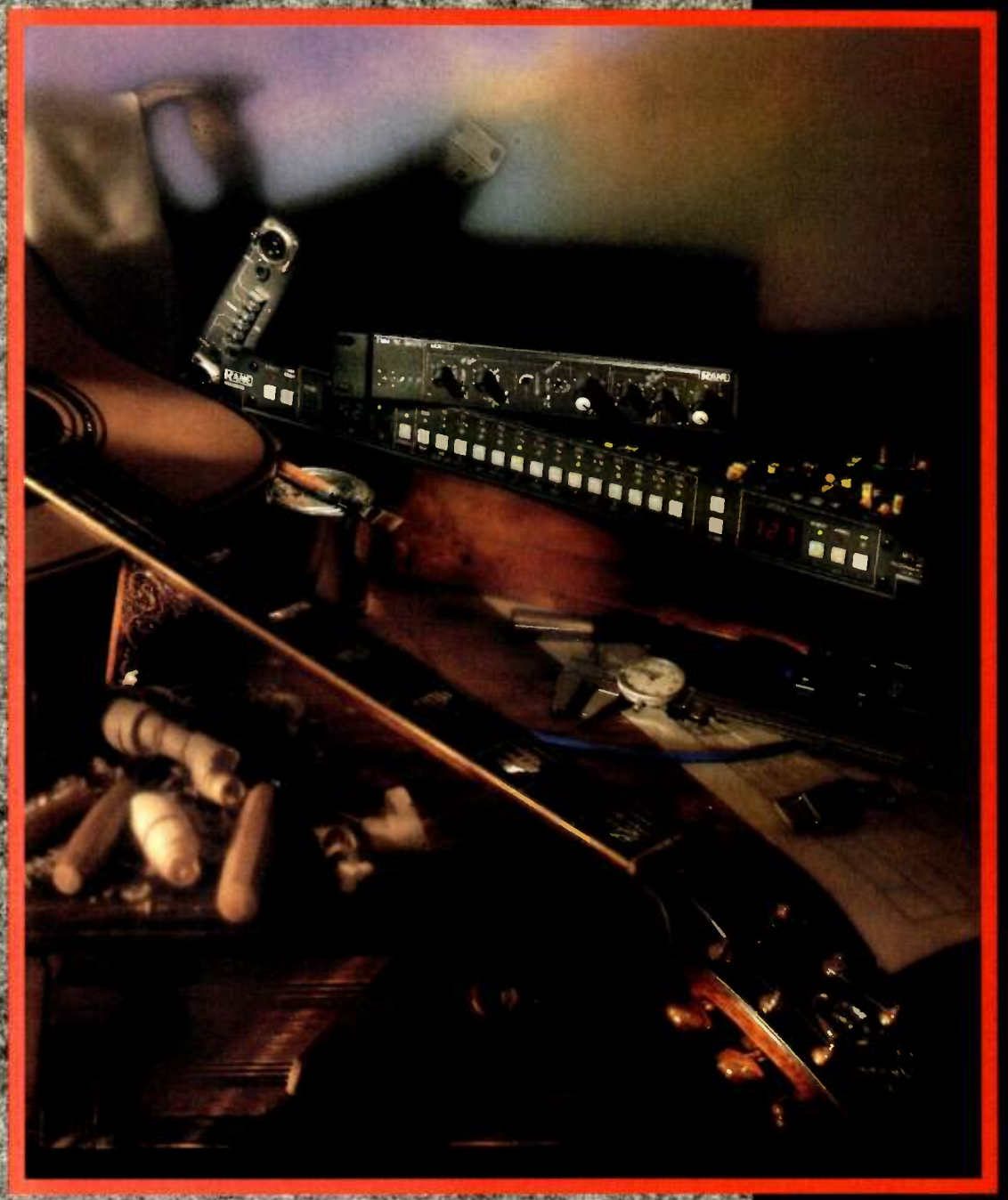

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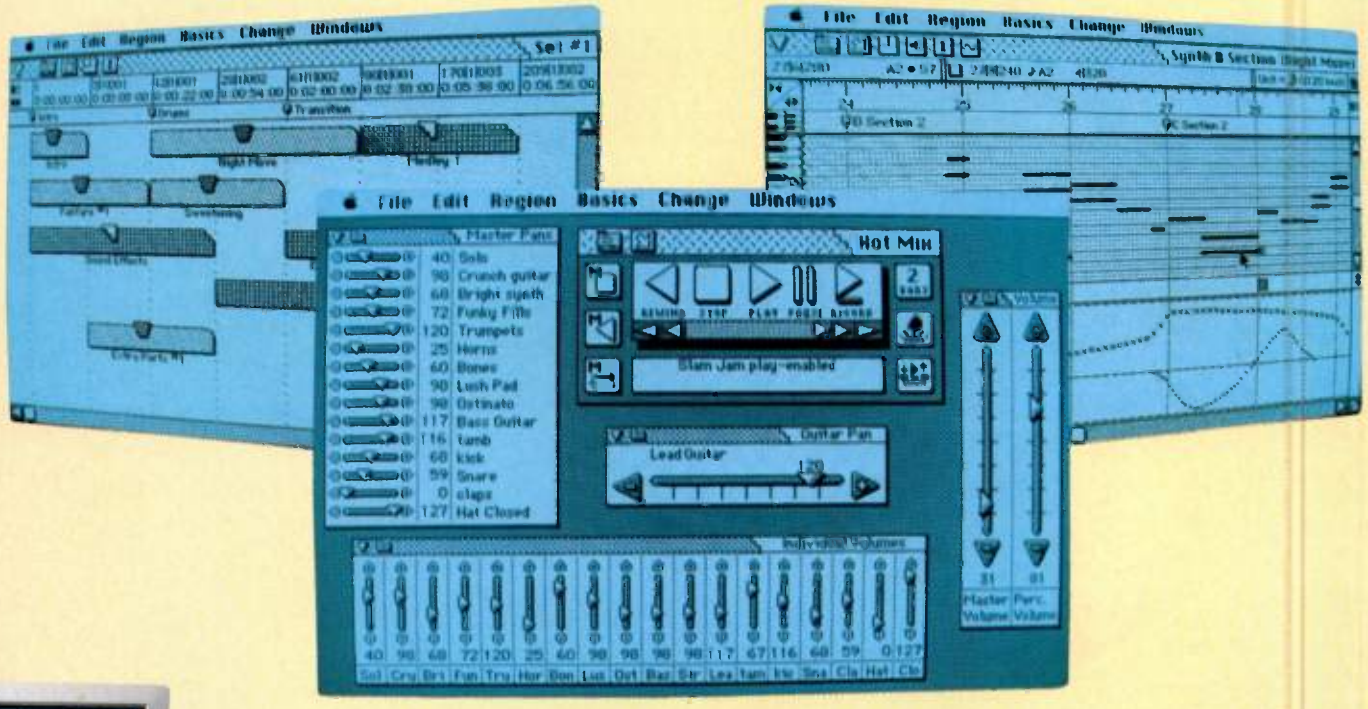

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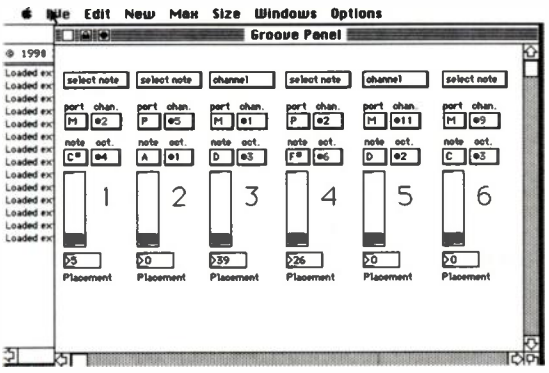

FIG. 2: User interface to control the patch in Fig. 1, complete with pop-down menus and graphic sliders.

hide wires or objects which might otherwise clutter the screen.

It is also the only one of these programs which allows the formation of compound objects so that an entire patch may be called as a single object in a larger patch. Programming in C, it is possible to add entirely new objects to *Max*, including drivers for protocols other than MIDI. The program will read and write MIDI files and is compatible with *MIDI Manager*. These features combine, in my opinion, to make *Max* the Rolls-Royce of iconic music applications.

Although it is yet to be commercially released, *Max* has been used to create a number of pieces at IRCAM. The program incorporates score-following capabilities, and these have been used extensively in the compositions of Philipe Manoury, including performances in which *Max* was coordinated with an orchestra, triggering sequences and MIDI processes under the control of a MIDI piano. Currently, French master composer Pierre Boulez is working on a piece using *Max*.

Despite its power and flexibility, the program is still user-friendly. An online help facility offers informative screens for almost every object. I am a novice programmer, but with a bit of assistance, I was able to create a device similar to the Aphex Feel Factory, globally delaying the MIDI stream and then selecting an entire channel or a particular note to be run through a separate, variable delay (see **Fig. 1**). The wires are pretty messy in this example, but it's possible to use "sends" and "receives" (which operate like virtual radio channels) to clean this up. With *Max's* built-in sliders and menus, I was also able to create an elegant front panel for an array of "feel" modules (**Fig. 2**).

HOOKUP!

Developed by David Levitt and his students at the MIT Media Lab, *HookUp!* is extremely easy to use, and offers links to the sound and animation capabilities of the Macintosh that the other programs ignore. It is being used in Apple's Vivarium project, which is an ongoing, innovative experiment in teaching the principles of programming to young children.

HookUp! includes the ability to make wires with right angles to bend around objects, and a feature that automatically hooks up an input and output placed in close proximity (see **Fig. 3**). Its implementation of MIDI, however, is less than complete. *HookUp!* Version 1.01, in fact, ignores all MIDI data but note-ons and velocities, although a later version may support controller data and add *MIDI Manager* compatibility.

Basic arithmetic and logic objects are provided, along with memory and switches, so it is possible to perform real programming tasks in *HookUp!*. In addition to MIDI note input, *HookUp!* allows data entry from software sliders, buttons, and the mouse. It really shines in its two complex animation demos, in which the very curious looking Ergit and the insufferably cute baby pterodactyl Gilda (complete with sneakers and a

How to Obtain...

- *HookUp!*, $149. Hip Software, 117 Harvard St., Suite 3, Cambridge, MA 02139. Tel. (617) 661-2447.
- *Interactor*, price not announced. For details of release, contact Mark Coniglio c/o the California Institute of the Arts, School of Music, 24700 McBean Pkwy, Valencia, CA 91355.
- *Max*, price not announced. Opcode, 3641 Haven Dr., Suite A, Menlo Park, CA 94025. Tel. (415) 369-8131.
- *Megalomania*, public domain (free). Downloadable from CompuServe and the Boston Computer Society. Also available by ftp at sumex-aim.stanford.edu (36.44.0.6).
- *MusicBox*, public domain (free). Downloadable from GEnie, CompuServe, and The Well.

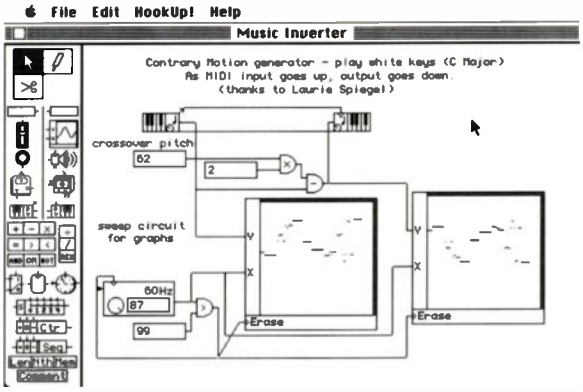

FIG. 3: A HookUp! network by Laurie Spiegel that inverts MIDI note data, producing a simple counterpoint in contrary motion. Note the keyboard icons for MIDI in and out, and the graphs used here to visually display incoming and outcoming notes. All of the programming functions may be selected from the toolbox on the left.

curly-cue tail) move about under the control of the mouse, making sounds as they walk, fly, or bump into other objects.

HookUp!, however, is not the only bag of tricks that Levitt has up his sleeve. He is presently developing a set of applications that will allow symbolic manipulation of musical data through an easy-to-use, *HookUp!*-style interface. By "symbolic manipulation," Levitt means the control of large-scale musical characteristics such as phrasing and feel, as opposed to local, note-specific editing. For instance, one might enter in a melody and then invoke the process, "lyric flute." This function might allow you to adjust timing so that the rhythm lags just a bit behind the beat, search out high notes and make them linger slightly longer than their official note value, use aftertouch to add vibrato to long notes, and identify the ends of phrases by marking them with a slight downward pitch-bend. Such processes would be entirely user-programmable, allowing the definition of custom "styles." This broad control of performance characteristics seems a particularly powerful concept, and it will be interesting to see what comes of it.

MUSICBOX

The only non-Macintosh program of the bunch, *MusicBox* is unique in a number of ways. It does not, for instance, allow easy access to incoming MIDI data. Although a single object is provided to store the incoming stream in a buffer, there is no provision for sorting by data type, such as note-ons, controllers, etc. For its output, it uses a technique of event generation similar to that of old-style analog step sequencers, with clocks triggering note or controller events. The objects are not represented by boxes or pictorial icons, but by stacks of values representing the object's various parameters. I didn't find this as visually pleasing an option, but it does have the advantage of constantly displaying the current values of everything in a patch, without the use of external output display boxes (as is necessary in *HookUp!* and *Max*). It makes use of color graphics for easy identification of inputs, outputs, and so on.

MusicBox, in keeping with its non-graphic nature, doesn't draw "wires" to display data flow. Instead, it notes the originating object in the destination's value display, and highlights all the destinations of a selected origin on demand. These are nice touches (it can be somewhat difficult to trace the wires from origin to destination in particularly complex *HookUp!* or *Max* patches), but they would have been more powerful if used in conjunction with the visual wires.

In keeping with its nuts-and-bolts flexibility, *MusicBox* offers such low-level capabilities as direct access to the I/O ports or individual addresses in the PC's memory. For the experienced programmer, this opens up a variety of possibilities, such as the potential to deal with non-MIDI information. *MusicBox* includes math and Boolean logic operators in addition to higher-level functions, about 150 different objects in all.

Unfortunately, *MusicBox* is unable to share its MIDI data easily. There is no mechanism available to pass MIDI information directly from program to program on the PC, as there is on the Mac, and *MusicBox* has timing problems that make it difficult to save data as MIDI files. While some enterprising programmer may find a solution to this, for the present it's necessary to own another computer or hardware sequencer to simply record the MIDI output (*MusicBox* will sync to MIDI clocks).

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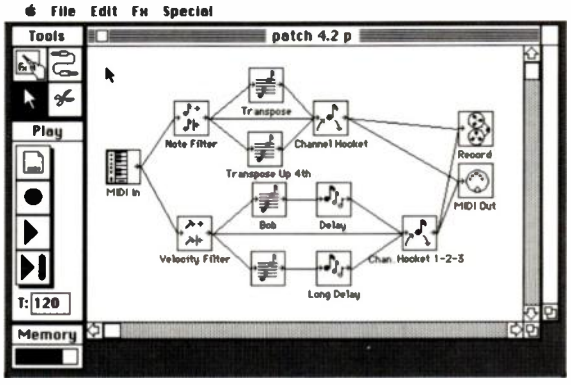

FIG 4: An effects patch in Megalomania; note user labels of objects, handy for keeping track of different configurations of the same effect. This patch is both sent to MIDI out and recorded into a MIDI file.

In general, I found this to be the most formidable of the programs, with an interface virtually devoid of text and a manual that is extensive but not always terribly helpful. (The introduction warns that the program is "not an easy instrument to learn.") I have a feeling that only committed hackers will be able to take advantage of its full capabilities. Then again, it's the only program of its kind on the PC platform, and the price is definitely right: its author, John Dunn, has placed *MusicBox* in the public domain.

MEGALOMANIA

Like a MIDI *Turbosynth*, Eric Huffman's *Megalomania* for the Macintosh provides a collection of real-time MIDI effects, including complex, multitapped delays with non-linear periods, controller-generating envelopes, and channel hocketing (sending each note of the MIDI input to a different channel). Its name is a comment on the feeling of power that you get when playing with a particularly complex effects chain; it's easy to start feeling overly self-important when you play one brief note on a keyboard and listen to that note propagate through delays and transpositions for the better part of twenty seconds.

While *Megalomania* is nowhere near as extensive in its capabilities as the other four tools, I found it a blast to play with. The icons (see Fig. 4) are simple and informative, and double-clicking on any of them brings up a dialog box in which the user can configure the object's parameters (e.g., number of delays and velocity decay amount for the simple delay). There are also some logic-style objects, which can be used to select notes, note ranges, or velocity ranges for special treatment, but no strictly mathematical capabilities are provided.

Non-linear effects are produced using graphs, which map changes of value relative to changes in time. For instance, a graph can be made to send a *sforzando* over MIDI volume (controller 7), starting at 127, quickly dipping down to 20, and then making a gradual crescendo back to 120 over the period of a second or so. Graphs may also control program functions, such as the period of a delay module. External controllers also may be used to drive graphs, allowing for some hip performance possibilities.

Megalomania reads and writes MIDI files—an old version (0.6). My sequencer, *Performer*, could read *Megalomania's* files, but *Megalomania* couldn't read *Performer's*. Huffman plans to implement read/write of new MIDI files, as well as (perhaps) support for Apple's *MIDI Manager*. Unfortunately, it's very easy to bog the program down with too much MIDI data (at least, it was on my Mac Plus). I'm told that this problem is

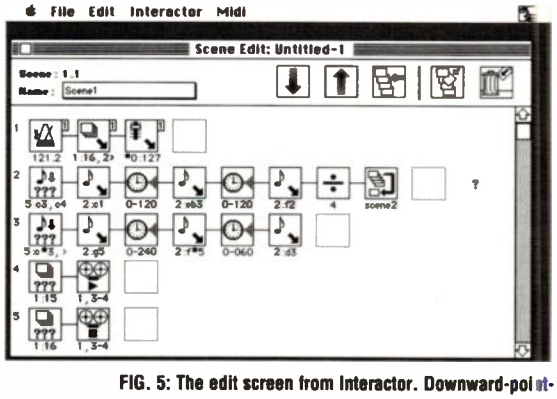

FIG. 5: The edit screen from Interactor. Downward-pointing arrows indicate output, in this case including notes, program changes (the three boxes), and controller data (the slider). When defined notes are received (note with question marks), arpeggios are produced (note outputs separated by "clock" delays), and program changes start and stop playback of a MIDI file.

not so pronounced on faster machines, and at any rate, the patches I've been creating in it are more geared towards ambient effects.These small complaints notwithstanding, *Megalomania* is extremely fun, helps to perform some neat and useful musical tricks, and is a good introduction to the possibilities of MIDI processing. That this program is available free is purely icing on the cake.

INTERACTOR

Developed at the California Institute of the Arts by Mark Coniglio and Morton Subotnick, *Interactor* is optimized for score-following and real-time interaction. The program uses techniques similar to those found in hardware devices such as the Aphex Studio Clock or Garfield's Time Commander to track the tempo of real-time MIDI input and compare the input to an internal score to determine the performer's location in the piece. *Interactor* also uses a series of "scenes" to invoke MIDI processes at various points (see **Fig. 5**). Every scene contains processes that are triggered by the reception of particular bits of MIDI data. Once a new scene is selected, *Interactor's* responses to the stimuli change, allowing a variety of responses from a small number of controllers.

Interactor is capable of playing the left-hand part to a Clementi sonatina along with a live keyboardist performing the right-hand part, synching up within two beats after the live player starts—from any point in the score. This requires analysis of the score by the programmer, who must identify the musical landmarks by which the computer will find its place. Coniglio points out that this is the same way that human musicians find their place and is more accurate than simply loading the entire score into the follower. Coniglio has written several pieces for *Interactor* and MIDI Dancer, a custom hardware item that allows a dancer to control MIDI events. Morton Subotnick's "And the Butterflies Begin to Sing" uses *Interactor's* score-following features to change EQ and reverb parameters in real time.

Interactor will read and write MIDI files, and Coniglio plans to make it *MIDI Manager*-compatible. The program is specialized in its applications, and it may not be applicable to the needs of all users. Once it is released, however, some may wonder how they worked without it. In live performance, for instance, complex effects could be synched to the music without tying the band down to the tempo of a sequencer. This is potentially powerful stuff.

THE END?

Hopefully these programs are just the beginning. As it becomes easier to exchange data between music programs and programming tools become more accessible, I think we'll see more activity in this area. Someday, musicians will be able to create any specialized tool, from a function that splits their keyboards into 37 different zones, each with its own velocity-mapping, to complex drum-quantizing functions. Graphic programming tools such as these are leading the way into some exciting new territory.

(Thanks to Rob Rayle for his assistance, and the use of his PC. Thanks also to Partha Bannerjee and Mike Brodhead, for instruction in the subtleties of programming and selected skepticisms. Additional thanks to Dr. David Wessel.)

Daniel Alan Phillips *is a MIDI consultant, a composer, and the singer/keyboardist for Bay Area band Rapid Transit.*

NEW MEDIA FOR MUSIC

WHITNEY SHERMAN

JUST AS NEW TOOLS FOR MAKING MUSIC HAVE BECOME AVAILABLE, SO HAVE INTRIGUING NEW FORMS FOR ARTISTIC CREATION.

Not long ago, the pinnacle of success was reached when your music made it onto an LP record. In fact, no matter the musical format, we still say, "We're making a record," or, "I've cut a record deal." What exactly do we mean by this? The past decade saw the decline of the LP, the ascendence of compact discs, and the arrival of the desktop computer as a musical necessity. What's next?

A coat of many colors is one good guess: new media, mixed media, interactive music, "flexible" music. Whatever you call it, the dynamic melange of music, data, and visuals represents the frontier of musical activity. The fact that these new formats free musicians from traditional linear media may have even more exciting implications for the future.

This media stew isn't exactly ready yet, but it's hot on the stove, blending together technologies, formats, and ideas. While a solid half-dozen or so examples currently exist, it's not too late to add your own seasonings to the mix. Electronic musicians are the ideal group to drive this development, and the dawn of the decade is the right time to examine just what's going on.

BY DANIEL J. KUMIN

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CURRENT FORMATS

Music Data

Today, music does not have to be distributed in its final form as CDs, records, or tapes. One concept whose time has arrived is that of *music data*, computer files of MIDI instructions that the listener can decant into his or her own system. Thanks to the standard MIDI file format, MIDI sequences can be recorded to computer disk and easily translated by users of any of the popular computers.

