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Electronic Musician
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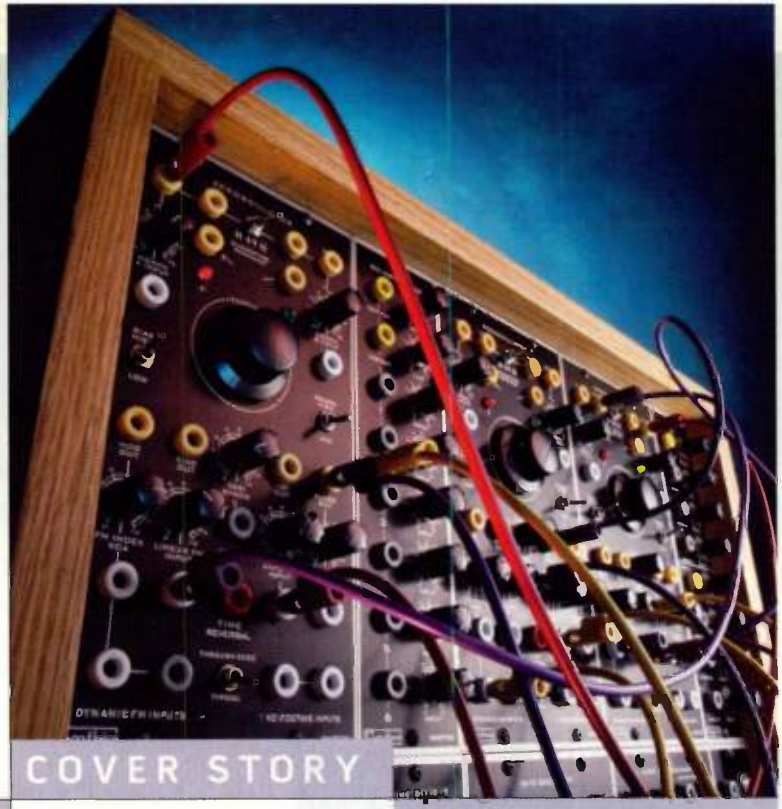

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Convolution is one of the hottest signal-processing techniques around. Learn how to record impulse responses to create your own virtual spaces. By Alex Kemmler

46 ANALOG RENAISSANCE

Analog modular synthesizers never really went away, but their popularity today is greater than ever before, thanks to their sound quality and playability. An amazing variety of new modules have been introduced in the last five years. We tested 11 of the most interesting new product lines. By Gino Robair

65 PRODUCTION VALUES: RECORDING THE GENIUS

Terry Howard was Ray Charles's engineer for almost 20 years. In this interview, Howard tells about Charles's "golden ears," the techniques and gear Howard used to record Charles's voice and piano, his legal squabbles with Charles's management, and his current studio, which includes a 64-bit Cakewalk Sonar system. By Mike Levine

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The Analog Revival

Rather than taking back their former position as kings of electronic music, analog modular synths are the darlings of a relatively small group of enthusiasts and will probably remain so. But given the modest size of the market, the number of new analog modular products is impressive: when EM senior editor and analog enthusiast Gino Robair began writing this month's cover story (see "Analog Renaissance" on p. 46), he discovered 11 new species of living, breathing modular beasts.

These ancient monsters are finding new life for several reasons, among which are their big, fat sounds, their playability, the flexibility they offer with signal paths that can be altered by repatching a cable, and the fun their operators have twiddling their knobs. They look pretty cool, too, in a retro sort of way. And unlike modulars of old, most modules in these modern synths support common standards, so systems from different manufacturers usually play well with each other.


JULIE BIRUM

But the biggest reason is a change in musical tastes. When analog modular synths first came on the scene, they were an instrument of choice for the avant-garde.

But almost all popular music featured acoustic and electroacoustic instruments, and so most musicians wanted to focus on those sounds. Sample-based and physical-modeling synths were only a futuristic dream. If you wanted to record a trumpet part, you had to hire a trumpet player or play it yourself. In response, a primary goal of electronic musicians became emulating the sound of acoustic and electroacoustic instruments using subtractive analog synthesis. That remained a common goal as additive and early digital FM synths came on the scene.

The problem was that analog synths weren't very good at sounding like acoustic instruments. Oh sure, they could sound like something that more or less resembled an acoustic instrument, but even with the best sound design, few people were fooled into thinking they were listening to the real thing—and the real thing is what people wanted. That's why, when sample-based instruments arrived, they took over the market and analog synths went out of style, as did FM synths.

But today, it's okay for music to sound overtly electronic. In fact, with many types of dance music, electric and acoustic instruments are most noticeable because they are surrounded by synthesized textures and beats. And if sounding electronic is your goal, then analog synthesizers are appropriate and powerful instruments of choice. In short, with modern electronic music, analogs can do what they do best. Hence the analog renaissance touted on our cover.

Incidentally, our April cover apparently caused considerable confusion in some quarters. To clarify, the young fellow shown in the photo is a model, not "Hired Guns" author and EM contributing editor Michael Cooper. Cooper is a tall, slender, middle-aged guy who has been engineering and producing music for a long, long time.