CD+MIDI

The nascent CD+MIDI standard provides another means of distributing MIDI data (see the September 1988 **EM** for more information). MIDI data is stored on a compact disc and synchronized with audio playback of the same compositions. Listeners equipped with a CD+MIDI player (a rare commodity so far) can listen to recorded music while adding tracks from their own synths, samplers, and drum machines. MIDI data also can be played alone or dumped to a computer or hardware sequencer, to be edited, remixed, or rewritten at the listener's whim.

There are no CD+MIDI discs available as yet, although Warner New Media, the format's software champion, promises to rectify that situation soon. At present, there is but one CD+MIDI player on the market: JVC's XL-G512, a $500 unit that carries output jacks for MIDI, as well as video. MIDI synchronization to an audio CD is not necessarily limited to the CD+MIDI format, however. A recent demonstration of *Max*, an iconic programming tool for the Macintosh (see "Iconic Music Programming" on p. 42), allowed its author, David Zicarelli, to record a MIDI sequence on top of (and in synchronization with) a standard CD played by a CD-ROM drive attached to a Mac. The key difference is that CD+MIDI permits sequence playback without any computer or hardware sequencer. If you think about the number of $129 mini-keyboards sold every Christmas season, each equipped with an almost certainly unused MIDI input jack, CD+MIDI's potential begins to loom larger.

CD-ROM

The 1990s may prove (finally) to be the CD-ROM decade. This computer peripheral can store almost 700 megabytes of data—over one hour of CD-quality sound (or tremendous amounts of lower-fidelity audio), text, color graphics, and more—with rapid access, in any combination, by personal computers. A relatively inexpensive software format, CD-ROM holds the promise of revolutionizing the information age. But the laser-read data disc has proved a slow starter. Discs are few and expensive, which has kept drives from proliferating. Consequently, the hardware costs have remained high (about $800 for most ROM drives), the classic chicken / egg dilemma.

This may be changing. Tandy recently announced its plan to bundle a CD-ROM drive, plus CD-based dictionary and encyclopedia, with a new, entry-level personal computer. CD-ROM-based computers from smaller companies such as Headstart and Dynabook are already on the market.

In response to wider CD-ROM dissemination, a fascinating new concept has arisen: interactive music. A CD-ROM drive also makes a perfectly capable audio CD player, completely under the control of a computer. Audio segments can be accessed with pinpoint accuracy and synchronized with onscreen text and graphics, or with computer-generated sound for musical examples and study experiments. CD-ROM-based interactive music holds immense potential for music education in a home or institutional setting.

FIG. 1: In addition to annotations and other background material, Warner New Media's *The Magic Flute* CD-ROM set also includes pre-recorded MIDI data.

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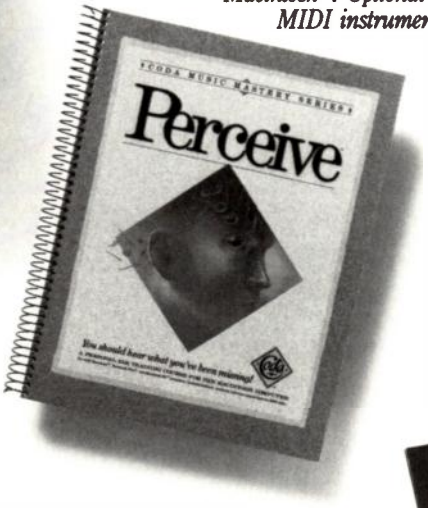

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Coda Music Software

• NEW MEDIA

CD+Graphics

Compact disc enhancements are not limited to MIDI and computer control. The CD+Graphics system, developed by JVC and Warner New Media, marries audio playback to still-frame video via CD+Graphics players equipped with a composite video output. This is patched to any video monitor, yielding hundreds of screens of color graphics, roughly equivalent in resolution to IBM CGA. CD+Graphics requires special mastering and is not immediately accessible to the independent artist. It also requires a CD+G player in the consumer's home. The only models available are JVC's XR-G512 (mentioned earlier) and NEC's TurboGraphix-16 game unit.

CD+G is interactive in the sense that graphics "chase" the audio as the user moves from track to track; new frames take about eight seconds to paint. Nevertheless, CD+G discs are already multiplying. Nearly 100 releases of every music genre are on the market, including discs from such artists as Simply Red and Phoebe Snow.

The beauty of CD+G is that the discs themselves are priced no higher than audio-only CDs (and are indistinguishable, except by the CD+G logo). Currently, 99 percent of CD+G software sales are (no doubt) played in audio-alone mode. If and when the graphic side catches fire, considerable potential exists for this dual-media fusion.

CD-I

The format that could put all this excitement together in one place is Compact Disc-Interactive. This concept—in the oven for nearly a decade now—combines audio, text, color, animation-motion video, and data of any other type in a single format. But CD-I's hardware and software implementation has proceeded by fits and starts. Several firms already market big-buck CD-I "development platforms" (usually built around powerful 80386-based computers). Philips has introduced a CD-I player for professional and development use (it looks a bit like a futuristic CD player, with monitor and keypad attached), and prototype consumer players have also been shown.

IMPLEMENTATIONS

Music Data

The first "big" company to participate in music data publishing is music software pioneer Passport. A new division, The

Music Data Company, is publishing a variety of sequences in SMF format, prechannelized for the Roland MT-32, but easily modified for other instrumental arrangements.

Passport bundles three professionally produced tunes in each *MIDI Hits* volume, which arrives on floppy disk, nicely packaged in a CD jewelbox, with notes and instructions printed on a CD-style insert. Each *MIDI Hits* volume retails at $39.95. The initial twelve volumes include such groupings as "Hits of the 50s" (and '60s, '70s, and '80s), R&B, Jazz, and classical sets. The sample I looked at ("Horns Up!/Mixed Bag") included Toto's "Pamela," Steely Dan's "Peg," and Sting's "Sister Moon" (a theme collection). Each tune is slickly sequenced and arranged and should provide hours of fun for the entire family. Music Data Co. is also marketing individual tunes or custom compilations from a library of over 300 titles through its *MIDI Records* catalog. The catalog is currently available and will continue to offer an expanding song library.

Besides entertainment, professionally done sequences could become an invaluable learning tool for the neophyte musician. If the concept catches on with a broad audience, a market for new material should eventually develop alongside the obvious "cover" demand.

CD+MIDI

CD+MIDI could provide a similar opportunity. Like CD+G, the MIDI compact disc requires mastering and production facilities above and beyond the usual. For the small-scale producer, getting started will be a bit more of a challenge. The MIDI CD field is caught in the same bind that impeded CD-ROM for so long. Only one piece of hardware is currently available, and there's essentially no software for it.

Interactive CD-ROM

Interactive CD-based audio is one of the most exciting new-media developments. The concept is relatively simple. A CD-ROM player can be commanded by its host to play any snippet of music, with precision down to the data block (13-millisecond) level. As a result, music and visual information can be synchronized to a high degree.

This is useful for hypermedia. Hypermedia works like a random-access encyclopedia. Chunks of information (text, graphics, and stereo sound) can be

cross-linked in vast, hierarchical networks. These may range from simple to almost unimaginably complex. Instead of searching an index for each item of interest, hypermedia instantly can take you to any related topic.

The best-known hypermedia program today is Apple's *HyperCard* application for the Macintosh, and *HyperCard* is at the center of the first fruit in interactive audio. Warner New Media currently is releasing a series of CD-audio/ROM hybrid discs called Audio Notes (see **Figs. 1** and **2**). The introductory title, a three-CD set of *The Magic Flute,* is set to retail for $66, about a third more than an equivalent, audio-only CD set. The Audio Notes edition of the Mozart opera carries the opera itself and over one hour of supplemental audio, linked to more than 7,000 screens of information.

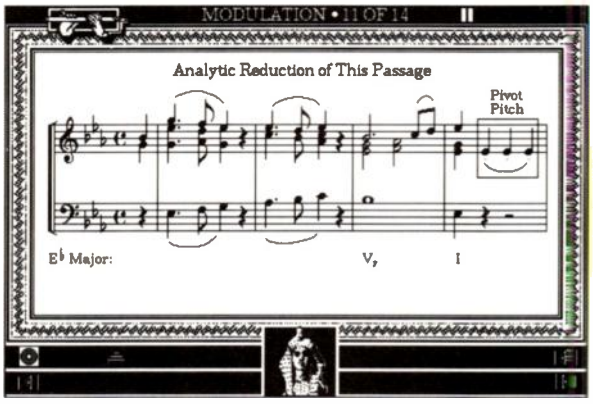


FIG. 2: Warner New Media's Audio Notes series includes musical analyses of the work in question; in this case, Mozart's *The Magic Flute* opera.

The system works something like this. Each CD in the set contains Macintosh data files in addition to the audio recording. Among these are an installation routine that automatically copies the requisite *HyperCard* program and documents to the user's hard disk. It then boots up the entire conglomerate.

Warner's *Magic Flute* offers numerous listen-and-learn options. The opera can simply be played through while the computer displays running commentary on the listener's choice of plot, character, symbolism, musical analysis, or any of several other paths. It can display the libretto as the play runs its course (all of the above in English or German). Alternatively, the user can take innumerable side trips. These may be only a screen or two of related information, or they may be much more elaborate "sidebars" that automatically pause the CD, display fresh information and graphics, and play separate audio portions (from the same disc), such as a narration describing the first performance of Mozart's work.

The Audio Notes discs are genuine multimedia works. They even include MIDI files (in the case of *The Magic Flute,* of principal character themes) that can be played or downloaded via a CD+MIDI player. Clearly, a single compact disc can contain a great deal of interactive, educational (and fun) potential.

VOYAGER

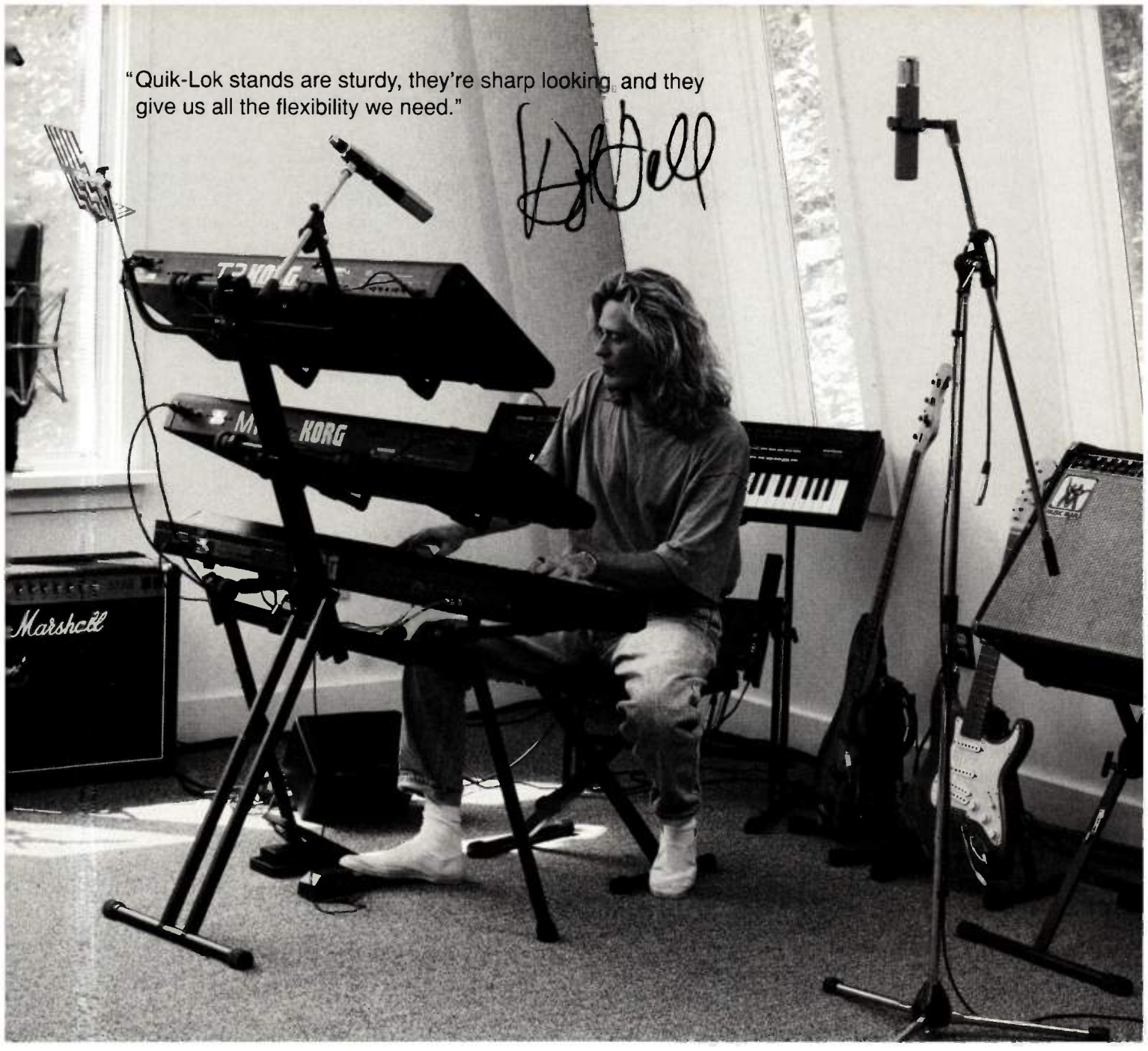
The Voyager Company, a California firm best known for its Criterion-label laser videodiscs, was the first to use CDs and *HyperCard* interactively. Voyager's Companion Series of CD-*HyperCard* sets accomplish much the same effect as the Warner series—and with a user interface that, if anything, is even a bit more elegant. The first of the Companion series is Beethoven's Ninth Symphony ($99, suggested, see **Figs. 3** and **4**), which provides interactive study, analysis, historical perspective, and even an entertaining "Ninth Game" quiz at the end. The next set to be released will be Stravinsky's *The Rite of Spring.*

There is a difference between the Voyager and Warner New Media approaches. Where Warner masters all *HyperCard* data onto the CD itself, Voyager provides the program files on Mac floppies; the user copies these to the hard disk. This approach has the advantage of flexibility: Software on floppy disks can be easily updated, or even changed completely. The compact disc for Beethoven's Ninth is a standard audio release, but the Stravinsky disc and future releases are being specially produced for the series, with additional audio tracks and other supplemental information.

TOOLS OF THE TRADE

CD AudioStack

Apple's *HyperCard* is a sort of software construction kit. You can assemble interactive databases, or "stacks," by moving resources via graphic representations



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THE MUSICIAN'S SILENT PARTNER

Surprisingly, sophisticated results can be obtained without writing a line of code. Using *HyperCard*, it is possible to use an ordinary compact disc to produce an interactive music program, *a la Ninth Companion*. No exotic hardware or mastering facilities are necessary. All you need is a CD-ROM drive, a Mac, and the necessary drive-controlling software resources to create your own interactive exploration of any CD you choose. *CD Audiostack* (see **Fig. 5**) is Voyager's software solution, a toolkit for using *HyperCard* with CD audio discs.

CD AudioStack is a collection of *HyperCard* resources that permit the user to control a CD-ROM drive playing stock audio discs. Routines to play discs, tracks, or segments can be assembled using familiar Mac cut-and-paste operations. Segments can be precisely defined, since *AudioStack* resources can locate down to the CD data block level. Even for the neophyte, *CD AudioStack* is easy to understand and integrate into one's own concoctions.

One use is the creation of interactive musical experiences along the lines of Voyager's own Companion Series. You could, for example, produce a multimedia experience based on "Purple Haze" by buying the CD and creating appropriate graphic screens with any Mac paint program, adding text, graphics, and CD-ROM audio control in *HyperCard*. Your stack might include psychedelic graphics, reproductions of concert posters, and a transcript of Jimi's appearance on "The Tonight Show." It could provide a routine that precisely cues up the "Haze" riff and repeatedly plays it while simultaneously displaying notation, tablature, or even a pictorial guitar neck with moving fingers for the young student to cop from.

The same concepts could be applied to other examples. If you've made the effort of producing a CD of your own, you could create stacks that allow you to add a new dimension of interactive involvement to the project. Interactive entertainment of the type possible with the CD Audio Toolkit is a new genre of art that's only begun to be explored.

Subtler uses of the program are also possible. Archiving CDs should have been made automatic, but, unbelievably, the agreed-upon CD standard did not require disc subcode entry of text information such as titles, artists, or liner notes (even though 50 pages would only occupy about five seconds of CD real estate). *AudioStack* can create a system (though you would have to keypunch in all the data) that could automatically display any combination of text and graphics as any disc was loaded, or any track, segment, or second of music was played.

Audiomedia

CD-ROM technology is not the only way to produce high-quality, multimedia. Desktop digital audio is fast trickling down to a price level that mere mortals can contemplate. The same digital audio data found on CDs can be recorded and retrieved from computer hard disks. The difference is capacity. A CD can store as much as 74 minutes of stereo sound, but even a slightly large hard disk—say, 105 megabytes—is only good for about ten minutes of CD-standard, 16-bit, stereo digital audio.

Desktop recording, nevertheless, holds enormous potential. The current price leader in the field is Digidesign's AudioMedia system for the Macintosh II (essentially a subset of the Sound Tools system, reviewed in the November 1989 **EM**). This is a hardware card, containing the Motorola 56001 DSP co-processing

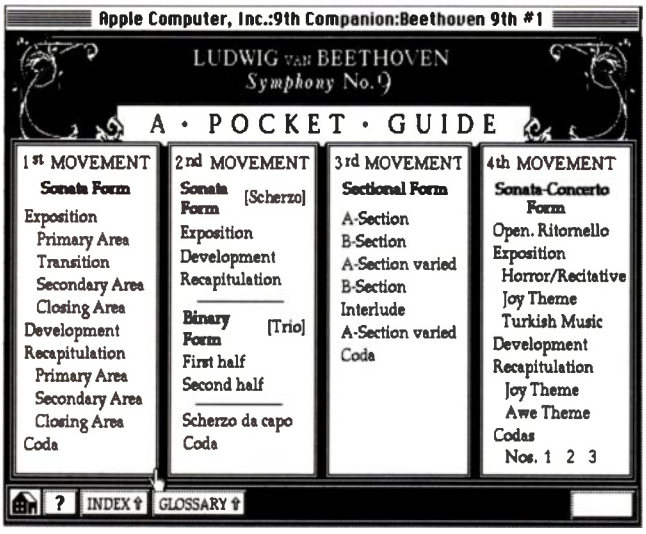

FIG. 3: Voyager's Ninth Companion gives you instant random access to any section of Beethoven's Ninth Symphony.

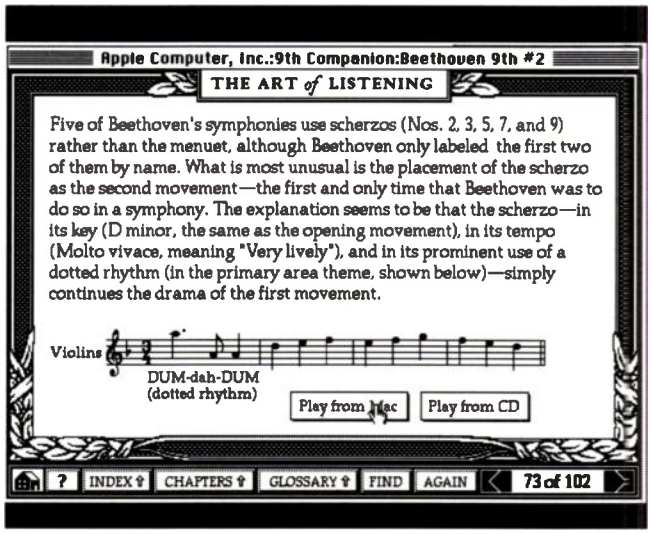

FIG. 4: Insightful commentaries and short notation excerpts make Voyager's Ninth Companion a powerful tool for music education.

"In blindfold listening tests with the best software sequencers, the Alesis MMT-8 won hands down for the best feel."

— Jay Graydon.
Producer, Engineer, Songwriter, Studio Guitarist, Grammy Winner.

Personal computers are great for editing notes and sorting out the MIDI spaghetti in a complex composition. But when it's time to play your latest song they often miss the beat.

There's a reason. Personal computers have to deal with many tasks simultaneously. The notes in your composition have to fight for time on a computer that's busy updating a screen, checking a mouse, and doing other non-musical tasks. Even if you quantize your music, this results in random timing errors during playback, which is readily perceived as a loss of feel. We call it *MIDI slop*. You wouldn't accept sloppy playing from a triple-scale studio band, so why accept it from your computer?

The MMT-8, on the other hand, is the best sequencer you can own because it was designed to perform only one task: making music. It plays back notes exactly as you played them in, or exactly how you want them quantized. All with pin-point accuracy, so your songs will have the exact rhythmic feel you intended. The same *meaning*.

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The Alesis Data Disk

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chip and A/D and D/A convertors, combined with software for recording, processing, and playing back digital sound (see **Fig. 6**). Sounds can be input at the CD-standard 44.1 kHz sampling rate for top fidelity, or at lower rates to save disk space. Processing facilities include mixing and merging, digital EQ, sample-rate conversion, and time compression and expansion. Sound files can be saved in a number of formats, including the various Mac sound resources. They can also be merged with a wide spectrum of Macintosh applications—notably MacroMind's *Director*, a popular program for producing visual presentations. AudioMedia lacks some of the facilities of Sound Tools, such as SMPTE synchronization, but at $995, it's a great introduction to desktop digital audio.

FIG. 5: Voyager's *CD AudioStack* allows you to create CD-controlling stacks of your own by offering pre-programmed buttons that can play user-defined sections of music.

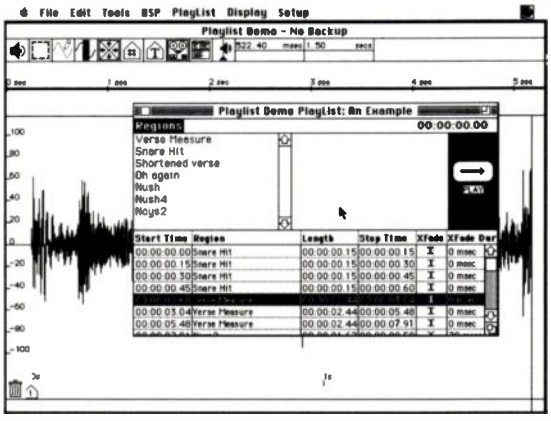

FIG. 6: Digidesign's AudioMedia system for the Mac offers relatively inexpensive, 16-bit stereo recording, editing, and playback capabilities, including the ability to put together playlists of previously recorded material.

MIDI Data

Chances are you already have everything necessary to produce MIDI data "recordings": a synth, a drum machine or two, a computer or sequencer capable of saving to SMF format, and a pair of ears connected to some compositional flair.

Distributing MIDI data instead of the finished music product is not a new idea, of course. A quick tour through the back pages of any **EM** issue of the last several years will confirm this. An entire cottage industry in MIDI sequences has come into being: supplying working bands, individual small studios, and the simply curious with ready-mixed music for any MIDI setup.

As sequence sources run the gamut of legitimacy, we urge **EM** readers to insist on proof of legal copyright compliance. MIDI data is music, just like a printed page, recorded disc, or tape. This goes double for anyone contemplating entering the business on the distribution side. On the other hand, why shouldn't there be a brisk demand for *original* music in data format?

CD + Graphics

Producing your own CD+Graphics discs, alas, is not really practical. Probably the best you can hope for is that, when the big day arrives, your forward-thinking record company will take snaps from your childhood photo album, liner notes, and stills from the video of your first smash-hit single and use them to produce your introductory album in the CD+G format.

The same goes for CD+MIDI and CD-Interactive—unless you've got the megabucks necessary to commission the scarce mastering facilities required for both these new-wave, technology-intensive formats. (If you've got that kind of money, perhaps you'd be interested in commissioning a string quartet or two instead; give me a call.)

CD-I

About the closest thing, at this time, to commercially available Compact Disc-Interactive is the new wave on the video game front. NEC, for one, has introduced a system that employs a stripped-down CD-ROM drive and discs to store the immense amounts of graphic and sound data that its increasingly elaborate games require.

Along the same lines, but more sophisticated, California's Tiger Media recently unveiled a product that's genuinely interactive. *Airwave Adventure* is a detective game in which audio and color graphics combine to yield a labyrinth with more than 1,500 possible "paths." The product was initially released in Japan for Fujitsu's FM/Towns computer—a sort of portable CD-ROM system. Tiger Media has developed this title, and future products, employing a subset of CD-I technology said to be capable of being transferred to other current platforms without extensive restructuring.

The video game world may not seem a very glamorous place to be at the moment. But industry analysts believe that interactive software will be close to a billion-dollar business by mid-decade. By then, such "games" should have become stunningly sophisticated—and truly interactive—and they're going to need music and sound effects of equal polish. *Somebody* is going to have to write, perform, and produce all that music. Remember, you heard it here, first.

WRAP-UP

Most of the examples discussed here employ the Macintosh computer, indicating that Apple must be doing *something* right. But similar concepts are available (or soon will be) for other platforms as well (Atari ST and Commodore Amiga families and the IBM PC and compatibles, in particular). Clearly, whatever the hardware format, the new decade is going to see a lot of combinations. Music and graphics; graphics, sound, and data; computer-based video plus any of these, or admixtures as yet undreamt—all will *probably* be commonplace artistic, entertainment, and educational formats before we're a great deal older. At least one thing is certain: The prototypical **EM** reader is bound to be in the van, leading the 1990s' new-media march.

Daniel J. Kumin *is the technical editor of* CD Review *magazine and writes about pro and consumer electronics for several national publications. He lives in New Hampshire, where he once composed music (before succumbing to the big-buck allure of magazine journalism).*

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Atari ST

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AN EAR FOR PROCESSING

The first of a six-part series on the current state of signal processing applications suggests why you need to understand the physics and psychology of sound to use processing to the best advantage.

by Gary Hall

Signal processing often seems to dominate modern music-making. No technology, even MIDI and synthesizers, has had greater effect on the music we hear. Dance music at times appears to be made up entirely of drum machines and effects. Contemporary rock artists and producers cultivate their styles of processing. New age music swims in an ether of reverberant ambience. Even guitar bands who forbid synths and computers use effects lavishly, and classical recordists regularly use digital reverberation to make the sound more "natural."

Most musicians would agree that signal processing can open up new dimensions, creating tantalizing illusions of sonic realms filled with mystery and delight. Yet we seldom ask ourselves why flangers, delays, reverb, filters, compressors, limiters, exciters, pitch shifters, vocoders, gates, and the like so dramatically affect the way we hear sounds.

What is it about our hearing mechanism that makes us susceptible to the seductions of an artfully crafted effect? Understanding how our sense of hearing has adapted to the physical nature of sound helps us make the best use of signal processing. Just as learning music theory takes us from banging at the piano to sophisticated composition and improvisation, learning physical acoustics and psychoacoustics (the study of audio perception) lets us move from haphazard experimentation toward specific, intentional results from our use of signal processing.

GREG SPALENKA

SOUND IN SPACE

Many creative processing techniques directly correspond to phenomena that occur as part of the normal propagation of sound in indoor and outdoor environments. This makes sense, because the ordinary function of hearing is to convey information about acoustic sound sources in real space. Therefore, studying the way that sound waves travel can shed light on the nature of our auditory sense.

The most salient characteristic of sound traveling in air is time. Sound travels at a speed usually given as 1,130 feet per second. Turning this around, we find that the time it takes sound to travel one foot is:

1 ft ÷ 1,130 ft/sec = 0.885 milliseconds

What's important to know is not so much the exact time value (which varies a few percent with temperature and barometric pressure), but that sound travels one foot in a little under one millisecond (in air). For now, 1 foot per millisecond is close enough.

This makes it easy to understand the relationship of the arrival times of various sound components: Simply examine the difference in the length of the paths that the different sound components have to travel. Substitute milliseconds for feet, and you have the approximate corresponding delay. For greater accuracy, multiply the distance in feet times 0.885.

THE EAR AS TIME-DOMAIN PROCESSOR

Nature has endowed us with a remarkable sound acquisition and analysis system. Our ancestors relied heavily on sound for information concerning their immediate environment and the identity and location of potential threats and food sources.

An important aspect of that system is an extremely precise ability to discriminate time relationships in sound. The ear is, in fact, quicker than the eye or the hand. Consider this: If a sound source is located a few feet away and directly in front of us (see **Fig. 1a**), the sound will arrive at each ear at exactly the same time. If the same sound source is off to one side (**Fig. 1b**), the sound will arrive at the nearer ear first.

In this case, the differences in path length are small (much less than a foot), and the corresponding difference in arrival time is a fraction of a millisecond. Yet, this tiny difference in time is

enough to tell us that the sound is located in the direction of the nearer ear, as the following step-by-step experiment dramatically demonstrates.

1. Patch a delay, or multi-effects processor with all effects except for delay turned off, into one side of a stereo path.

2. Feed the processor with a mono source (use just about anything except a steady tone), and monitor both sides over headphones, as shown in **Fig. 2**.

3. Bypass the delay. Carefully balance the left and right levels to center the stereo image in the headphones.

4. Set the delay unit to the shortest delay time available and take the delay unit out of bypass. If the shortest delay is one millisecond or more, the stereo image will lurch suddenly and decisively to the side of the undelayed signal, even though both levels remain the same. (Be sure that the level stays the same in bypass and active modes.)

5. If your delay offers sub-millisecond delays, set it to 0.1 ms (100 microseconds) and experiment with lengthening the delay. Even a fractional millisecond delay is enough to strongly tilt the image. The difference in arrival time at the two ears is a major cue about the direction from which a sound originates, known among hearing researchers as Interaural Time Difference, or ITD.

OTHER DIRECTIONAL CUES

Hearing also involves the localization of sound. After all, our ancestors needed to know which direction that saber-tooth cat was coming from in order to know where to run. Those who got it right lived to do the horizontal bop and see future generations who would invent MIDI, spandex, and cappuccino.

FIG. 1: (a) Sound travels an equal distance from the source to the left and right ears. (b) The source has been moved to one side, and sound must travel a greater distance to reach the ear that is opposite the direction of displacement.

Besides ITD, the difference in the sound level that arrives at each ear (called IAD for Interaural Amplitude Difference) is important for localization—as anyone who uses panpots can verify. Although time delay is actually a stronger cue than level differences in most instances, in nature all the various cues work together to confirm our perception of a sound's location.

In addition, the angle at which the sound arrives at the ear influences a sound's spectral content. Reflections from the ridges and folds of the outer ear, as well as from the head and shoulders, create phase cancellations that introduce notches into the frequency response of what you hear. The exact character of the resultant response

curves, how they change with direction, and the relationship of the differing signals at each ear, are not well understood at present. This topic is currently the subject of some intense research, but obtaining conclusive results is difficult, particularly as the shape of the outer ear differs markedly from one individual to another.

Even though the details of spectral cuing are complex and poorly understood, the involvement of moving notches helps explain why phase shifters, flangers, and other devices that produce swept notch filters can impart a sense of motion to a sound (though this is not the only cause for that feeling of motion).

CUES FOR DISTANCE: DIRECT AND REFLECTED SOUND

Cues regarding the distance of a sound source come partly from the lower amplitude of a distant sound and partly from the attenuation of high frequencies that occurs as sound travels through air. Perhaps most important in this case, however, are cues that result from the interaction of sound with the physical environment. Besides being sensitive to the difference in arrival time of a sound

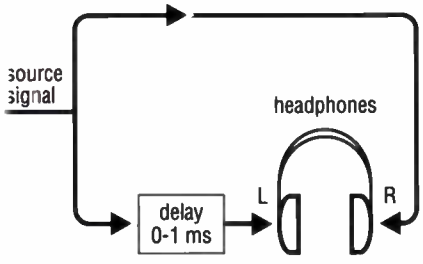

FIG. 2: A simple experiment with headphones and a delay line demonstrates the ear's sensitivity to interaural time differences.

to the two ears, our hearing system has a remarkable ability to analyze reflections from environmental surfaces. In signal processing terms, this implies a powerful correlation capability. This ability seems to lie partly in the physical ear and partly in the nervous system. Interestingly, researchers have found that some of the processing seems to occur not in the brain itself, but in the nerve bundle that connects the inner ear to the brain. This would seem to emphasize that the sense of hearing has an ancient and fundamental relationship to our being.

In nature, sound without reflections rarely occurs. Even outdoors, sound reflects from the ground, from rocks, trees, etc. The relative delay times, levels, and spectral characteristics of various reflections give us important clues to the listening environment, and to the location of different sound sources within that environment.

Reflected sound provides critical information regarding a sound source's distance. With a nearby sound source, the direct sound will exceed the reflected sound. If the source is more distant, the relative balance of direct to reflected sound will shift in favor of the reflections. We are all familiar with obvious examples such as distant thunder echoing from the hills, but this mechanism is also at work even in small listening spaces.

Besides the balance of direct and reflected sound, the time interval between the arrival of the direct sound and the various reflections will be different depending on the distance of the sound

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source. If the source is nearby (**Fig. 3a**), the direct sound will travel a much shorter distance than reflections from the rear wall. The differences in path length will be less for reflections from the floor and ceiling. If the sound source is more distant (**Fig. 3b**), there will be less time difference between the arrival of the direct and the reflected sound, as well as less difference in level between direct and reflected sound. The reflection from the rear wall will also more nearly coincide with the arrival of reflections from the floor and ceiling.

Spatial sense is critical to the perception of sound as real, as opposed to reproduced.

The ear is sensitive to the direction (and distance) of reflected sound, as it is for direct sound. Individual reflections are heard as emanating from their respective directions, giving us a distinct sense of the space in which a sound is heard. This spatial sense is critical to the perception of a sound as real, as opposed to reproduced.

A PRACTICAL APPLICATION

Let's apply this information to a signal processing device in order to control the apparent distance of a dry sound source.

As we saw above, much of the perception of a sound source's distance comes from four factors: intensity, attenuation of high frequencies, balance of direct to reflected sound, and the time relationships of direct and reflected sound. Many current effects processors can use MIDI continuous controllers to vary these factors. **Fig. 4** shows a block diagram for the audio and MIDI routing of a patch that emulates the behavior of a source at varying distances. By linking a single controller with different scaling to multiple parameters, we can cause the sound to change in such a way as to provide a reasonable suggestion of a sound receding into the distance.

Depending on the available processor, you may be able to create this patch with a single multi-effects device, or it may require two or more units. On some multi-effects, the output level affects reverberant sound as well as direct, which is not what we want; the idea is to hold the reverberant level constant while changing the character of the direct sound. You may find it easier to use a MIDI controllable mixer to set the level, and (perhaps) filter parameters.

Setting up this patch offers a chance for you to become more familiar with the algorithms and resources that your current processing offers. Remember:

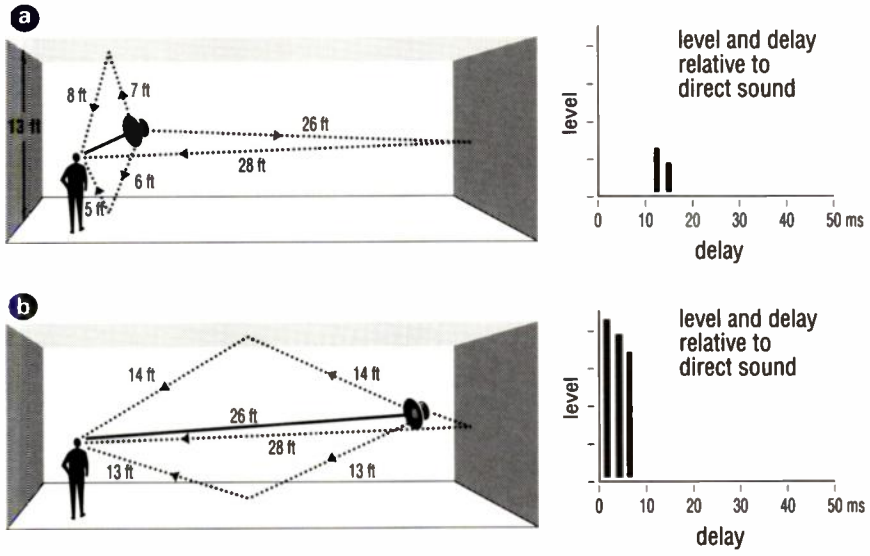

FIG. 3: As the distance of a sound source changes, the relationships of direct and reflected sound change. (Distances and delays are approximate and not to scale.)

Look at the capabilities of your gear in detailand think about what you want to do. Correlating what you want to do to how a given device can accomplish what you want to do is the key to getting beyond your presets and into the realm of creative control.

Achieving a reasonably convincing effect requires that the MIDI controller affect each parameter in the proper degree and direction. Since every MIDI-controlled processor works differently in this regard, we'll adopt a generic procedure.

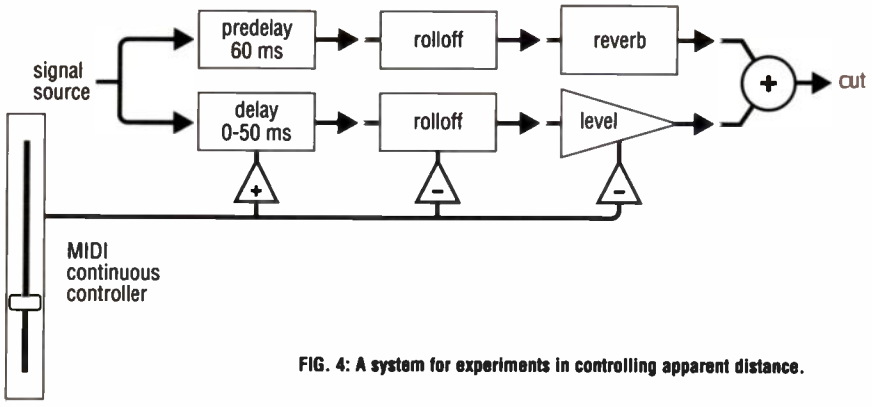

FIG. 4: A system for experiments in controlling apparent distance.

1. Set the MIDI controller to a value of 0 and adjust the settings of the processor(s) for a close, "in-your-face" sound (level high, filter open, delay of 0 ms). Adjust the reverberation to a fairly low level, with a moderate decay time (1 to 1.5 seconds) and a pre-delay of about 70 milliseconds. You might like to use spoken word as a source and picture the person as standing in front of you in a large, empty concert hall. As the person speaks, you hear the sound of the room as a soft "whisper" behind the direct voice. Roll off the high frequencies on the reverb a bit as well.

2. Move the controller to its maximum value and adjust the "scaling factor" of each controller "patch" to give the impression that the source is at the opposite end of the hall. You will want to use a negative scaling factor for the gain parameter so that level decreases as controller value increases. Also use negative scaling on the filter cutoff so that the sound becomes darker, with less high frequencies, as the controller value increases. Adjust the scaling to the variable delay (positive scaling factor) so that the actual delay at the maximum controller setting is a little less than the predelay on a reverb (about 50 ms).

Don't set the scaling values too high; otherwise, the direct sound may fade out entirely and the high end may disappear more or less completely. If the delay value goes too high, the direct sound will come after the reverberation, a situation that does not ordinarily occur in nature. Likewise, make sure that the reverb's rolloff frequency is never

higher than that of the direct sound at the most distant. Our goal is to preserve a relationship between these parameters that corresponds to acoustic reality. It's little things that cue the ear whether an acoustic space sounds more natural or more artificial, so be aware of details.

3. After setting the two endpoints, try various in-between points on the controller to shift the position of the sound in the room. If the position doesn't change in the desired manner, repeat the scaling procedure and scrutinize your setup. The controller curves for your gear may not be as linear as we would like, in which case you might have to try alternative scalings. As mentioned above, some gear is less well-adapted to this task than others. Be creative; find out what the resources of your equipment allow. Above all, keep the goal of achieving a degree of realism in this exercise, and use your mind and your ears to help you reach that goal.

Intensity varies with distance in an exponential manner; in other words, as distance increases, sound intensity decreases as the square of the change in distance. For example, moving the sound source farther away by a factor of three diminishes the sound intensity by a factor of nine. Delay time, on the other hand, increases linearly with distance. For the most realistic response, therefore, our equipment should provide an exponential control of level in response to the MIDI controller. If your gear does not provide that option, you may be able to fake it by routing the controller output to the scaling factor of the "patch" that is controlling level (some models let you do this).

MOTION CUES

If a sound source and listener are moving in relation to each other, the apparent pitch of the sound varies in proportion to the velocity with which the sound is moving toward or away from the listener (the familiar "passing car" effect). This is commonly referred to as "Doppler" pitch shift, and is the principal cue for sound in motion.

Doppler pitch shift can be incorporated in our "distance simulation" if you have a delay line that changes delay time continuously. The delay time in most current multi-effects units changes in discrete steps, and each transition can produce unpleasant noises. Analog delays generally sweep smoothly, but since few of these have been made since the advent of MIDI, you'll probably need to use a MIDI-to-CV converter to control it via MIDI. (Alternatively, you could do this whole exercise with a voltage-controlled modular synth and an analog delay). Dedicated digital delays use a mixture of both, with continuous sweep over a limited range. Current technology is starting to take us back in the direction of continuous sweeps, since DSP (Digital Signal Processing) can "smooth out" the individual steps of delay.

If you do have a sweepable delay, you'll find that Doppler pitch shifting occurs automatically when changing delay times. This is because transient shifts in delay lines occur for exactly the same reason that they do in nature: the delay time is increasing or decreasing with distance (one foot per millisecond, remember?). Note that some processors limit the rate at which a delay can be swept. This means the speed of apparent motion will be limited, as well.

In real life, reflected sound makes the situation a little more complex. Go back to Fig. 3, and consider the situation as the sound source moves from position

TRANSDUCERS AS SIGNAL PROCESSORS

Every time an audio signal is recorded, reproduced, or otherwise converted from one medium to another, signal processing occurs. We don't usually think of it that way, but information is altered in the very act of transformation. Microphones, loudspeakers, amplifiers, control and recording rooms, are common studio elements that profoundly affect the nature of our sounds. Think of these as processors, and you'll find new ways to use these items creatively.

Start with microphones. Sound in air is a phenomenon that occurs in three-dimensional space. An audio signal traveling down a cable has only the single dimension of a voltage changing with time. Miking is a process that inherently selects some information and rejects other elements. Most recordists are aware of miking techniques that influence frequency response, balance of ambient sound, and leakage from other instruments (see the March 1990 issue of EM). Consider these as part of your processing arsenal; you can't process sounds that aren't there, so always get basic miking down before reaching for the dials.

Loudspeakers also affect sound. Studio monitors generally are optimized for accuracy, while guitar speakers are designed to color the sound. Want your synth patch to sound more like a guitar? Play it through a guitar speaker cabinet.

Amplification is, by definition, a signal processing function. Although amps supposedly boost power without otherwise changing the signal, arguments rage over the sonic character of different amps.

Rooms are, in some ways, the ultimate time-domain processors. Most experienced engineers agree that electronic reverb and ambience still do not quite capture the way a sound "blooms" in real space.

You can make all of these factors work for you by employing an old studio trick. Once a sound is on tape, you can still "put it in a room" by playing it over a miked speaker. With all of the variables of microphone, speaker, and amplifier selection and placement there's truly infinite potential for variation. The more you regard all your gear as part of the signal processing chain, the more you'll discover new ways to process your sound.

For more information on using transducers as signal processors, see "An Acoustic Mixer" (August 1986 EM) and "Amplification and Transduction: New Tricks for Old Licks" (July 1989 EM).

(a) to the position shown in (b). The path lengths (hence delay times) both change, but at different rates. Therefore, different Doppler shifts will occur for reflected sounds than for direct sounds. When a sound moves in a room, we hear a whole group of different shifts at varying levels and delays. This gives us information about the motion of the source, as well as the room. In a reverberant space, shifted versions of the moving sound feed into the room ambience too. Remember, I told you it gets complex.

REFLECTIONS VERSUS REVERBERATION

In our previous distance control experiment, we used reverberation exclusively to cover the "room" part of the sound. In the real world, our ears distinguish between individual reflections and the complex, decaying tail of sound we call "reverb." Reverberation is the result of sound reflecting from one surface to another over numerous diverging paths in an enclosed space. The mix of sound quickly becomes too complex to analyze in terms of individual delays, and must be viewed statistically in which different frequency bands, called modes, decay at different rates. Fine performance spaces are distinguished by a high density and evenness of these modes, as well as by a large percentage of reflections from either side (remember that our ears hear reflected sound as having direction, too).

Individual reflections usually occur in

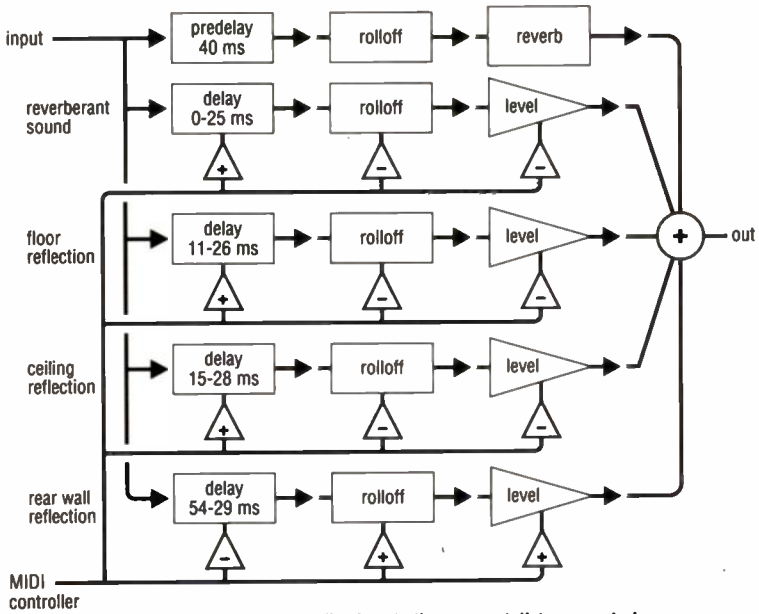

FIG. 5: Adding individual reflections to the apparent distance control.

the first few milliseconds or tens of milliseconds after the direct sound. Reverberation builds up shortly after, with decays up to a few seconds. Sound sources at various locations in a room will produce different configurations of "early" reflections, while producing nearly the same reverberant field. A source close to the listener will have a single, strong reflection from the floor, with weaker reflections at longer delays from the walls and ceiling (Fig. 3a). As the source moves further away, the direct sound and floor reflection will become weaker while the delay time and level of other reflections remain nearly the same (Fig. 3b).

Additional delay chains can simulate individual reflections. **Fig. 5** illustrates an elaborate network that simulates the room and reflections from Fig. 3. Notice that for one reflection, that from the rear wall of the room, the path length decreases with increasing distance. This example is presented primarily to stimulate thought, as it requires a number of individual delays, filters, and level controls. If you do attempt this, tune it using the same procedure as before.

Be aware that Early Reflections programs found on some processors are less useful for this purpose, since the relationships of individual reflections are not changeable.

PANNING WITH PSYCHOACOUSTICS

Let's use the previous ideas on lateral (left-right) positioning cues to make a "super panner" that more accurately reflects real-life localization than ordinary console panpots. **Fig. 6** shows an array that takes account of interaural time and amplitude differences. Frequency response is dealt with (crudely) on the basic assumption that less high frequencies will make it around the head to the more distant ear.

Notice that the direction of control for the various parameters for the left ears is opposite that for the right ear, but that the scaling value should be otherwise the same for each ear. Use the same tuning procedure as before, but tune for

TAPE AS PROCESSOR

Analog tape is itself a signal-transforming medium. Recording tape is highly nonlinear, and much of the design of an audio deck is concerned with processing the signal so that it can be reproduced with fidelity. Even so, the act of recording and reproducing invariably alters the original signal, however subtly. Furthermore, tape machines are the original time domain processors. Many effects used today, such as flanging and echo, have their roots in tape manipulation.

The best known use of analog tape as processing is tape saturation. As tape approaches the point beyond which further magnetization cannot be sustained, the recorded signal starts to distort. Ordinarily, such distortion is not desired, but the type of distortion that occurs in the region before total overload has an effect that can enhance a sound in some situations (snare drums or rock and roll guitar, for instance). Even staunch advocates of digital recording will sometimes roll in an analog deck to capture that sound, which is then transferred to the digital master.

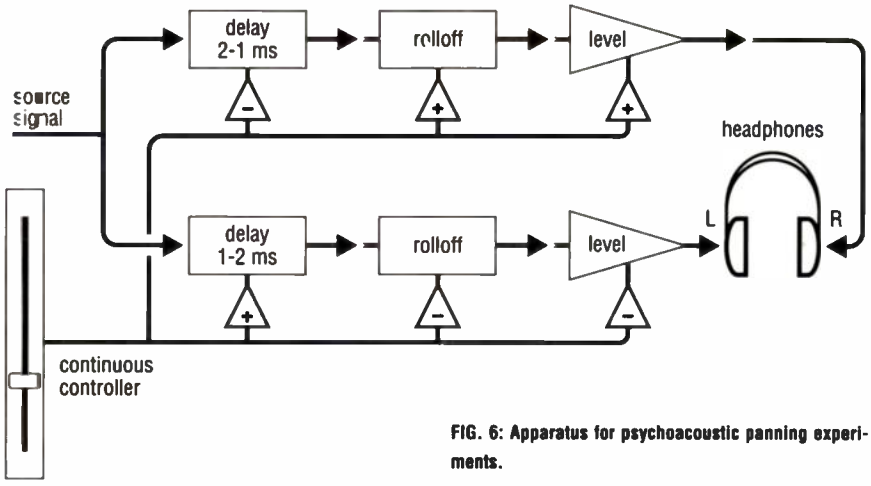

FIG. 6: Apparatus for psychoacoustic panning experiments.

the center position first. Then tune up the left and right positions. Pay attention to symmetry between the two extreme positions.

Because of the acoustic crosstalk between loudspeakers, this approach will only work with headphones. It's also necessary to use very finely resolved delays—finer than those allowed by many processors. For both these reasons, this may not be practical for you, but at least check it out conceptually.

If you have plenty of delays and time, you can attempt to add reflected sound to the picture, using the same approach as in the distance experiments. And if you really have a taste for punishment, you could try to combine this with the distance simulator from before. (Bless you, you're braver than I).

DEVELOPING YOUR OWN APPROACH

We've taken the concept of localization to a fairly elaborate degree. We could have used a similar approach to EQ, or any other aspect of hearing and processing. The point is: Learn to use your ears and equipment together. Pay attention to sound from the perspective of a relationship to physical space and hearing. Listen carefully to sound in daily life and think about what you hear and the way you use processing.

Learning how to make processing sound natural is also the best training to create "unnatural," or "special" effects. By understanding our perceptions of real environments, we are in a position to bend that reality to our own ends.

As artists, illusion is our medium. Learn to move easily between nature and fantasy, and you'll have a skill that will serve you well, no matter what kind of music you set out to create.

EM *associate editor* **Gary Hall** *has been involved in the design, manufacture, and marketing of digital processing equipment for more than ten years.*

Questions & Answers

Our talented tech teaches tricks of pot-mounting, 'scopes out MIDI data, reflects on ROM revisions, and deals with dysfunctional tape drives.

By Alan Gary Campbell

JACK DESROCHER

Q● Replacing ROMs is often recommended as a good do-it-yourself project, but manufacturers won't provide ROMs to the consumer! How can this be a good DIY project if you can't get the parts?

A● Replacing ROMs is recommendable as a straightforward project with which to build do-it-yourself skills, because many instruments and accessories require minimal disassembly to access the ROMs to be changed, and, of course, ROMs simply "plug in"—some devices even have zero-insertion-force (ZIF) sockets with little latches, so you don't need a screwdriver or IC-removal tool to extract the old ROMs. Moreover, new ROMs often add new (sometimes many) features and fix software bugs, so the return on your investment of time and effort is potentially great.

With regard to availability, ROM upgrades do not really differ from other service components in that the consumer can, in most cases, order them through a service center that is authorized to repair the equipment in question. This is but one of the many reasons that I have frequently encouraged **EM** readers to establish, whenever possible, a good working relationship with a qualified, local, authorized service center. Some upgrades are provided by manufacturers at no charge; others are not, generally depending upon whether the upgrade merely fixes bugs or also adds new features.

It is not unreasonable to expect that a service center with which you are on good terms would consent to order for you, at no charge, any ROM upgrades that are normally provided to the service center at no charge. But, don't expect the service center to release the ROMs to you if the instrument is under warranty. In most cases the warranty would be voided by user ROM-installation. Make sure that this matter is clearly understood at the outset.

Some service centers charge a flat rate for ROM installation; in other words, "It's thirty bucks, Mack, regardless of the complexity of the job!" Others charge according to the time required, which saves money on simpler installations. Some shops price upgrade installations deliberately low, to create good will and generate repeat business—a good idea. Rarely, when an upgrade is created specifically to fix a problem that prevents proper function of an instrument, the manufacturer will provide the upgrade at no charge, *and* reimburse the service center for the installation labor.

Manufacturers, no doubt, do not like it when service centers pass along no-charge updates—even out-of-warranty—to do-it-yourselfers. They perceive that the potential for user destruction of equipment (and manufacturer hassle) is too great. So be it. The first time I used a soldering iron, I inadvertantly picked up the wrong end. But I went back and tried it again, and if I hadn't, you wouldn't be reading this column.

The do-it-yourselfer has to start somewhere, and if you approach such matters in a responsible manner, a service center with which you are on good terms may cooperate with you. But you, alone, are responsible for acquiring the necessary knowledge and skill to assure success and safety in your DIY endeavors. *If you are not absolutely certain that you have the necessary knowledge and skill for a given job, refer the work to a qualified technician.*

Do-it-yourself service was covered in the August 1986 Service Clinic; and installing ROMs was covered, in detail, in July 1987. (Back issues are available from the Mix Bookshelf.)

Q. Can an oscilloscope be used to monitor the data at a MIDI output? Is there a simple way to check for the presence or absence of data?

A. Connect a 330-ohm resistor, as shown in **Fig. 1**, from pin 4 to pin 5 of the output, to provide a voltage that can be monitored by the oscilloscope at pin 4. You might want to construct a special cable for this purpose, with a 5-pin DIN plug on one end, to connect to the MIDI out (or thru), and a UHF connector on the other end, to connect to the oscilloscope (the resistor can mount in the DIN plug shell).

Note that a common, non-storage oscilloscope is only good for basic circuit checks i.e., to determine the presence

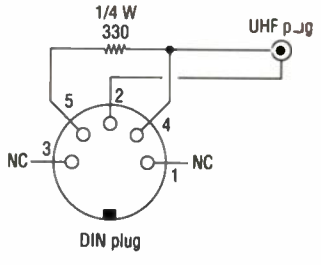

FIG. 1: MIDI-to-oscilloscope adapter schematic.

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or absence of data, its instantaneous density, and pulse symmetry. For more than that, you'll need to use a multi-trace storage oscilloscope or a logic analyzer (or the PC equivalent).

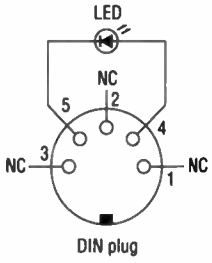

FIG. 2: MIDI data tester schematic.

A simple data tester can be fabricated by wiring a high-brightness LED in a DIN plug. Trim and tack-solder the LED leads to the appropriate DIN-plug pins, as indicated in **Fig. 2**, so that the LED lens protrudes slightly from the cable opening in the plug strain relief.

Q. When mounting a rotary potentiometer to a panel, how can I keep the threaded bushing from sticking through too far and elevating the knob in an unsightly manner? (I've thought of adding an extra nut behind the panel, but try finding one the right size!) Also, how can I keep pot nuts from loosening in use?

A. To mount a pot flush, place a stack of *fender washers*—large, flat washers with a small hole—over the bushing before mounting. Apply the number of washers that will allow the threaded bushing to protrude slightly beyond the nut, or come out even, after tightening. Fender washers are available from some hardware stores, or from suppliers of fasteners. Check the *Yellow Pages* under "Bolts & Nuts."

Inserting a lockwasher between the top washer and panel will keep the pot nut from loosening, but only if there's no slippage between washers. Silicone sealer or super glue, applied along the edge of the washer stack, will stop slippage if it occurs. Silicone sealer can also be applied at those points where the washers meet the pot body and panel, for a further "locking" effect.

An additional nut behind the panel will also work. Extra nuts are available from electronic parts suppliers, e.g., Radio Shack catalog numbers 64-3020 (standard nuts) and 64-3063 (metric nuts). But using an extra nut is not as sturdy as using fender washers, since in the former case any lateral force upon the pot knob tends more readily to deform the panel.

Q. I have a Sequential Circuits Prophet-10 dual-manual synth. Everything works fine, except that the tape drive in the front of the unit will rarely read the data tapes. This is a nuisance because the sequencer memory goes away when the unit is turned off, *and* there's no way to back up patches. Is there a service manual for the drive, and where can I get parts? Is there a way to add a Prophet-5-type cassette interface to it?

A. The microcassette tape drive in your unit, termed a "wafer drive," was manufactured by Exitron and was replaced on later P-10s with a side-mounted "minicassette drive," manufactured by Braemer, that was more reliable and incorporated expanded sequencer memory.

Wine Country Productions, 1572 Park Crest Court #505, San Jose, CA 95118, tel. (408) 265-2008, carries Sequential parts. They have blank cassettes for the wafer drive, but no other drive parts (they do have complete Braemer minicassette drives, but no end bells for mounting). Some service data for the wafer drive is included in the P-5/P-10 Technical Manual (also available), but not much.

Try the following: remove the drive and dismount the piggyback PC board; take care not to strain the motor leads. Remove the drive belt (make sure that your hands are clean, to avoid contaminating the belt with body oil). Remove the C-ring that secures the capstan. Clean the capstan bushing and shaft with Freon (Radio Shack TV Tuner & Control Cleaner & Lubricant, catalog number 64-2315, or equivalent). Apply a drop of light machine oil at the lower half of the capstan, before reassembly (do not get oil on the upper section that contacts the tape). Spray some Freon on a swab and clean the head. If the belt is loose, try replacing it with a rubber band.

If none of this helps, consider that the P-10 MIDI retrofit, described in the September 1989 **EM** (available from Wine Country), allows patch, but not sequence, data to be transferred via MIDI (the cassette drive is disabled). There is no P-5-type cassette retrofit for the P-10, that I know of.

Alan Gary Campbell *is owner of Musitech, a consulting firm specializing in electronic music product design, service, and modification.*

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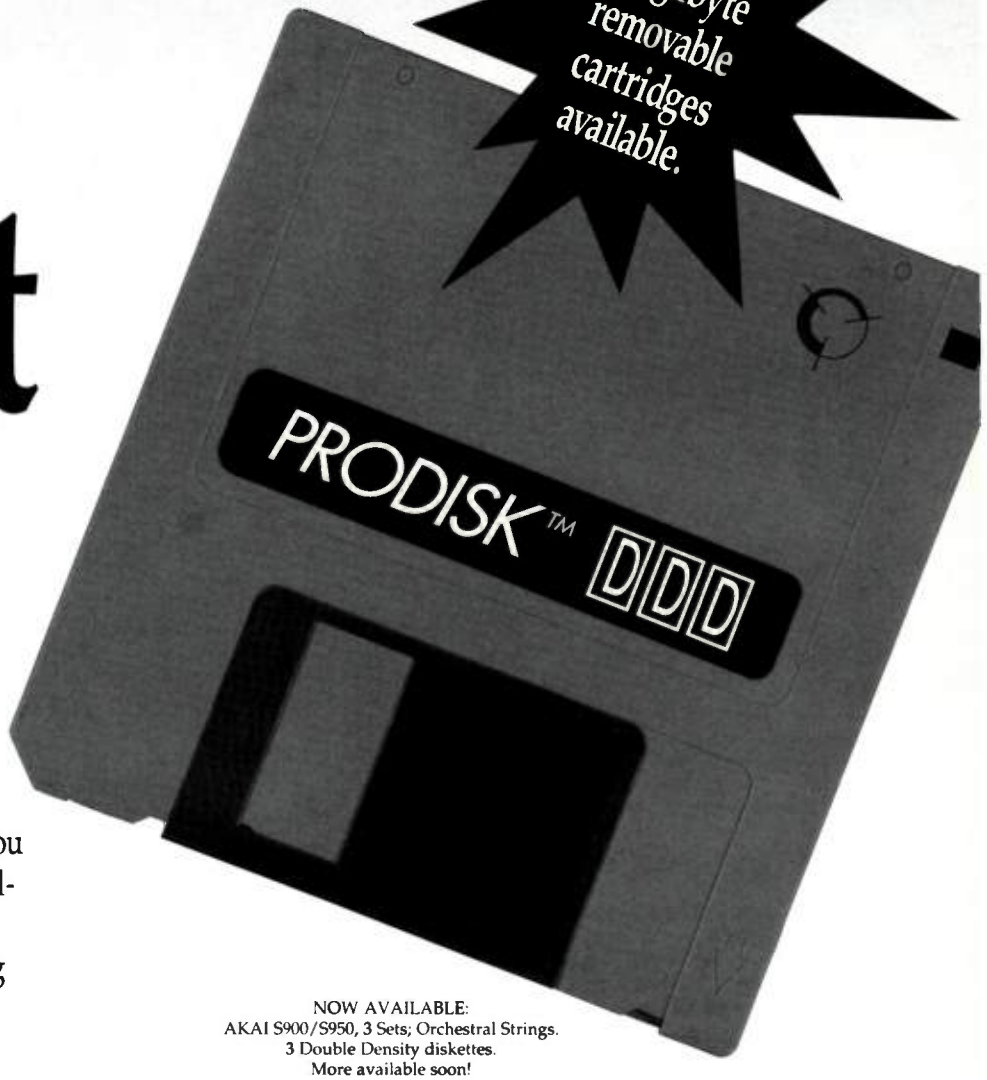

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Cool Shoes Drummer V.1.0 ($79.95)

By Matt Isaacson

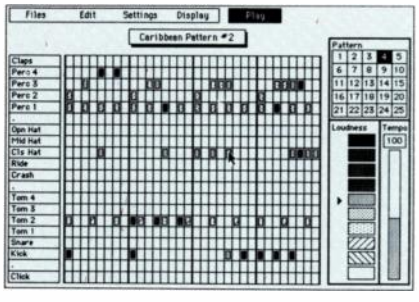
Drummer for IBM PC compatibles lets you create rhythm patterns by pasting notes or patterns onto grids. Rhythms are played as MIDI notes via an MPU-401 compatible interface. The package is inexpensive, but corners have not been cut in the "look and feel" of the program or its manual. The essentials of a rhythm pattern tool have been solidly implemented, without esoteric features or myriad options. A mouse and graphics display are required. Most graphic displays will work (low-res CGA is the only exception). This makes *Drummer* fun to use and easy on the eyes.

Most of the action happens on the Pattern page, which contains a grid with twenty horizontal lines (for sounds) and a variable number of columns representing time divisions. The grid can represent from one to eight quarter-note beats. Each beat is divided into one to eight equal time steps.

To create a pattern, you move the cursor around in the grid, clicking to insert and remove notes. This can be done while looping; *Drummer* will keep marching to the beat, although it hiccups when notes are inserted. Inserted notes use the current loudness (velocity) level. Ten levels are available, and the selection can be changed by mouse click or function key. Grid squares are shaded according to velocity, making dynamics readily visible. By dragging, you can insert notes that extend over several time divisions, so patterns can also include bass lines or other parts that require varying note durations.

The left edge of the Pattern page contains line info displays (only one is visible at a time). One display shows the MIDI channel and note number used to play notes on each line. Another shows the name given to each sound. The third controls Auto-fill, *Drummer*'s only "special" feature. For Auto-fill, you set a value per line from 0 to 100, specifying a percentage of time that *Drummer* will randomly play notes in the *unoccupied* time steps on that line, and you set a loudness level for the random notes. This feature is moderately successful, although some loudness variation would help.

A box with numbered squares lets you move quickly among the 25 patterns and



Cools Shoes Drummer

the EM rating system

EM reviews include 11-step "LED meters" showing a product's performance in specific categories chosen by the reviewer (such as ease of use, construction, etc.) and a "VU meter" indicating an overall rating. The latter is *not* a mathematical average, since some categories are more important than others. For example, if a guitar synth has great documentation and is easy to use, but tracks poorly, it could have several high LED meters and a low overall rating.

The rating system is based on the following values, where "0" means a feature is nonfunctional or doesn't exist, while a value of "11" surpasses the point of mere excellence (a rating of 10) and is indicative of a feature or product that is truly groundbreaking and has never before been executed so well.

Please remember that these are opinions, and, as always, EM welcomes opposing viewpoints. We urge you to contact manufacturers for more information, and, of course, tell them you saw it in EM.

cc "live sequencing." All of the aspects discussed regarding patterns (size, quantization, and choice of sounds), as well as offsets for overall loudness, note number, and tempo, can be programmed independently for each pattern. All of this information, as well as the actual note data, can be copied in whole, or in subsets, to any or all other patterns in a single stroke, making track building quick and easy.

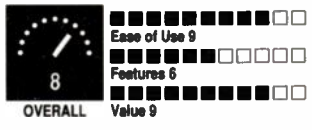
On the Score page, the grid method is used to chain patterns together into tracks. There's a row for each of the 25 patterns and a column for each score step. A box for each column shows which Pattern will play in that step. There are no looping options, but the score can have up to 2,000 steps.

As a drummer, I usually favor MIDI pads and a high-resolution recorder, but a program such as Drummer extends my rhythm vocabulary into otherwise untouched areas. The same can be said for adherents of the "two-finger" method.

Drummer Version 1.0 is not intended to be, nor is it, a professional program. It isn't shaky; it simply lacks many things a pro user would require, such as copy/paste editing, MIDI input, high-res programming, merging from different files, song position pointer chase, tempo mapping, and SMPTE/MTC sync. This is not a criticism; "professional" programs usually cost three to six times *Drummer's* price.

Scores can be saved to disk as standard MIDI files, meaning that tracks created using Drummer can be exported to any other sequencer that reads these files. Along with solid performance within its limits, this makes *Drummer* a contender for a place in the arsenal of the serious sequencer user.

Matt Isaacson *has worked several years as an R&D engineer for Sequential Circuits, Peavey, and others and has written extensively for music magazines. He plays MIDI percussion and guitar in the San Francisco area.*



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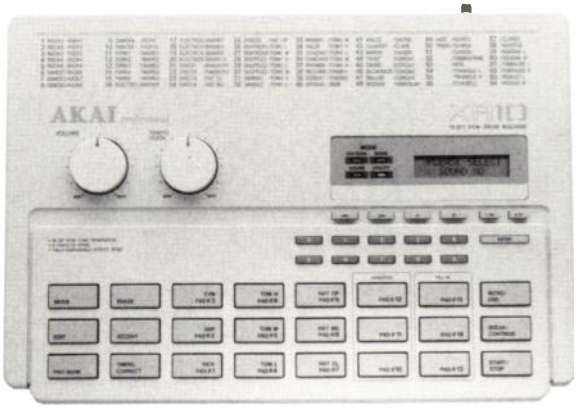
Akai XR-10 Drum Machine ($699)

By James Strater

The Akai XR-10 is a compact, mid-priced drum machine with extensive sound- and pattern-editing facilities. I was immediately impressed with the quality and variety of the 65 preset sounds and 50 patterns, which range from straight-ahead rock to techno-pop, funk, rap, and Latin. The machine's distinctive, late-1980s sound makes it particularly well-suited to modern techno-pop. The sounds are monophonic samples taken from (among other sources) the Akai S1000 library and are sampled at various rates up to 44.1 kHz, with a 16-bit dynamic range. Akai has done an excellent job of choosing which sounds to include: ten kick drums, ten snares, four sets of toms with three pitches each, one hi-hat with three positions (closed, open, and mid), a few cymbals, a clap, and a bunch of Latin percussion sounds. You'll even find a slap bass and an orchestra hit.

Many of the sounds are processed with reverb, which is important as the unit does not have multiple outputs for processing the sounds individually in a mix. Instead, it has a pair of stereo outputs and an effect send.



Akai XR-10 Drum Machine

The XR-10 stores up to 99 of your own rhythm patterns, nineteen songs (groups of patterns chained together) and 32 modified versions of existing sounds. One of the great things about the preset patterns in the XR-10 is that each pattern has three 2-bar variations and three fills, an intro, a break, and an ending, each one bar long, making 450 actual patterns, albeit short ones. The fills are especially good to have as a library, as some of the drum rolls and flams can be difficult to program from scratch.

Preset sounds can be copied into other locations in memory and edited for thirteen different parameters, including forward/reverse playback, tuning, pitch envelope (for pitch bending during playback), hold and decay times, loudness, pan position, and effects send output levels.

Patterns can be created from scratch or copied from the presets and edited

Real-time and step-time editing are available and are generally well implemented. I found the step-editing a bit cumbersome, but that could be a matter of taste. Patterns are a maximum of four bars long, with a variety of time signatures available. Quantization is variable down to the nearest 48th note. With quantize off, resolution is 1/384th note (96 pulses per quarter note).

You can create complicated songs without having to enter each occurrence of a pattern because groups of patterns can be nested within other patterns. There are three levels of nesting available, and a group in any level can repeat up to four times.

The XR-10 also offers several features that, unfortunately, only apply to preset patterns. The Sound Replace function substitutes different sounds for the kick, snare, and tom toms within a pattern. To do this for one of your own patterns, you have to change each occurrence of the sounds individually. Also, when you play the presets, you can insert fills, variations, and breaks "on the fly." This is not only fun, but improvisational, something drum machines generally are not. Unfortunately, you can't organize your own patterns into variations and subgroups like you can fills. You can "improvise" this same way with your own patterns, but it's not as simple and immediate as the press of a single button.

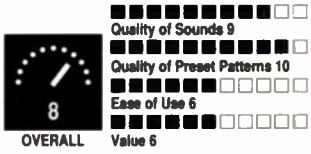
The bad news is that the operator's manual is incomplete, misleading, and full of typos. All references to the right and left arrow keys actually refer to the up and down arrow keys, and vice-versa. Several of the MIDI utility functions aren't even mentioned, and some of those that are mentioned are explained incorrectly. I had to use trial and error to figure out quite a few things on the XR-10. (*According to the manufacturer, a new manual, with better coverage of MIDI utility functions, proper arrow-key descriptions, a new MIDI implementation chart, and several other corrections, is now available.—SO*)

I have three other gripes about the machine. Most of the settings in Utility mode are not battery-backed, so every time you power up the unit, you have to turn Protect mode off in order to make changes, including resetting the basic MIDI channel to something other than Omni mode. The second is that you can't press and hold any of the keys in order to scroll through values quickly; for example, you have to press the decrement key 127 times to set a sound's MIDI note number to 1. The third is the price, which seems steep compared to the competition.

Because the XR-10 has three outputs and many good preset patterns, I would recommend it to someone with a limited number of channels on their mixing board and limited experience composing drum patterns. I would not necessarily recommend it to complete novice drum machine/MIDI users, since the manual is often confusing enough to be really frustrating (although the new manual may help correct that). As a MIDI module for someone who has another main sequencer, there is good reason to buy it just for the sounds and patterns, which are great. You can also

play the patterns via MIDI into your sequencer and modify and learn from them there.

As a child, **James Strater** *always wanted to play drums, but his parents couldn't handle the noise. Drum machines are an imperfect, but adequate, substitute.*



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Johnsware MIDIBoss V.1.3 for the ST ($99.95)

By David Snow

MIDIBoss V.1.3 is an efficient MIDI system-configuration editor/manager for the Atari ST that enables you to interactively define the state of your MIDI system setup and provides both real-time and snapshot-style system control. The complete system configurations can easily be saved and recalled. Setting up patches and modes on a MIDI rig is tedious, but a system librarian such as Johnsware's *MIDIBoss* creates files of system-exclusive dumps, program changes, and mode settings, invoked at the click of a mouse. The program runs as an application or desk accessory so it can interact with, and complement, your sequencer.

Configurations (or "patches") are organized in banks of 128. The Bank screen displays patches for selection with the mouse or arrow keys, and the Patch screen displays patch parameters for editing. You can select patches via program changes from a controller, the mouse, or the computer keyboard, and you can copy, swap, or print them.

The Device list (global for the bank) associates instrument names with the channel each instrument is on. Each device is assigned a program change, volume value, mute and solo status, and a sysex file to be transmitted. Identical devices on different channels can use the same file. Mute disables program changes and real-time, controller-information mapping. Solo sends a volume value of 0, or a user-defined "null

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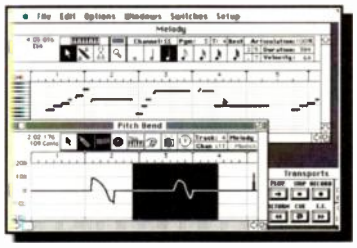

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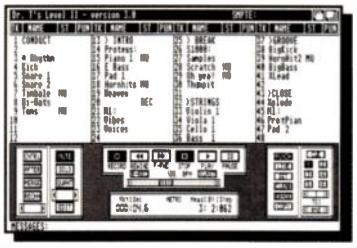
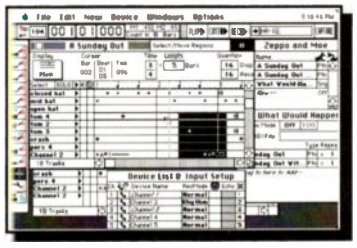
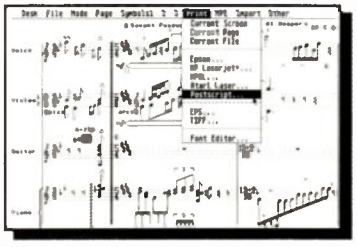


KCS 3.0



UpBeat 2.0



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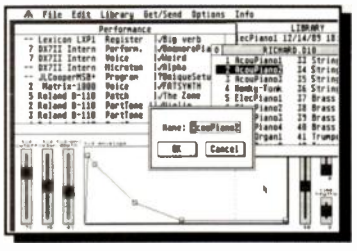
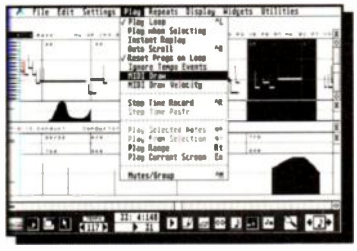
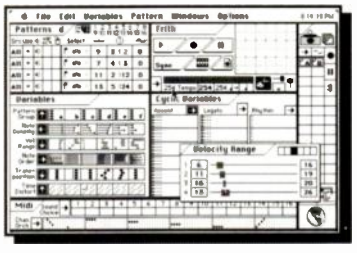


X-oR



T.I.G.E.R.



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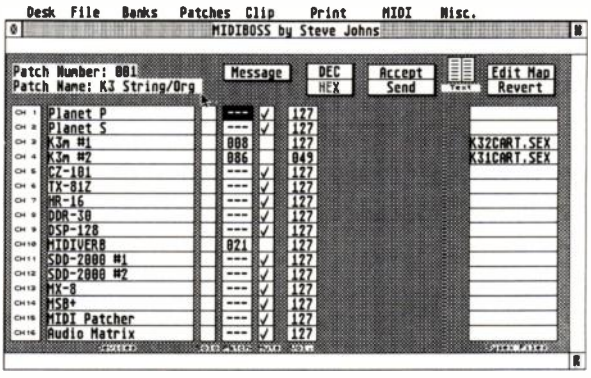
patch," to all channels except the one soloed.

Each patch includes remapping of incoming controller information, filtering the information on a channel-by-channel basis and distributing it to the various channels as desired, creating user-defined key and velocity splits and velocity thresholds. In this way, even a "dumb" controller can control a system. For each patch, you can create custom MIDI messages, in hex, using a 64-byte buffer. Mapping options are: block all data, send input directly out, and re-channelize according to user-defined splits and velocity thresholds. If Mapping is turned on, you can't select patches with the mouse, but you can select them with the arrow keys or remote program change commands.

MIDIBoss's Capture feature lets you initiate a device's sysex dump via user-entered request messages, or the program can wait while you initiate a dump manually from the device's front panel. You can define and save these request messages into a library, which can be saved with a bank or as individual files. One file can contain multiple dumps,



MIDIBoss Patch Screen.

but due to the limits of the buffer, the total size of the combined dumps cannot exceed 32K. The program expects a device that will dump on command and does not support handshaking protocols for devices such as the CZ-101 that require it. With these units, you must manually initiate dumps.

With Autosend, patches are sent automatically upon selection. Otherwise, the Send button must be clicked. Disk Check scans for available space before saving. If you attempt to save on a full disk without this option, the program will give you arcane errors and tell you the file was saved anyway. This works best with floppies; the process takes a long time on hard drives. The Show MIDI feature displays incoming data as a hex stream or parsed and labeled by message type. The Help screen, included as a reference for creating custom MIDI messages, is described as a "condensed version of the MIDI spec" and is recommended for hardcore binary types only.

A low-level MIDI thru function, distinct from Thru Mapping, has a separate interrupt handler from that in TOS. Use with caution. If you're sending a patch with it enabled, any input will be passed directly to the output, without regard to message conflicts.

MIDIBoss does not poll your system to determine its status, nor does it come with a ready-to-use library of sysex re-

quests. I would like selectable run-time default status for Autosend-enable and Mapping-enable (they are disabled, by default).

I got up to speed quickly and found the program well-designed and easy to use, though the manual is rather sparse. *MIDIBoss* didn't crash, either. All functions worked as described, and the usefulness of the program is evident. To use *MIDIBoss*, you're going to have to hit the owner's manuals and learn a little hex code to compile a dump-request message library (unless you're just working with front panel dumps). But once you've compiled a library of request messages, they can be reused, and the patch-building process becomes simple.

If you spend as much time setting up your system as playing it, *MIDIBoss* could be a good investment. On the other hand, if you have a good knowledge of hex, you may find your sequencer's sysex capabilities adequate for your needs. With its mapping and remote-control options, *MIDIBoss* seems particularly suited for live performance. For the price (and considering the unconditional money-back guarantee), it's a bargain.

Johnsware
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David Snow *is a composer and self-styled domestic god (read "househusband"). His music has been premiered by such diverse ensembles as the Composer's Chamber Orchestra, the Harvard Wind Ensemble, the Ruby Shang Dance Company, and the Los Angeles Tuba Quartet.*

ROM Cartridges for the Ensoniq VFX

By Gary Hall

Organization and documentation of synth patch collections are vitally important if a library is to be used effectively. Most packages provide a simple list of patch names by way of documentation. It's surprising how evocative eleven characters can be, but it's important to have at least a brief description of the modulation routings and performance characteristics of a sound. The user can try all the performance controllers, but it gets difficult to keep track, and I feel it's part of the programmer's job. Grouping of sounds of similar type is a major help. As a former factory programmer (Lexicon), I know how hard this can be, but the results justify the effort. Therefore, in evaluating these creditable programming efforts, documentation is a consideration.

If these collections are an indication, the VFX is attracting very good programmers. There was no evidence of laziness, or copying of factory patches. Of course, there was some overlapping, but that is to be expected.

Sound Source Unlimited (ROM cartridge $129.95; data disk $69.95)

This cartridge, which contains 120 sounds and twenty presets, is a "double-barreled" model, with a slide switch to choose between two banks. It's convenient and certainly gets a lot of sounds onto one cartridge. As the name indicates, the

certainly gets a lot of sounds onto one cartridge. As the name indicates, the theme is classic electronic instruments. The sounds are really good, with fine dynamic qualities. Patch names are mostly literal, and where they are not, they are effective at evoking the nature of the sound. This is a good thing, because documentation is scant: a list of names and a description of the set that is more ad copy than anything else.

The programmers generally make good use of modulations and effects (great mod-wheel controlled flange on a MiG fighter sound). Some pages show a sense of grouping (one page of orchestral strings, one of Fairlight voices), but it's not followed through consistently. This made me feel I was wandering around. For all that, the quality of sounds, and the descriptive nature of the names, made working with this collection quite pleasant. Indeed, many of the sounds bring forth memories of instruments I've known and loved.

Sound Source Unlimited
5320 Derry Ave., Unit 0
Agoura Hills, CA 91301
tel. (800) 877-4778
or (818) 879-0093

Eye and I Productions Voice Crystal 1 and 2 (ROM cartridge $59.15 each)

Both Eye and I volumes (which include 60 sounds and twenty presets each) follow a similar organization. The first page (Page 0 on the VFX) consists of keyboard instruments, electric keyboards on Crystal 1 and acoustic on the second volume (including the best VFX grand piano I've found). Page 1 is more "synthish", with sounds instantly identifiable as electronic. These are less general-purpose sounds than the first six, but they have nice, cutting, dynamic qualities.

Page 2 is devoted to pads. On Volume 1, these are mostly voice-like. Page 3 of each volume is a little less cohesive, with some "stringy" synths, but also some anomalies such as ocarina (Volume 1) and fife and drum (Volume 2). Page 4 of

ach volume is mostly winds (good sax on Volume 1), but again, with a couple of oddballs. Page 5 has a few patches with "VOX" in the title, but on Volume 1, these are mostly organs, with a couple of symphonic touches. On Volume 2, these had much more vocal quality. Page 6 is all percussive keyboards, with more of an emphasis on bell and chime sound in the second volume.

Page 7 is devoted to pure effects, and I appreciated their being collected here. They are interesting and fun, but I'd hate to get one of them by accident during a wedding gig. Page 8 is drums and melodic percussion. The Caribbean mallet instruments are nice on each volume, but the drum kits seemed too highly modified for general use. Page 9 in each case is all synth basses of good quality. (Bass was the one patch type everyone seemed to put on one page.)

By the way, the two Crystals are different colors (red and blue), which makes it easy to grab the one you want. I liked the Voice Crystal collections. The programming is good overall, and there are some real gems. The organization and its consistency between cartridges was a real help in getting around.

Eye and I Productions
930 Jungfrau Court
Milpitas, CA 95035
tel. (408) 945-0139

Ensoniq German Collection (ROM cartridge $59.95)

The first release in Ensoniq's International Collection, these are not "ethnic instruments," but pop music sounds programmed by Ensoniq's product specialist in Germany. This approach has both good and bad aspects to it. The customer gets more sounds that can be used in a general context, but there seems to be little specifically German about these sounds. If you hadn't told me, I wouldn't have guessed that they were unusual in any respect.

The sounds in this collection (60 sounds and ten presets per ROM cartridge) were good, but not quite as distinctive as the other collections reviewed. This is more a compliment to those than a criticism of this collection. It just seemed to me to be more generic in its nature (which could be a good thing, if that's what you are in need of). The best thing about this collection is its documentation. Ensoniq provides a 25-page book that spells out the modulations and effect routings, and provides a one- or two-sentence description including performance tips. In terms of organization, though, there was only a spotty grouping of sounds (basses, again, but also some orchestral) on individual pages.

Ensoniq Corporation
155 Great Valley Pkwy
Malvern, PA 19355
tel. (215) 647-3930

● **FIRST TAKE**

Hughes & Kettner Cream Machine ($349)

By Craig Anderton

The Cream Machine (CM) is one of three spare-no-expense, half-rack, distortion boxes (other family members are the Blues Master and Metal Shredder). Each box offers its own timbre, with the Cream Machine producing the smooth "British" overdrive sound that was much sought after in the 1960s.

The CM is a miniature tube amp with a preamp, power amp, and output transformer. This alone makes for a more authentic sound than just having a tube preamp by itself; the power amp even generates enough juice to drive a speaker to practice amp levels. Three level controls (one mounted rather inconveniently on the rear panel) tailor the level at various stages, allowing anything from slightly crunched sounds to heavy-metallish overdrive.

There is quite a choice of outputs: clean out, overdrive out, mix of the two (for single-channel amps), and "cabinetulator" out. The cabinetulator emulates a speaker cabinet sound and does an uncannily realistic job (the cabinetulator circuitry is available separately for $99). Although less bright than the main outs, the "cab" out is punchy and very smooth. It's definitely the output of choice for me (it also happens to make sounds that are good for sampling).

A switch changes these four outputs from line to instrument level. There's also a switch (and footswitch jack) for switching between clean and overdrive sounds.

The construction quality is definitely above average, including such touches as Groove Tubes, internal power supply (no outboard transformer), heavy-duty chassis, and precision components. However, all this does not come cheap; at $349, the CM is a Mercedes overdrive in an Escort world. Aside from price, the CM could also be faulted for lack of versatility (there's no EQ, per se, or way to store presets). Yet the thing sounds gorgeous and convincingly shows why good tube circuitry remains coveted in the world of guitar. The CM may have a limited repertoire, but it does what it sets out to do extremely well.

Overall: 8. *Hughes & Kettner, 35 Summit Avenue, Chadds Ford, PA 19317; tel. (215) 558-0345.* ■

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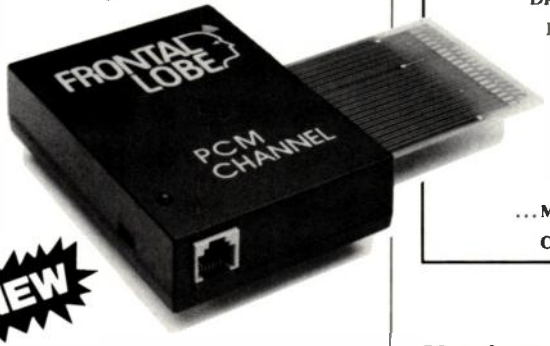

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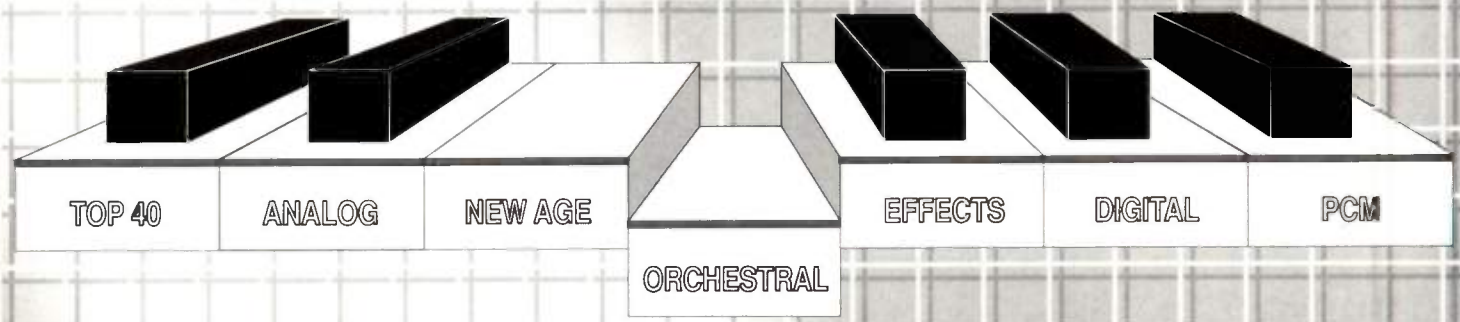

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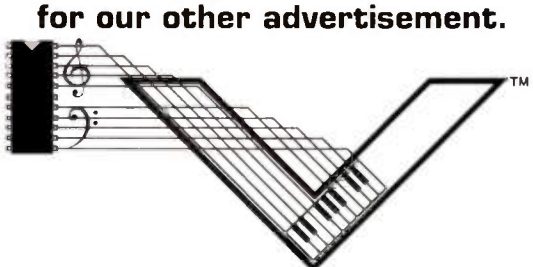

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Excerpt from review in Electronic Musician, Jan 1990.

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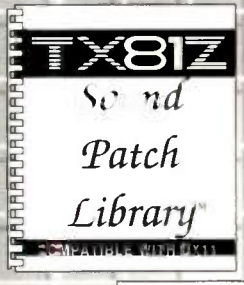

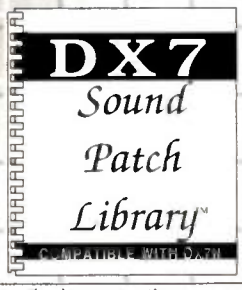

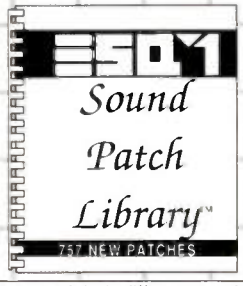

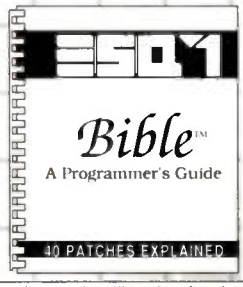

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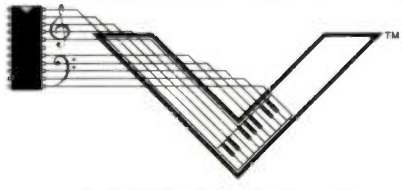

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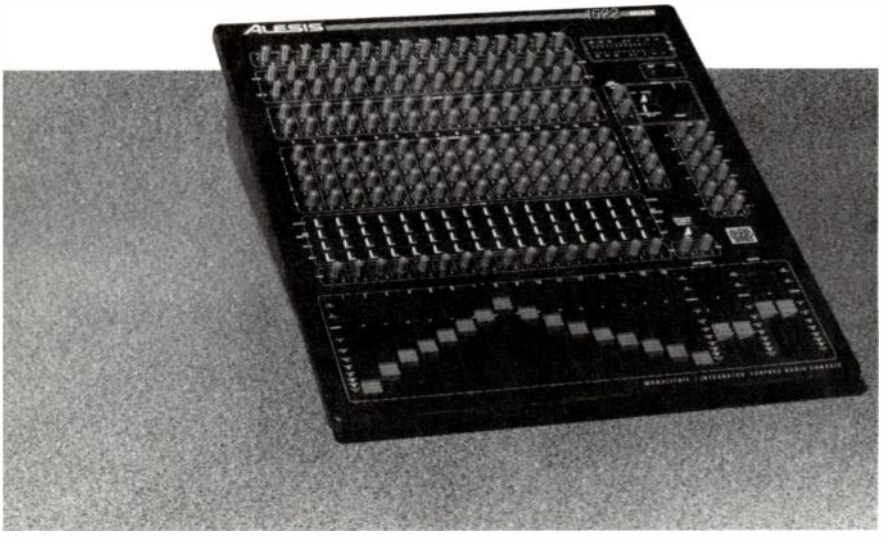
Alesis 1622 Mixer

By Steve Oppenheimer

A feature-loaded mixer is now affordable, thanks to an innovative technology—but does the new unit justify the manufacturer's ambitious claims?

In this age of layered synthesizers and samplers, sixteen or more mixer channels are rapidly becoming a necessity for home recording and onstage submixes. Conventional, mid-sized mixers are relatively heavy and expensive, especially those with superior sound quality. A new, innovative technology has emerged to challenge the conventional approach, and it is not surprising that Alesis, a company with a reputation for creating good products at low prices, is its creator.

Providing great versatility and convenience, with a groundbreaking, low price tag and good sound quality, the Alesis 1622 16-channel, rack-mount mixer employs potentiometer technology never before used on this scale, in this way. The manufacturer has had to make compromises to provide a lot of mixer for $799, but only a few of these appear significant. The mixer's depth of features is apparent; the biggest questions regard performance, ease of use, durability, and ease of repair. The former two points can be determined—this is a clean-sounding, well-designed unit that is a pleasure to use—and the mixer appears durable, but because the technology is new, the jury is still out on the latter two points.



C.R. KING

ON THE SURFACE

The aspect of the 1622 that has raised the most debate is the new Monolithic/Integrated Surface design (see sidebar "Introducing Monolithic/Integrated Surface Technology"). All pots and switches on the mixer, except for the rotary pot controlling monitor volume and the power switch, use the new technology. However, from the user's point of view, the 1622 appears like many other mixers. The faders and rotary pots lack the wonderful, "oily" feel of conventional pots, but their electrical response is fine. The sixteen channel faders, four submasters, and master faders control levels smoothly. The features—EQ, submixer and master bus controls, trim pots, solo, pan pots, etc.—are logically and ergonomically arranged. Before reading the manual, I was able to wire and use all features, with no nasty surprises.

Alesis provides electronically balanced, mic-level, XLR inputs on the first eight channels and unbalanced, line-level, ¼-inch inputs (which override the XLRs on channels 1 to 8) on all sixteen channels. Unfortunately, the XLR jacks are not the locking type. All other inputs use good-quality, ¼-inch, unbalanced jacks, mounted on a strong, metal back panel. The 1622 does not provide phantom power.

Although input trim pots are provided, there are no channel-input overload indicators, so to detect clipping on a particular channel you must solo the channel(s) and read the master LEDs. (The solo bus takes priority over anc

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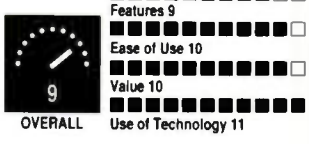
defeats all other signals flowing to the LED meters.) This soloing method is only useful in setting up a studio mix, or in soundcheck, but is unusable live, where you want to observe all channels for possible overloading while the entire mix (not just a soloed part) is playing. This is unfortunate, since Alesis clearly intends the 1622 for both studio and sound-reinforcement applications.

In order to provide a large number of effects sends, Alesis had to limit the EQ section. It consists of two shelving EQs, at 100 Hz and 10 kHz. If you use a lot of acoustic instruments, especially vocals, or have a complex live mix, you'll certainly need more equalization than these two bands can provide. If, on the other hand, you'll primarily be running synths and drum machines through the board, this simple EQ may meet your needs. If you do need more, you can take advantage of the mixer's insert points.

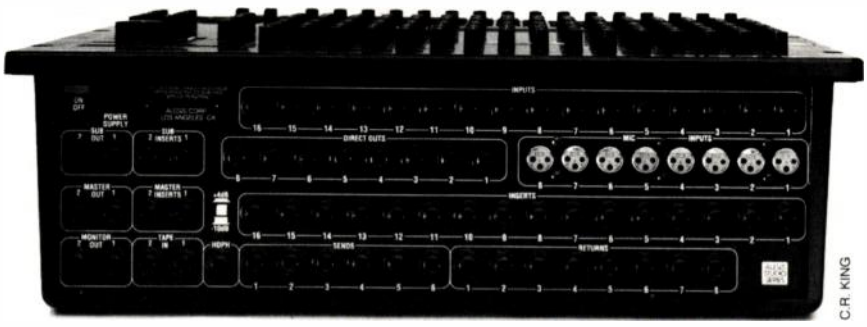
The 1622 provides a set of ¼-inch stereo insert points (tip = send, ring = return) for each channel and for the submasters and master. By using a stereo-to-mono splitter, these can be used for inserting an equalizer, limiter, or other processor (such as reverb) to a channel, submaster group of channels, or the

Product Summary

PRODUCT:
Model 1622
TYPE:
16 × 2 × 2 recording and sound-reinforcement mixer
PRICE:
$799
MAIN FEATURES:
Sixteen ¼-inch inputs; eight XLR inputs; sixteen stereo inserts; two-band EQ; six effects sends and eight returns; solo and mute controls; headphone jack; +4 dBm/-10 dBV switch
MANUFACTURER:
Alesis
3630 Holdrege Ave.
Los Angeles, CA 90016-9801
tel. (213) 467-8000



entire mix. Usually, inserts are wired with tip as return so that, in an emergency, you could utilize the insert point as a line input, using a standard, mono, ¼-inch plug. It's too bad Alesis has not observed this excellent practice. It also means you have to wire custom cables for the 1622's inserts. On the other hand, including inserts for the submaster and master is excellent; this feature is not available in some boards costing far more.



Rear panel view showing the 1622 mixer's extensive patching capabilities.

The 1622 has six mono aux send buses, the first two of which are prefader (and occur *before* the channel insert and solo buses). These are intended for setting up cue, or monitor, mixes, but they're also available for effects. As with any mixer, if you use prefader sends for effects, keep in mind that the fader will not modify the balance of the processed signal with the dry signal, so the wet/dry mix is not held constant. The four post-fader sends can be used in conjunction with the eight returns as effects loops. Four of the eight returns are pannable, two are hardwired to the left master, and two are hardwired to the right master. If desired, you can use the four post-fader sends with four mono-in, stereo-out effects boxes and use the pre-fader sends for cue mixes.

Four horizontal rows of sixteen plastic toggle switches comprise the channel mutes and matrix where you assign channels to the submaster, master, and solo buses. An advantage of this arrangement is that you can run your thumb down a row of switches to toggle, at a stroke, all, or an adjoining set, of switches. I didn't like the feel of the switches; you must switch them firmly or they won't switch all the way, even though they appear properly set.

The mutes are prefader but come after the prefader sends and do not mute them. Since the prefader sends are commonly used for monitor/cue mixes, in a sound-reinforcement application where feedback occurs in a monitor channel, you can't mute the offending channel. Instead, you must turn down the send pot, ruining your monitor mix. I fail to understand the logic of this.

The submaster buses, combined with eight post-EQ direct outputs (channels 1 to 8), monitor outs, main outs, headphone jack, and the effects/cue sends, add up to a lot of outputs, and they're easy to figure out. (Direct outputs allow you to send separate signals from each channel to a multitrack deck, master mixer, or yet another signal processor.) The channel inputs are supplemented by the eight bus returns and two tape returns. Add the insert buses and you have a lot of patching capability.

The monitor section has the only conventional volume pot, with a large, comfortable knob. One switch selects between the tape inputs and the master bus, while another disables the monitor outputs (for monitoring on headphones without resetting the monitor-level knob).

A back panel switch lets you select -10 dBV (used in so-called semi-pro gear) or +4 dBm (used in professional gear) output levels. (For a detailed explanation of -10 dBV and +4 dBm, see "The Decibel Demystified" in the April 1990 EM.)

The 1622 is laid out in a sensible way, making it a breeze to follow the signal flow. The challenge lies in making the most of its capabilities. The documentation has lots of advice on that and other subjects. For those unfamiliar with the features and patch points of a flexible mixer, the manual carefully explains each function and provides wiring diagrams for various applications such as sound reinforcement and audio-for-video. Some of its advice is good, but some is debatable: For instance, the grounding section recommends eliminating stubborn hum by using a ground-lifter on the power amp, an approach you should avoid, as lifting the ground eliminates the protection provided by a grounded chassis (see "Getting Wired—A Power Primer" in the April 1990 EM).

Speaking of power, the 1622 has an external power supply, which helps keep the signal cleaner and the mixer lighter (only fourteen pounds). The supply connects to the mixer with a 4-pin DIN plug that, unfortunately, doesn't lock on. You run the risk of knocking the power cable out with a slight brush of the hand every time you reach near the DIN jack (the power switch and sub outs are nearby). If this irritates you, as soon as the warranty is up, you may be able to replace the power connector with a locking connector such as a good, 4-pin XLR, assuming you can mount it on the back panel.

The mixer can be rack-mounted, but the unit itself takes twelve rack spaces, and you need to allow another three spaces to plug in the cables. When set on a table, the wedge-shaped unit has a convenient, sloping front panel.

PERFORMS AS ADVERTISED

Alesis lists some very good specs for the 1622. My associate, Gary Hall, and I wanted to find out how the new manufacturing technology would translate into the kind of audio performance suggested by those specs, so we conducted a series of tests to measure the machine with regard to noise, distortion, and frequency response. Peter Miller of CAE Sound (San Mateo, CA), provided test facilities and expertise.

Using an Audio Precision test system and an oscilloscope, we were able to

replicate nearly all of the manufacturer's test measurements. In many cases, the exact conditions of the manufacturer's tests were not fully clear from the written spec. By experimentation, we were generally able to find a set of input and output conditions under which the specified readings could be obtained.

Because of this circumstance, some of our test readings were inconclusive. In our test, the full signal-to-noise ratio of 100 dB was obtained only at maximum output level, immediately below the point of clipping. A more complete spec document that arrived at our offices as this went to press indicates we should have been able to achieve this reading at an output level 8 dB lower. As the document we had at the time did not make this clear, we assumed that we were in agreement with the manufacturer's conditions. It is quite possible that the seeming discrepancy is a result of differences between the procedures used at Alesis, and those we used in our test. This is somewhat of a problem in the musical instrument and home recording field, and it is to be hoped that manufacturers will print more of the details of test conditions on their spec sheets.

The 1622 performed well under test conditions. No one can complain about a noise floor 90 db down.

All of that aside, the 1622 performed well under test-conditions. No one can complain about a noise floor 90 dB down with 10 dB of headroom left. Crosstalk and noise readings, in particular, were impressive.

The left and right main output levels were found to differ by 1 dB, a noticeable difference. With EQ and trim set flat and all faders set at the hashmark, the machine delivers close to unity gain, which means that the level at the input approximately equals the level at the output.

In our test, headroom was measured relative to zero on the input trims (unity gain). This yielded a not particularly impressive 7 dB. (The manufacturer specifies maximum level before clipping with the input trim set for its maximum attenuation of 10 dB, as opposed to headroom above unity gain.) In operation, we would recommend that the user set the input levels conservatively, particularly as there are no overload indicators on the inputs. Otherwise, you risk distortion at the inputs, and the old rule, "garbage in yields garbage out," applies.

The frequency response test showed that the 1622's master outs meet the manufacturer's claims of 20 Hz to 20 kHz (+0/-2 dB). This is especially important for synths, which generally produce a wide range of frequencies. The 100 Hz shelving EQ easily met its specs for both boost and cut. The 10 kHz shelving EQ produced only 5 dB of boost or cut in our test, rather than the specified 12 dB either way. When tested with a variety of

synth patches, however, the high EQ seemed effective. The disparities may reflect differences between our test procedures and those used by Alesis. (We were surprised by this result, and so was Alesis. Further tests could not be performed in time for this review, but are planned.)

Total harmonic distortion was a little better than Alesis's claim of 0.015% at 1 kHz, and common-mode rejection on the balanced lines was a respectable 70 dB. (In simplified terms, common-mode rejection means that because of the design of a balanced input, signals, such as electrostatic interference or noise, that appear in *common*—i.e., have the same polarity with respect to ground—across both center wires of a balanced line, are cancelled, or *rejected*, but the audio signal is allowed to pass.) Channel-to-channel crosstalk was verified by feeding a signal to one input and measuring the output from an adjacent channel. The 1622 met its impressive spec of -91 dB in this test. Residual noise, claimed to be -104 dBm, came within 1 dB of spec. If there's significant noise in your rig friends, don't blame it on the 1622.

For practical purposes, the unit me or exceeded the manufacturer's impres sive claims, with minor exceptions. The specs tests confirm what my ear leads me to believe: the mixer is quiet and almos transparent, delivering virtually the same sound quality at the outputs as i sees at the inputs. One manufacturer claim, however, did not hold up quite as well.

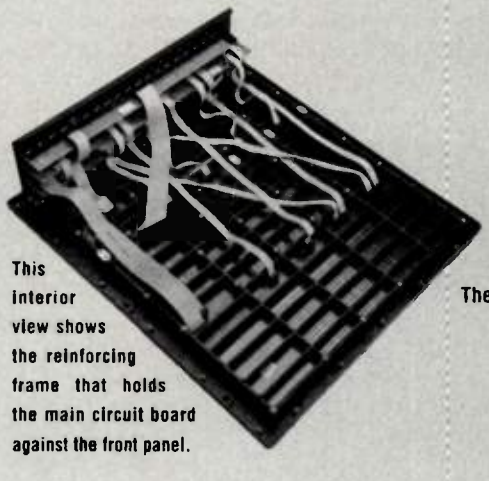
Introducing Monolithic/Integrated Surface Technology

They said it couldn't be done. When Alesis started looking for suppliers to fabricate the components of their new mixer, they were informed that the technique they wanted to use would be impossible to implement on such a large scale. Alesis proposed to eliminate nearly every rotary pot, fader, and switch from a full-featured, 16-input mixing console, and replace them with resistive and capacitive elements printed directly on the main circuit board, an approach the company calls *Monolithic/Integrated Surface* technology. Previously, such on-the-board control elements had only been used in small products, such as hand-held remotes and personal stereos.

The obstacles, indeed, proved to be daunting. The process of designing and tooling the 1622 was, in some ways, like developing a custom chip, with large up-front investment in time and money and no guarantee of ultimate success. As with custom ICs, the reward is very low costs in manufacture of the final product. Development costs are spread over a very large number of units.

For the benefit of 1622 owners who, quite rightly, don't want to void their warranties, I opened up the 1622 and took it down to its component parts. It is, to say the least, unusual in its construction.

The external case of the 1622 is composed of two large pieces, top and bottom. These are molded of a high-strength, carbon fiber-impregnated polymer that provides electrostatic shielding as well as structural support. The operation of the 1622 depends, to a high degree, on the precision with which these parts are molded. The case top, in particular, holds all of the moving elements, guides their travel, and carries much of the responsibility for maintaining firm contact between the PC board's resistive carbon elements and the metal wipers. Alesis maintains an extraordinary degree of precision for a molded piece of this size.



This interior view shows the reinforcing frame that holds the main circuit board against the front panel.

Inside, a sturdy frame made of the same carbon-impregnated plastic as the case holds the main PC board tightly against the front panel (see photo). The frame attaches by screws to both the top and bottom covers, yielding a remarkably rigid package. A projecting "nubbin" on the frame lies underneath every single switch and pot, with a row of them under the faders. These projections hold the PC board securely against the top cover, ensuring contact with the cover-held moving elements.

With this frame removed, the two main circuit boards lift out easily, leaving the top cover with all of the moving elements resting in it. Each knob, switch, and fader consists of a molded plastic part to which a gold-plated contact element is affixed. These are the actual wipers, angled so that "spring action" assures mechanical contact with the circuit board. The wipers are further divided into three individual small elements for redundant contact.

The circuit boards are quite unusual in their appearance. Instead of a forest of mechanical sliders, pots, and switches interspersed with integrated circuit packages and discrete components, one sees row upon row of black carbon areas corresponding to each control element. It's as though a mixing board had been stripped of all its mechanical elements and half its discrete components, with pieces of black masking tape left behind. (The ICs and some of the discretes are still there, however, mounted with conventional, plated-through hole techniques.)

The technology of the 1622, Monolithic/Integrated Surface, is unquestionably innovative. Alesis deserves substantial credit for taking risks and flying in the face of conventional wisdom to deliver a product in the company tradition of a high ratio of performance and features to cost. —*Gary Hall*

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THE PEPSI CHALLENGE

At the 1990 Winter NAMM show, Alesis answered those skeptical of the new technology's durability with a video that showed cigar ashes and Pepsi being spilled into two channels of a 1622 (followed by a dose of non-residue potentiometer cleaner), while the music played on, glitchlessly. This video invoked disbelief and further skepticism from technically knowledgable observers. Alesis was kind (or foolish) enough to send **EM** a copy of the video, and we attempted to duplicate the test.

I can confidently state that, as with any other electronic gear, you should *not* pour an ounce or two of Pepsi into the 1622's faders (non-residue cleaner notwithstanding). The channel faders immediately shorted out; the sound kept playing even when the faders were down. The apparent cause was that we had set the mixer on a small base so that it lay flat. (This is a real-world possibility, though.) The 1622's wedge-shape design and non-jacketed potentiometers will cause liquids to flow *down* the circuit board, and non-residue cleaners can wash it clean, affording a measure of protection. Laying flat, some of the liquid ran the opposite direction, shorting out the faders and circuitry. The Alesis video was fun, and it wasn't faked, but it mainly proves that you never know what Alesis product reps, or **EM** editors, may do.

It is too soon to answer the more serious questions about long-term durability. The case's structure is reinforced by an internal plastic frame and appears tough, but since the manufacturer's video didn't display the 1622 operating while getting hammered by a drunken gorilla, I didn't try that.

The 1622 uses a new technology, and Alesis wants to monitor service problems; for now, it will be factory-serviced. The section that holds the faders is precisely machined, and the unit may be difficult (if possible) to fix without specialized tools, so the factory will swap boards for a reasonably low price. The idea of not being able to fix the mixer locally may deter a few potential buyers, but this may be a necessary trade-off with certain emerging technologies. (Repair ace Peter Miller, who helped us test the specs, is convinced that a sufficiently capable, well-equipped tech could fix the 1622 at a shop near you.) The mixer is well-built and, hopefully, will require minimal repair. If so, the question of serviceability is less worrisome.

EASY FADER

The 1622 has impressive patching and routing flexibility, a major plus for a mixer. It is quiet and clean, but you must be aware that the inputs have little headroom. You may regret the lack of channel overload LEDs, especially if you're using this mixer live. The 1622 is easy to figure out, the price is, to say the least, excellent, and the manufacturer's impressive specifications are accurate. If you're willing to take a chance on the servicability and durability of a new technology and don't need lots of onboard channel EQ, the 1622 is an excellent buy.

__EM__'s investigative reporter/associate editor, __Steve O__, wouldn't have done it if he hadn't seen it in a video.

A Private Lesson with the Expert

Correcting the 6 Common Myths about Perfect Pitch

Myth #1:

"You can't *develop* Perfect Pitch; you have to be *born* with it."

David L. Burge explains:

"This myth had become widespread because Perfect Pitch is mysterious to most people. Musicians found they were unable to develop Perfect Pitch because they didn't understand it.

"No one is *born* with a perfectly developed ear. At birth, who can name tones or chords by ear? At birth, who can sing a C# without a starting pitch? And at birth, how would you tell if a song were playing in B major rather than A major?

"All these Perfect Pitch skills are *learned*—and they are learned *effortlessly*.

"Learning pitches is like learning colors. When you were young, your mother probably played the 'color game' with you many times. She would say *red* while pointing to a red object. Then you said *red* back to her. Later she would ask, 'What color is this?' Perhaps at first you confused red and orange, but soon you learned to recognize the differences between all colors.

"Just as your eye can recognize colors of light, your ear can learn to recognize colors of pitch.

"Every musical tone has its own unique *pitch color*. The difference between visual colors and pitch colors is this: Visual colors are a *visual* quality, whereas pitch colors are *heard* as a *sound* quality.

"That may sound difficult, but it's not. In practice, it's really *so simple a child can do it* (and children do it)! Unfortunately, most of us did not learn our pitch colors the way we learned our visual colors many years ago. In fact, you may find today that you cannot distinguish *any* difference between an F and an F#—except, of course, that one pitch is higher and the other lower. Aside from 'high' and 'low,' all pitches sound pretty much alike to most people.

"But regardless of what instrument is playing—whether piano, guitar, saxophone, flute, voice, etc.—there is always a subtle difference in sound between an F and an F# which your ear CAN hear. You just have to know what to listen for. Most importantly, with just a few simple instructions you can begin to hear and recognize these differences *immediately*.

"Once you can hear these pitch colors, you *automatically* know the tones and chords you hear, just like you know the colors you see. You can even envision any desired tone in your mind, and then sing it in proper pitch. All these skills are gained with Perfect Pitch, the master key to the entire musical language.

"Why is Perfect Pitch the master key to the entire musical language? Because music is composed of pitches. Your music *depends* on your personal ability to hear, evaluate, and enjoy *pitches*.

"A few rare individuals pick up Perfect Pitch skills all by themselves at a young age. They become known as 'musically gifted,' and in a certain sense they are, because they have stumbled onto a priceless talent without outside assistance. But with the correct instructions, you could surpass even these individuals, regardless of what age you begin to open your ear.

"Remember: No one is *born* with fully developed Perfect Pitch. And Perfect Pitch can be *learned* at any time. It's just simple listening; you don't need any previous or special musical training.

This technique for gaining Perfect Pitch is so easy—and it's already been verified by research at Ohio State University and by the experiences of thousands of musicians all over the world. You don't have to *think*, you just have to *listen*, because Perfect Pitch is just a *natural musical perception*.

"The talent for Perfect Pitch is already there, in your ear. It's totally up to you when you want to claim it."

To be continued. . .

(Note: Although some musicians may be visually color blind, no musician can be tone deaf. Every musician has the capacity for Perfect Pitch. Mr. Burge discusses the myth of tone deafness in a later article.)

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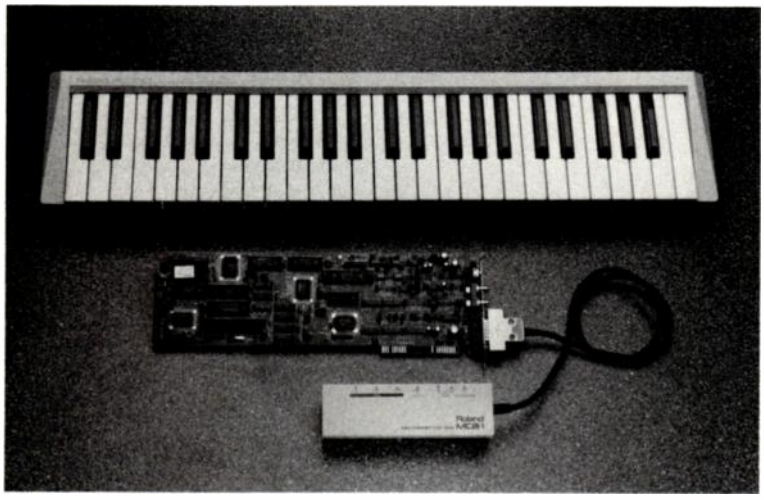
Roland Computer Music System for IBM Compatibles

By Dan Sevush

If you're getting started with computer-assisted music, this system could save you a lot of headaches.

New members of the IBM PC computer music fold can easily become discouraged and confused in their search for a good, easy-to-use, IBM PC-based MIDI system. In addition to wading through a flood of new ideas, you need to keep your budget afloat. Thus begins a search for an affordable synth, MIDI interface, keyboard or other MIDI controller, and sequencing and synth-editing software. Then comes the challenge of putting the parts together into a working system.

IBM and Yamaha addressed part of the need with the IBM PC Music Feature card, which combines a Yamaha FB-01 FM synth module with a MIDI interface. But the interface is not compatible with the heavily supported Roland MPU-401 MIDI interface format, and the FB-01's sound quality has been eclipsed by other sound modules and technologies. Still, sales of the PC Feature remain good, especially to educational institutions.



C.R. KING

Roland PC-100 Keyboard, LAPC-1 card, and MCB-1 MIDI Connector Box.

For under a thousand dollars, the Roland Computer Music System (Roland's entry-level music system for PC-compatibles) includes the LAPC-1 card, MCB-1 MIDI adapter, PC-100 four-octave keyboard, and Dynaware's *Ballade* sequencing and editing software. You get up to 32 voices, see your 9-track sequence in notation format, mix with virtual (onscreen) faders, and edit all parameters of any internal voice.

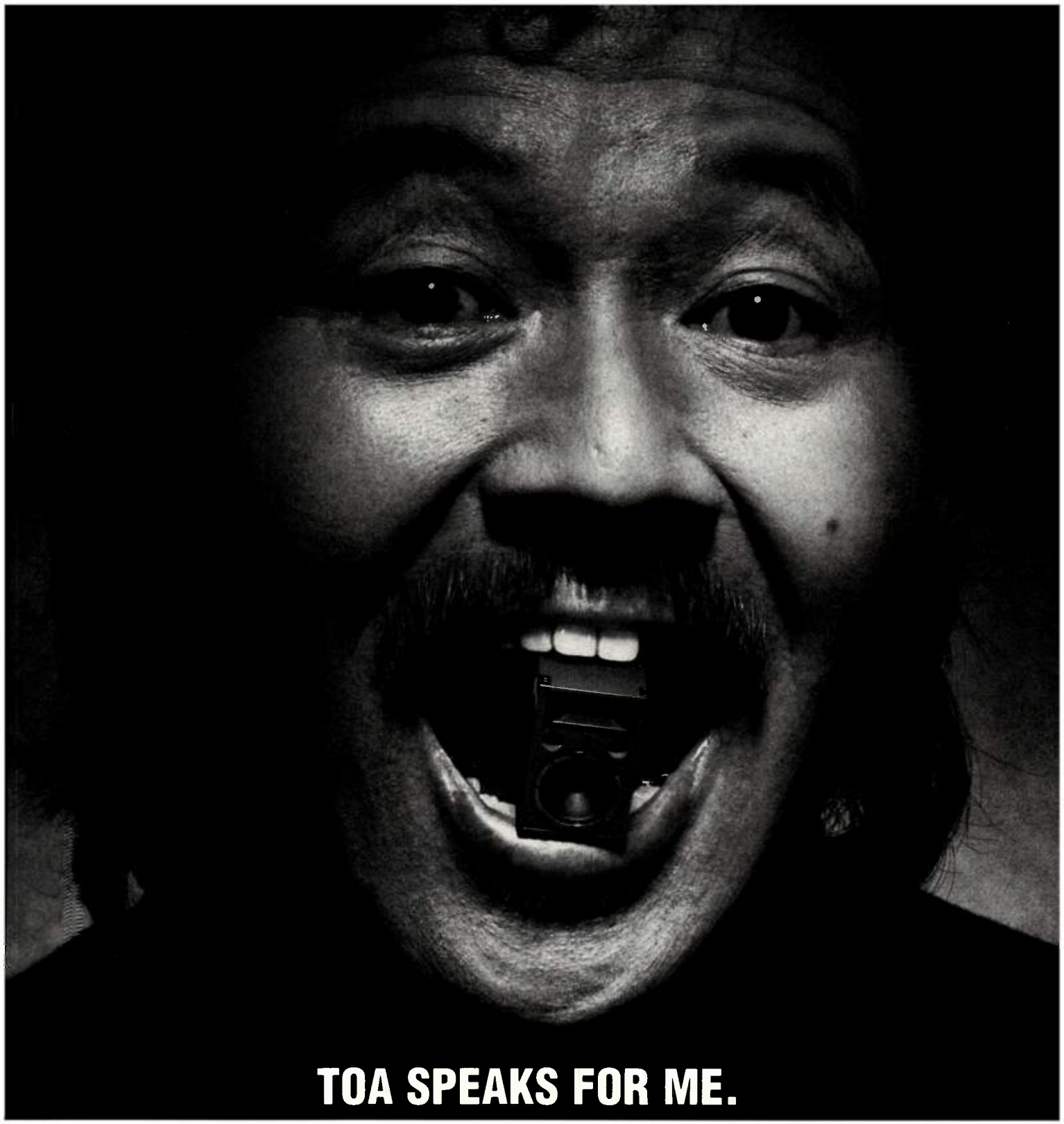
If you are ready for additional capabilities, the CF-10 Digital Fader adds membrane-style mixing controls, and the CA-30 Intelligent Arranger provides rhythms, bass lines, and harmonies. The system is completed by MA-12C powered monitors. Additional sound modules are available (not reviewed), including the CM-32L (the L/A synth portion of the LAPC-1), CM-32P (a PCM sample-playback module), and the CM-64 (which combines the two). The CM-32L and L/A portion of the CM-64 are fully compatible with the LAPC-1.

All the items can be used separately (except the MCB-1 MIDI adapter, which only works with the LAPC-1 card), but Roland intends this to be a carefully configured, integrated system. As it is now, the system isn't configured as carefully as it could be, but Roland is working to improve it.

THE BASIC SYSTEM HARDWARE

Roland's system is centered around the LAPC-1 card, a full-length IBM card that combines an MPU-401-compatible interface with an upgraded Roland Linear Arithmetic (L/A) synthesizer, similar to an MT-32 but with improved signal-to-noise ratio, additional PCM partials, and sound effects. (For more on L/A, see "Inside L/A Synthesis" in the May 1989 issue.)

The interface directly addresses the onboard sounds of the LAPC-1 and, with the MCB-1 MIDI adapter, lets the computer communicate with the rest of the MIDI world. The 32-voice polyphonic sound card supplies nine multitimbral



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● ROLAND SYSTEM

parts (one of which is dedicated to percussion), 128 synth tones, and 30 percussion sounds. The LAPC-1 also offers an assortment of 33 sound effects, done in drum-machine style (where note 76 plays laughter, note 80 plays footsteps,

Product Summary

PRODUCT:
Roland Computer Music System

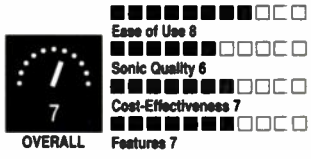
TYPE:
Integrated hardware/software music compositior and sequencing system

PRICE:
Basic system $995, including: PC-100 keyboard ($250), LAPC-1 synth/interface card ($595), MCB-1 MIDI adapter ($150), and *Ballade* sequencer/editor software ($195). Optional: CF-10 Digital Fader $240, CA-30 Intelligent Arranger $595, MA-12 powered monitors $145 ea.

FEATURES:
Basic System: Full-sized IBM PC card with MPU-401-compatible interface and MT-32 L/A synthesizer (32-voice polyphony, 9-part multitimbral); four-octave, unweighted MIDI keyboard controller; customized sequencing and patch-editing software; integrated system.
Optional units: Digital Fader MIDI volume and pan mixer with membrane-style touch sliders; Intelligent Arranger, which supplies rhythms and computer-created bass lines and harmonies.

SYSTEM REQUIREMENTS:
IBM PC XT/AT or compatible, 640 KB RAM, DOS 3.0 hard disk drive

MANUFACTURER:
RolandCorp US
7200 Dominion Circle
Los Angeles, CA 90040



etc.). They are a natural for games, and it is compatible with a number of entertainment packages, including adventure games from many well-known manufacturers. To complete the sound production package, the card includes an onboard signal processor with several reverb algorithms and a delay algorithm.

The LAPC-1 has some set ways of doing things, which is not necessarily bad news since it is part of the system's integrated design. The LAPC-1's architecture dictates that you use channels 2 through 9 for melodic parts and channel 10 for percussion parts. There is no way to disconnect the synthesizer section from the interface section using *Ballade*, but this can be done with more sophisticated software or via sysex. With *Ballade*, the LAPC-1 will always be live and playing on channels 2 through 10, although you can disable a channel by setting up a special program that contains no voices and selecting that special program. Roland could increase the system's long-term flexibility by asking Dynaware to offer local on/off control of the LAPC-1 in an update to *Ballade*.

If you buy the LAPC-1 without the rest of the system, consider the MCB-1 an obligatory purchase. This MIDI connector box offers a MIDI in, two MIDI outs, DIN sync out, FSK in/out (for synchronizing to tape), and metronome out, plus the connector for the LAPC-1.

I've never seen anything go together as seamlessly as this system.

Once you have defined the structure, a wonderful feeling of integration takes place. While using *Ballade*, the CF-10, and the CA-30, I never had to think about what channels to use or how drum notes were mapped. In the case of the CA-30 and *Ballade*, I could select the factory ROM programs by their names. In all the years I've played with computers and synthesizers, I've never seen anything go together as seamlessly and needed the manual as rarely as with this system.

This is fortunate, as the bulk of the LAPC-1 manual discusses the sounds in the synthesizer section, drum-note mappings, etc., but there is nothing that addresses using the system as a whole. There are jumpers to set the LAPC-1 to other interrupt request (IRQ) values, which is a necessary adjustment when dealing with machines, such as those by Tandy, that are not 100% IBM-compatible. There is no documentation on how to do it, but this information is available through the Roland service department.

The battery-powered PC-100 MIDI keyboard is the ultimate in minimalist keyboards, with a power switch, a four-octave, unweighted keyboard (which is not velocity-sensitive), and a jack for an optional 9V adapter. Like the classic Yamaha DX7, the PC-100 only sends on channel 1. *Ballade* expects the MIDI controller to be set to channels 2

through 10, so to use the PC-100 in the system as is, you must have a MIDI channelizer (i.e., MIDI hardware or software that remaps channel assignments; see "The EM MIDI Channelizer" in the May 1989 **EM**). Dynaware is aware of this problem and says that a *Ballade* upgrade (which is not available yet but is expected soon) will allow MIDI input-channel remapping. Until then, this hardly is a well-configured system, and it's surprising Roland marketed it before correcting this fault.

BALLADE

Ballade is refreshingly different from other sequencers. It is a mouse-driven sequencer with a graphical interface that does not use Microsoft *Windows* or GEM. Knowing that it's easier to sell any new product if 90 percent of the ideas are old, Dynaware has provided some comfortable metaphors. The most obvious is Play mode, a mixing board that contains ten sliders, eight pan pots, and various master controls such as reverb type, master volume, tempo, and pitch. Unfortunately, you can't record your slider moves into *Ballade;* they are strictly for mixing down at playback.

You can enter notes in step time or real time. *Ballade* offers diverse time signatures and keys, point-and-click note entry, regional and event-editing of volume, tempo, controllers, and more. You can loop bars and punch in. Overall, you get a good selection of basic features.

Recording your sequences in real time is a test of your dedication. Song mode shows you each track in standard music notation, which is surprising for a package in this price range. It is refreshing to see what was played in notation format, but the price you pay is a substantial wait for each take you decide to keep. In fact, the whole method of having to answer dialog boxes before and after you record your part quickly wears thin. If you had some gem of an idea when you started, you might forget it while waiting. Although it displays notation, *Ballade* does not support printing; Dynaware is working on it, though.

The only aspect of *Ballade* that is usable while playing back a song is the mixing panel. The mixing panel works well in real time, and you can select a new voice while a song is playing, but the sequence playback halts until the voice change is completed.

The method of selecting files is not intuitive. You cannot simply click on a collection of interest and open it. You must first select it and then Jump into it. It would be much simpler to simply double-click on it, avoiding the extra menu choice. According to the manufacturer, the next version will import and export standard MIDI files, a major step toward expanding the system's capabilities.

Tone mode delivers a complete editor for the LAPC-1 and compatible modules. The graphics work well, including the ubiquitous graphic envelope editor. You can click on any of the program names and navigate a multi-page, patch-selection tool, and you can audition the tone when you click the mouse to make a program selection. The note will sustain as long as you hold the mouse button down. My only complaint about the graphic envelope editing, which applies to almost all editors, is that I'd like to see all the envelopes plotted against the same time curve.

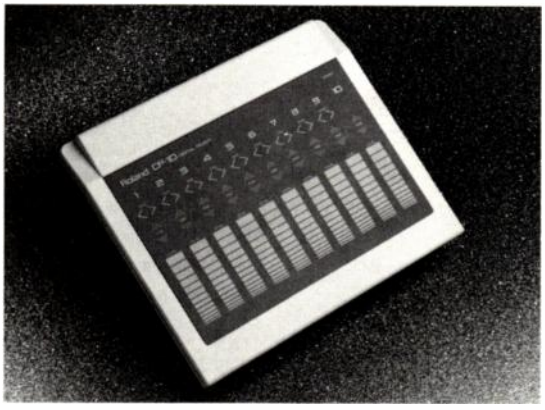
My wish list also includes piano-roll editing and the ability to see more than

one track at a time in Song mode. As wonderful as it is to see notation, many people can understand and relate to a piano roll better for editing tasks.

CF-10 DIGITAL FADER

If you're ready to go beyond the basic system, additional modules are available. The CF-10 is a wedge-shaped box, about the size of a book, that offers a simple digital mixer with a membrane-style fader surface for adjusting pan position and MIDI volume data.

The ten coarse volume sliders, assigned to MIDI channels 1 through 10, read the actual position and adjust to that value, allowing you to position the volume as you would using a conventional mixer slider. In addition, there are fine-adjustment volume controls that consist of increment/decrement membrane switches (vertical arrowheads), located just above the coarse volume sliders. The sliders work well with *Ballade*, as you can control all the faders on the screen without ever touching the mouse.



C.R. KING

Roland CF-10 Digital Fader

The pan controls also consist of increment/decrement switches, similar to the fine-volume controls, but with horizontal (left-right) arrowheads. They are only available for channels 1 through 9; the drum kits, configured to channel 10, have preprogrammed panning. The only modification you can make is to reverse all the pan controls using a switch in the rear.

I never got used to the membrane-style control surface. Perhaps an LED that indicates contact would help. It's very hard to track physically, even when monitoring the pro-

gram's onscreen faders. To use the CF-10 with *Ballade,* you have to turn on MIDI thru at the latter's Play screen, but there is no way to save this in your setup—a limitation that begs for correction—so you'll have to enable MIDI thru every time you use *Ballade.*

CA-30 INTELLIGENT ARRANGER

This magic box, which goes between your MIDI controller and sequencer, offers major assistance in creating musical arrangements. When you select a musical rhythmic style, such as samba, swing, funk, or jazz, the CA-30 analyzes your chords and plays a bass line that accentuates the rhythms being played and gives the feel of the style. You can select between two types of patterns, basic and advanced, and a variation of either, complete with a turnaround (fill). The CA-30 has a slot that accepts any of nine style cards (compatible with the Roland E-A-50 and E series), opening up even more possibilities.

C.R. KING

Roland CA-30 Intelligent Arranger

The Smart Melody feature harmonizes with your melody line. I found it often worked against what I was trying to do—or at least what I thought I was trying to do—but sometimes it produced good ideas that I didn't anticipate.

The CA-30 is designed to drive an LAPC-1/compatible, so much so that it lets you select LAPC-1 factory RCM patches. Channel assignments can be changed, but the system is configured using default assignments. Therefore, the CA-30 (with the default setting) expects you to provide chord data on channel 3, which it analyzes carefully below middle C. (I don't call it "C4" or "C3" anymore.) The notes above middle C are passed on, unaltered. On channel 4, you can supply a melody line that may be embellished or left alone, depending on the Smart Melody setting. The machine plays a bass part on channel 2, a drum part on channel 10 (if you plan to use other gear, make sure you set the drum machine's MIDI channel accordingly) a rhythm part on channel 3, and some accompanying parts on channels 5, 6, and 7.

I was skeptical at first, but it works well. You probably won't write a sophisticated, Frank Zappa-style tune using this box, but if you're still trying to get your bass track to work with your drum track, there is a great deal to be learned from routing the output of this box into your sequencer and examining the tracks.

MA-12C POWERED MONITOR

Unlike the rest of the system, the powered monitors do not use wall transformers. Instead they have AC cords that are amazingly thick for power amplifiers that supply only 10 watts each.

These are by no means "flat" monitor speakers. They sound more like tiny keyboard amplifiers, with a gutsy bottom, acceptable high end, and just three controls: bass, treble, and volume. Somehow the "tiny keyboard amplifier" sound brought out my Jan Hammer side.

C.R. KING

Roland MA-12 Powered Monitor

These would make great practice amps when driven by an effects box.

CONCLUSION

There is something wonderful about starting *Ballade* in Play mode and showing your family and friends that the music is not coming from the MIDI Monster Rack in the corner, but emanates completely from within the computer. The LAPC-1 certainly is not up to the sound quality (or price) of 16-bit instruments, but I was impressed with the quality and quantity of voices.

The Roland Computer Music System is targeted at the computer-literate MIDI novice. It will suit the purpose once a few problems are fixed. As it is now, this system could be frustrating, especially for the MIDI novices who are expected to buy it. The most important concern—allowing the user to remap the MIDI input channel so the keyboard and software are properly integrated—supposedly will be corrected with the next version of *Ballade*. The system's documentation needs to be expanded. Roland and Dynaware have promised these fixes are on the way. The other concerns discussed earlier are less critical but merit consideration.

Those caveats aside, the structure of the LAPC-1/MT-32 allows the novice to forget worrying about what channel is active, program change numbers, and drum machine mappings.

If you already have an MPU-compatible interface or have set your sights on a particular synthesizer, this system is probably not for you. This gear is designed primarily for the MIDI novice using the entire system, with preconfigured software.

Computer dealers are reluctant to give up shelf space for new untested products. Roland's MPU-401 MIDI interface became a standard, and the MT-32 already has a reputation from its many aficionados, including computer gamesters, that should allow the LAPC-1 to move in, taking up even less shelf space. Adding the PC-100 keyboard and *Ballade* to form an integrated system should help a lot more closet musicians get started with MIDI.

In a former life, **Dan Sovush** *was a struggling composer and musician. He is now a software designer who has been responsible for products such as* Lotus 1-2-3 *and* SpeedUp. *His first MIDI software product,* PC ObjectMover, *is published by Kurzweil and Sound Logiq.*

Tascam MIDiiZER MTS-1000 Multi Synchronizer/Controller

By Chris Many

Centralize control of your multitrack recorder, MIDI sequencer, and video recorder with this SMPTE-based synchronization system.

Tascam's MIDiiZER is an affordable synchronizing package that not only complements the company's gear, but is compatible with other standards as well. You can tell right away who the target market for this synchronizer is: musicians who are MIDI-wise, studio-inclined, and interested in expanding their facility to include synchronizing to video or additional audio sources.

The MIDiiZER combines a remote tape transport with a MIDI-to-SMPTE synchronizer. Its main purpose in life is to lock up two audio tape recorders (ATRs) to expand track availability, or an ATR with a video tape recorder (VTR), all the while keeping a MIDI sequencer in sync with these machines. As always with attempts to bring high-end technology to a consumer level (and price), there are tradeoffs, but they usually add up to working just a little harder to get the results. In the final analysis, you have to weigh what results you get for the price you pay. With the MIDiiZER, the balance works out rather well.

C.R. KING

WHAT IT IS

The MIDiiZER is the central controlling element between a master tape recorder, slave tape recorder, and MIDI sequencer. If the tape recorder transports are serial-controllable (as all new Tascam multitracks are), they can be controlled directly by the MIDiiZER. Most professional tape recorder and video recorder manufacturers, however, use a parallel interface scheme.

Tascam realizes this and offers an additional piece of equipment, the IF-1000, that permits connection to the parallel port found in other gear. You should know this up front because it's not made clear in MIDiiZER ads. Unless you're a dedicated Tascam user, be prepared to invest the additional eight hundreds dollars for the IF-1000. Otherwise, it's cumbersome to work, especially when the MIDiiZER controls are laid out so nicely.

The 17×12×4½-inch unit is not rack-mounted and weighs in at around sixteen pounds. The MIDiiZER is sturdily constructed, and the familiar autolocation and other transport controls are there. The machine also features a Locate key and mode, allowing you to program and store up to twenty cue points, used to locate, repeat between two sections, or automatically punch in and out of record mode. The automated punch function works well, allowing for a rehearsal punch (you can hear the way the punch will sound without actually making it and can fine tune it before you commit yourself), as well as record and review. As a transport control unit, it behaves as it should, and it enables arming of tracks if you're hooked up to a Tascam recorder.

WORKING WITH VIDEO

Let's assume you're going to connect the whole system to a video machine. The MIDiiZER connects to the IF-1000 via a 40-pin ribbon cable that is shipped with the IF, but there are other required cables that do not come with either unit. Tascam's reasoning is that different machines (i.e., Sony or Panasonic ¾-inch VTRs, 24-track machines, etc.) require different cables, so it's up to you to find out which cable you need. Tascam will help, and they may have the one you need, but cable availability from Tascam seemed a little less than standardized. In the company's defense, cables and protocols for synchronization change often, sometimes even over the life of a single model machine.

Once you have the machines connected, the MIDiiZER has to "learn" the transport characteristics of the master and slave machines. Since we're talking about different machines from different manufacturers, you'll need to educate the synchronizer about how the transport controls respond, the speed of the capstans, servo response, damping and gain, etc. This is a required step on any synchronizing system and involves striping SMPTE time code to tape on the machines you're using and running the learning procedure laid out in the manual. It's straight ahead, and I accomplished it without incident. The MIDiiZER also includes a full SMPTE time code generator and reader, so most of your time code needs are solved with this unit.

If you've connected everything correctly, your audio recorder will follow the video, and both will be controlled through the MIDiiZER's transport controls.

For some reason, Tascam failed to include a jam synching function within the MIDiiZER. Another feature that's missed is regenerating code from a bad source. All too often, when working in video, you get a tape with code that is garbled or dysfunctional, so a common function on SMPTE generators allows code regeneration based on the original source code. Not so with the MIDiiZER. There are some other good solutions to overcome this problem, which the MIDiiZER can perform, but it would be better to correct the code.

Once you have completed the learning process, you are ready to synchronize machines. Select one of the machines to be the master and one the slave. If you're dealing with video, the video must be the master because of the way a VTR functions: the video tape speed is internally controlled so that the rotation of the video head matches the frame lines on the tape. If you attempt to have video follow an audio master, in trying to follow the somewhat "off" speed of the audio, the picture will roll through the vertical interval on the screen.

• MIDIIZER

If you have connected everything correctly, your audio machine will follow the video, and both will be controlled through the MIDiiZER's transport controls. If you use a sequencer with the system, it also follows the video and audio machines. *Voilà*, you're sychronized!

AND MIDI TOO

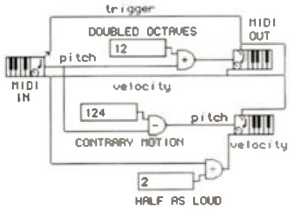
You couldn't call it the MIDiiZER if all it did was allow a sequencer to sync up with a tape deck. After all, an MTC- or SMPTE-based sequencer already does this by routing the code to the appropriate conversion box. Tascam's unit includes one MIDI in, three MIDI outs, and a ppqn (click) out for use with older rhythm machines or sequencers. One of the main features touted is tempo mapping. There are several ways to get a tempo map into the MIDiiZER: step-write it (manually enter it one beat at a time), tap-write (use the tap button to input tempo and changes or synchronize it to a kick or cowbell audio track, for example), manual-write (use the rotary dial to create and change a tempo as it plays in real time), or transfer from an external MIDI source. (These functions work much like Roland's SBX-80.) You can edit the tempo map, cut-and-paste, offset MIDI tracks, and store maps to a Tascam card made for this purpose or to a MIDI file. In addition, MTC is fully supported.

Patch changes can also be made from the MIDiiZER and programmed to occur at any point in the song/tempo map. Unfortunately, if you roll tape after the point at which you make a patch change, it won't know you've done so and won't make the change for you. In other words, like many sequencers that don't support controller chasing, you'll need to start from the beginning if you plan on taking advantage of this feature.

That's about it in terms of MIDI functions. Why the disappointment? Most sequencers already have these features and often implement them much better. If you plan on using a sequencer to write music for video, it's a fact of life that tempo changes will be required. Why not program all your patch changes into your sequencer tracks rather than spend extra time transferring the information over to your MIDiiZER (especially if it doesn't update patch changes intelligently)? If you want to use one of those MIDI out ports to program patch changes on MIDI-controlled reverb

(continued from page 71)

...is easy as plugging in an extension cord.



Product Summary

PRODUCT:
MIDiiZER
TYPE:
SMPTE-based machine and MIDI synchronizer
FEATURES:
Remote transport controls of Tascam recorders; SMPTE read/write; SMPTE-to-MIDI conversion; programmble punch-in and loop points; synchronized control of two tape recorders and MIDI sequencers; tempo mapping with tap tempo
PRICE:
$1,995
MANUFACTURER:
Tascam
7733 Telegraph Rd.
Montebello, CA 90640
tel. (213) 726-0303

units, great, but a better solution is to save that to the sequence so you don't have to keep track of loading up the data next time you want to mix. I'm sure some folks will use the MIDI functions in this unit, but the same MIDI functions are implemented equally well in middle-of-the-line computer sequencers and far better in top-of-the-line versions. If, on the other hand, you're using a hardware MIDI sequencer, the tempo-mapping features of the MIDiiZER should prove to be very useful.

Overall, the synchronizing function is well done and includes some features that are helpful in real-world audio/video work. For example, have you ever tried to lock a tape that has been striped with non-drop frame time code to one that's using drop frame? Here's one solution: *Phase lock* enables two machines to stay locked using the "sync word" of the master, as opposed to the actual numeric address. Another good feature is *slow lock*. When used in conjunction with chase or phase lock, the synchronizer overrides a sudden slight change in the time code (like a drop out, or corruption of some sort) by nudging the slave back into sync without noticeable pitch variation. If you're using the IF-1000, you generate code in sync with video frames, very important if you're going to do any video editing with the video tape. Everything works fine when you're connected, and the transport controls feel great.

In using the IF-1000, there is a multi-pin cable connector to connect machines for triggering events, such as a CD player or 2-track that will start/stop on command. If you want to lay in a voice-over to a 2-track machine, you can program the trigger point and control it from the MIDiiZER . I wish I could program a MIDI note to trigger directly from the MIDiiZER without using a sequencer.

One last criticism: You can't chain additional, parallel units. This is a problem in the real world, as often you need to synchronize more than one video and one audio machine at the same time, e.g., laying back to a 1-inch video master. It would be a pain to reteach the synchronizer each time you planned to switch to the 1-inch machine and back again. There should be some easy way of stacking up and synchronizing additional units other than using Tascam's more expensive ES-50 synchronizing system, which can handle multiple machines but alas, there's not.

THE FINAL FRAME

Tascam's MIDiiZER is solid in feel and functionality, bringing video synchronizing to a wider consumer base (the price is right). The MIDI angle is a bit of marketing hype as far as I can see; there's nothing new or miraculous that you can't already do on a good sequencer. What is new about the MIDiiZER is that it's the first machine to integrate machine sync, MIDI sync and a remote transport control in a single box. If you want that type of convenience, it's definitely the way to go. Be aware, though, that the additional unit, the IF-1000, makes life a lot more convenient if you're using video equipment, as you won't be able to synchronize using the MIDiiZER 's controls without it. All in all, the MIDiiZER is a good unit and a good value.

Chris Meny *is an L.A.-based composer who along with his partner, Geoff Levin, recently composed the theme to the new Valerie Harper show, "City." He is also a member of Celestial Navigations.*

Music: Last New Ideas

By Robert Carlberg

It's getting harder and harder to be original, but some people still find a way.

A major project has been underway at the Library of Congress for the past several years. As you know, each recording registered for copyright is stored at the library. Housed in a huge complex of buildings in Washington, D.C., under the auspices of the National Bureau of Standards, a highly trained staff of technicians has been cataloging all the recordings housed at the Library of Congress, entering the titles and the lyrics, and sampling the melodies into an enormous computerized database created just for this purpose.

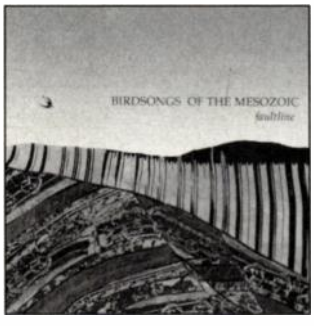
You may have read in the papers recently that the Director of the Library, Williams Baines Hoffnelli, announced the completion of this cataloging. With all of this information now in the computer, some quick analysis of the data has revealed the following startling facts:

1. There are no new song subjects left, and, in fact, no truly original lyrics have been written since July 1937.

2. The supply of original melody lines is getting perilously low. There are, by Hoffnelli's calculations, only thirteen tunes left which have not already been used by someone, somewhere.

Armed with this valuable research, I dug into the pile of cassettes, albums, and CDs sent into **EM** for review and came up with eleven of the thirteen remaining unused tunes. Therefore this column may well be the *last column* in which original music will appear, since the chance of any solitary composer hitting on one of the two remaining unused tunes is exceedingly slight. It is a bittersweet honor, therefore, to be able to present what are probably the Last New Ideas ever to appear anywhere.

In Wheaton, Maryland, lives Steven Feigenbaum, a dedicated fan of what might be called "dangerous music": virtuosic, often blazingly fast, full of jagged, unpredictable, off-center rhythms and gnashing dissonances. In both his previous role as a musician/producer for Random Radar Records (playing guitar solo/duo, and producing The Muffins, Mars Everywhere, and Logproof) and his present role as a businessman (with his mail-order business Wayside Music and independent record label Cuneiform Records), Feigenbaum has done his utmost to promote and distribute music too frightening for the majors. In the last year or so, Cuneiform has released (or re-released domestically) some classic "dangerous-music" albums such as *1313, Uzed,* and *Heatwave* by the Belgian group **Univers Zero**, *Trisaidekaphobie/Le Poison Qui Rend Fou* by U. Zero offshoots **Present**, **Piero Milesi**'s *The Nuclear Observatory of Mr. Nanof and La Camera Astratta*, the self-titled second album by Montreal trio **Miriodor**, and *Faultline* (Cuneiform RUNE 19 CD) by **Birdsongs of the Mesozoic**. Birdsongs, a Mission of Burma offshoot, had an earlier compilation CD released by Rykodisc (reviewed 6/88), but *Faultline* is all new material. The group has matured considerably since their 1983 debut, becoming a cohesive unit with a wonderfully eclectic sound (saxes, clarinet, trumpet, guitar, synthesizers, piano, and percussion). It is fast, furious, fluid, and more than a little frightening. All of Feigenbaum's productions



or Cuneiform are heartfelt, and what he can't re-release on Cuneiform he sells or import through Wayside. If the boneheadedness of U.S. commercial music depresses you, check out Feigenbaum's alternatives (PO Box 6517, Wheaton, MD 20906).

Recommended Records (ReR) is distinguishable from Feigenbaum's efforts, which used to be on Random Radar Records (RRR), because the former is located in London. Both on occasion feature Fred Frith. Both idolize Henry Cow, Slapp Happy, Art Bears, and spawn. Both do a lot of mail-order to clients who like the same type of music, and in fact there's a friendly cooperation between them. ReR has a new production which fits right into this scheme, *In This Life* (ReR tpCD) by **Thinking Plague**. Like Birdsongs of the Mesozoic, this Denver septet has a broad instrumentation (saxes, flute, clarinet, guitars, bass, drums, synthesizers, organ, piano, balalaika, mandolin, violin, accordion, and miscellany, plus vocals). Singer Susanne Lewis's lyrics are miniature masterpieces of Rimbaud-esque nihilism, although the angular, often-strident music and deliberately off-key singing has caused more than one passerby to exclaim, "What is that awful crap?" I guess it helps to have just sat through 27 straight albums of new age sax-and-synthesizer music beforehand (Recommended Records, 19-23 St., Saviour Road, London SW2, UK).

Rational Music for an Irrational World is the logical title for the first cassette of **The Just Intonation Network**, a collection of seventeen pieces from as many composers, spanning 1955 to 1989. Included are David B. Doty and Carola B. Anderson (from the justly intoned percussion ensemble Other Music Erling Wold), Robert Rich, Thomas Dougherty, and unequal-temperament pioneers Harry Partch and Lou Harrison (if someone who returns to a pre-Bach tuning can be described as a "pioneer"). Like Thinking Plague, the grating tonalities of the largely synthesized intonation will either delight or annoy you, and this impression is likely to supercede any reaction to the music itself ($9.98 postpaid from The Just Intonation Network, 535 Stevenson St., San Francisco, CA 94103; tel. [415]864-8123).

Continuing our journey from "dangerous" music to slightly safer ground is a debut tape, *Skeletal Resonance*, by **Frederic**

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L. Hodshon (26203 Via Roble, Mission Viejo, CA 92691; tel. [714]588-6952). Hodshon is a guitarist, keyboardist, bassist, drummer (probably programmed), and sometime vocalist, handling all with considerable aplomb. Also, through the miracle of samplers, he gets to play marimba and lots of tuned percussion instruments. *Skeletal Resonance* (the title has something to do with picking up

sounds from inside the body) is a collection of short, mostly instrumental pieces (0:10 to 6:58), but with a few odd vocal passages: a version of Captain Beefheart's "There Ain't No Santa Claus on the Evening Stage" followed by a weird, mock commercial for "replacement stomach linings." Most tracks are synthetic, jazz-fusion instrumentals, sometimes sounding for a few seconds like Frank Zappa, Allan Holdsworth, Carlos Santana, or Thomas Almqvist, plus quick renditions of the Viscounts' great "Harlem Nocturne" and John Coltrane's "Equinox." I guarantee you've never heard anything like this tape before.

Another production that is guaranteed to be original is *One* by **Thomas Metcalf** (Clockwork Records CWCD-1, PO Box 68, Paoli, PA 19301). The sounds Metcalf uses are unusual: short bursts of complex sound, almost like sampled orchestra. That may well be what some of them are, since an Ensoniq EPS is listed, as well as SQ-80, Mirage, Ensoniq Piano, Mellotron, Rhodes Chroma, SCI Drum-Traks, and Gato Drum. Other longer, pure-digital tones appear, indicating a real talent for programming. Metcalf, in fact, is an analog engineer and sound designer for Ensoniq, where (until recently) he worked with John Greenland, featured in last month's column. The two have performed live together since 1987 (small world). Metcalf's music is hard to summarize, falling somewhere between the Carlosian neoclassicism of

• MUSIC REVIEWS

Greenland and (I hate to say it) the eclecticism of grant-supported academic music. The music is not catchy in a Top 40 kind of way, but it does challenge you to play it over and over. Parts of it sound like U.K.'s debut album, parts like Carlos's *Digital Moonscapes*; and if you can reconcile those two poles, then you should be writing this instead of me. It'll give your stereo a pretty good workout too, both the tweeters and the woofers. *One* is not simple or casual music, but that's only one more reason it stands out. Distribution is being handled through Wayside Music by the aforementioned Steven Feigenbaum.

If your tastes are more traditional, there's *Dig* by **Rob Mounsey + Flying Monkey Orchestra** (Sona Gaia ND62761). No, the F.M.O. has nothing to do with the Wizard of Oz; the title supposedly comes from a 16th-century Chinese novel, and like Wendy Carlos's "LSI Philharmonic" it refers only to veteran studio musician Mounsey's collection of sampler and computers. *Dig* is a digital *tour de force*, full of interesting samples in clever arrangements. It's a little more Hollywood than Stewart Copeland's solo Fairlight work, but Mounsey goes out of his way to come up with new sounds and include a little humor along the way. At least it's not that awful "happy jazz" that is sprouting up everywhere. Perhaps a better comparison is the Jamaican keyboardist Wally Badarou, whose Synclavier work is similarly individual.

Finally, a mainstream surprise is **Bill Ward**, former drummer for Black Sabbath (1968 to 1985). His first solo album, *Ward One: Along the Way* (Chameleon D4-74816), is equal parts hard, heavy rock 'n' roll (as might be expected) and an unexpected dose of progressive, almost experimental elements: sound effects, live recordings, unexpected twists and turns. Genesis, Pete Hammill, Bill Bruford, and Pink Floyd are obvious influences, with strong writing in that vein from Ward. Intelligent lyrics, careful production, and elaborate shifts in musical texture were not the hallmarks of Black Sabbath, unless memory fails me.

Since this is **Robert Carlberg**'s *last column reviewing original music, it will run again next month and every month thereafter, unless sufficient new music arrives for review at PO Box 16211, Seattle, WA 98116.*

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A Declaration of Dependence

Technology has given us the capacity to create orchestras all by ourselves—but does that modern-day freedom lure us away from what music is all about?

By Craig Anderton

Musical electronics have proven to be a declaration of independence for musicians. Inexpensive multitrack decks have made those on a budget independent from big studio bills, and the synthesizer/controller combination has made sound-generating sources independent of sound-triggering mechanisms. Recording used to involve a group of people playing together, guided by a producer and recorded by an engineer, possibly with a couple of songwriters hanging out to rewrite a lyric here or there. Now it's possible to make a complete record in the comfort and privacy of your own home—no other humans required.

Just because we *can*, though, doesn't mean we *should*. Human interaction takes on a specialized and beautiful meaning in the context of making music. At its best, playing with another musician falls somewhere in the spectrum between having a really fascinating conversation and making love. Even at a somewhat lesser level, interacting with other players is bound to be at least educational (if they're better than you) or challenging (if they're worse).

More important, involving other humans can relieve music of a certain one-dimensionality. Songwriting teams are a common phenomenon, and if you see a good team in action, it's obvious why: They help each other create a better work than either could individually. In bands, each member contributes something unique to the whole. Sometimes I wonder if the complaints about recordings of electronic music lacking "life" have less to do with the technology than with the fact that, in many cases, these recordings are created by individuals who produce and engineer themselves with no outside input that could enrich the results.

Of course, humans also often have inflated egos, bad childhoods, prejudices, and all that other kinda stuff that we wish didn't exist. When you get two humans together in the same place at the same time, they might start hassling instead of creating. The price of interaction is that a certain degree of compromise is mandatory, yet the process of achieving that compromise can actually strengthen a musical statement instead of dilute it. I can't count the times I've come up with a musical idea only to have a collaborator come up with something better. That would often inspire me to come up with another way to improve the improvement, which might get improved again by the other person. Those moments just don't happen when you work alone.

Listening back over the years to what I've recorded, it's obvious that the stuff I did by myself, while interesting (at least to me!), lacks something compared to what I did in conjunction with other people. It's no coincidence that the first recording released under my name in years was also the first major collaborative project I'd done in quite some time.

Independence still has a very important place in music. When I work by myself, I come up with new patches, improve my technique, and set up "what-if" musical scenarios (i.e., "let's reverse the notes in the chorus and see what happens") that would probably bore anyone else. Doing entire tunes by yourself is a quick way to become a better producer, songwriter, engineer, or electronic musician: You'll probably learn more about arranging the first time you sit down with a MIDI sequencing setup than you would from spending the same amount of time talking with someone about arranging. We still need to "woodshed" and improve our chops; only now, "chops" also encompasses recording, programming, computers, and so on. We need the time and privacy to improve our craft at our own pace.

However, the woodshedding ideally should be a prelude to working with others, or we cheat ourselves out of the communicative and social aspects of music that make it so special. It used to be that many of us were forced into independence because no one else living within 100 miles knew enough about this stuff to collaborate, but that's changing fast; it's not hard to find other musicians with similar mindsets.

It's time for a "declaration of dependence" because we are all dependent on each other to learn new things and gain different perspectives. Start collaborating, even if it's just swapping standard MIDI files and seeing how a friend orchestrates your tunes. If you have a studio, "sponsor" some songwriter who has good ideas but no facilities, and record a demo tune or two (you'll learn a lot). Get someone else involved in your next mix. Balance dependence with independence, and your music—and maybe even your life—will be better for it.

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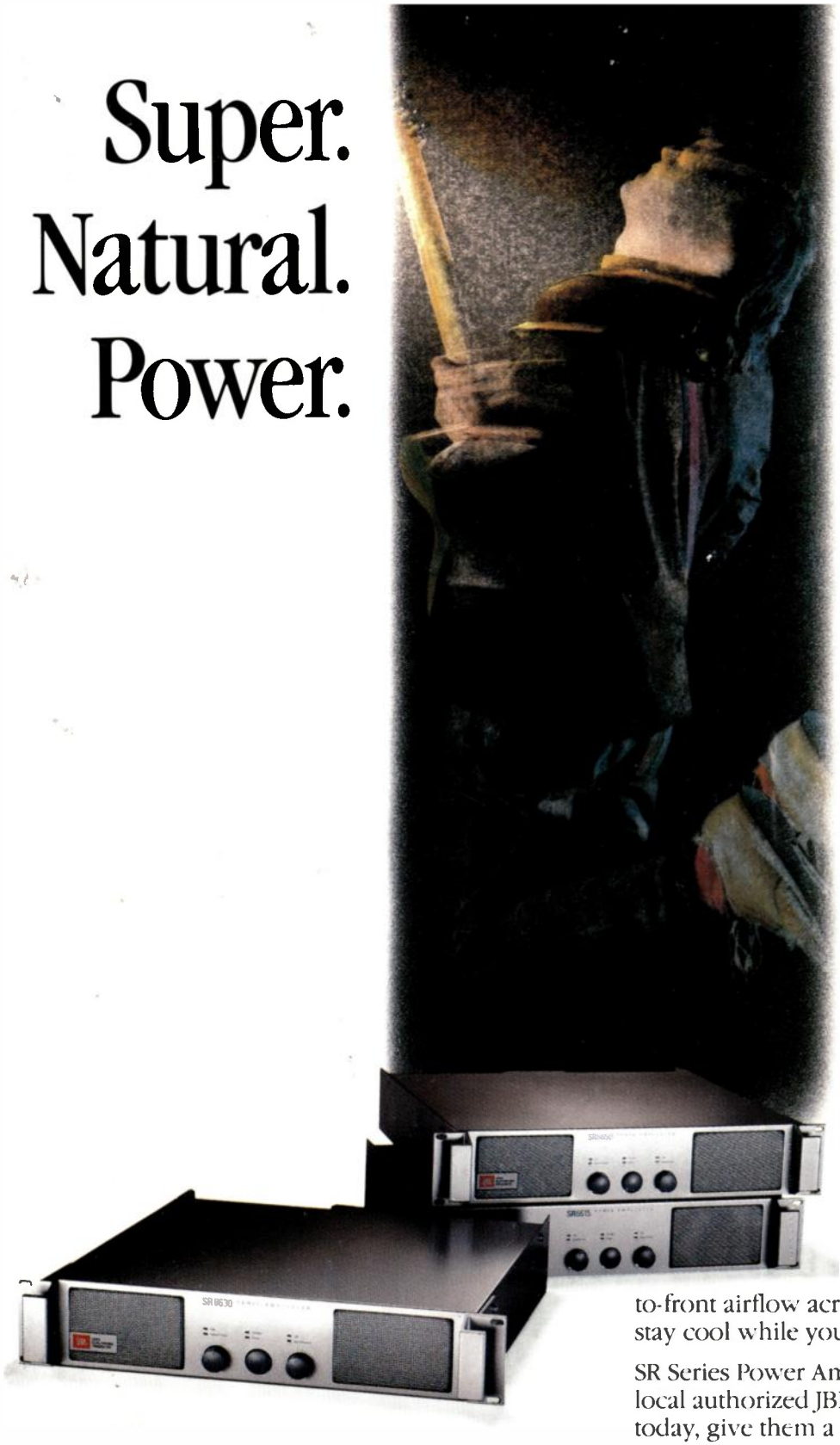

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