Steve Oppenheimer
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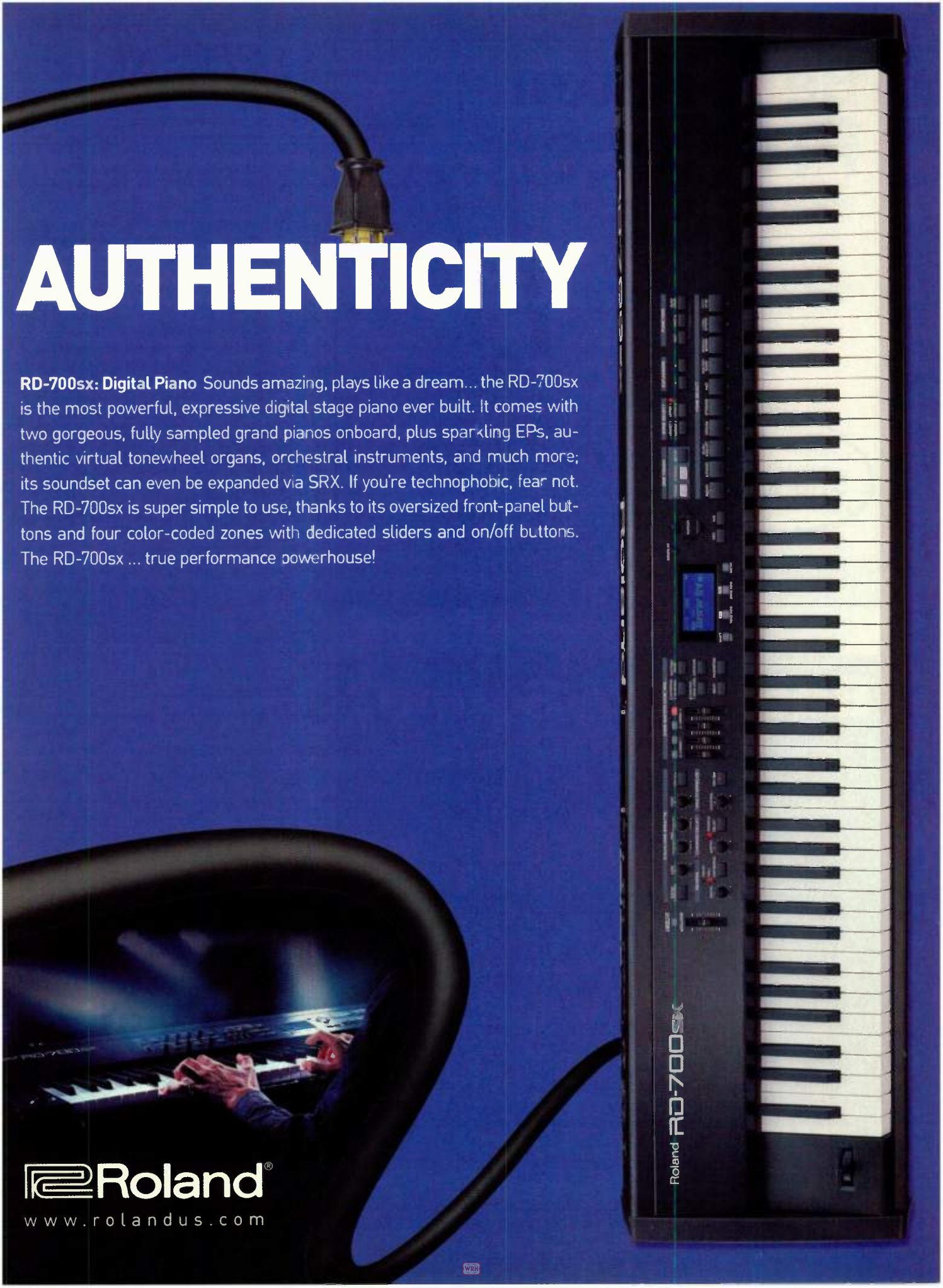

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EARL OTSUKA

Letters

In the Studio

Michael—I'm writing to applaud you for your article (see "Hired Guns" in the April 2006 issue of EM). I've been a studio percussionist for 33 years, and you laid out the scenario for cutting demo tracks or any rhythm tracks as seamlessly as possible. You cover everything people need to know to book a session here in town, providing people with the information they need to prepare demos at home, hold sessions that run smoothly, and pay for it through the union.

I especially liked the fact that you respect the players and their creativity and let them play. It shows that you trust us and respect our abilities. Thanks on behalf of all of the people that I work with. I only wish that other producers were as organized and together as you.

Tom Roady
Nashville, Tennessee
www.tomroady.com

As one who has worked in New York for many years, I found the info on the Nashville scene in Michael Cooper's "Hired Guns" fascinating. Here are a few points that may help people follow his efficient and clear methods:

1. Timecode start time on song files: while it probably won't be much of an issue these days, common practice has been to start song files at a time past 0:00:00:00. Convention has been 1:00:00:00, but I happen to use 0:00:30:00. Back in the day, tape machines did not do well with timecode locations at zero. If the session started at 0:00:00:00, the tape machine would try to park just before that point. If there were no timecode, the machine would often think it had to rewind to find zero—not good, especially in the early days of fairly primitive synchronization. Even now, though, it's still good practice to leave "preroll" timecode before the count-off, just in case.

2. Michael's multiple safety-copy practices are sound and prudent, and sending a DVD to be booted at the studio before you leave home is the best practice. Additionally, when burning DVDs of your preproduction materials to take to the session, it's always a good idea to reimport the data from the DVD after it's burned, just to verify that the same procedure will go smoothly at the session. It's time-consuming, but one time in 1,000 you'll be glad you did it.

3. It's often a good idea to preformat session templates that have track names and layout. That way, you (or the engineer) are not typing furiously while the musicians are waiting. On many DAWs, an option (or a default) exists to name the audio file for the preassigned track name. It is very helpful to have *kik .tk1.Love You Baby* (or *kik.t1.LYB* or any shorthand that works for you) as the name of the raw sound file on your drive, rather than *audio 7 #43*.

Bob Power
via email

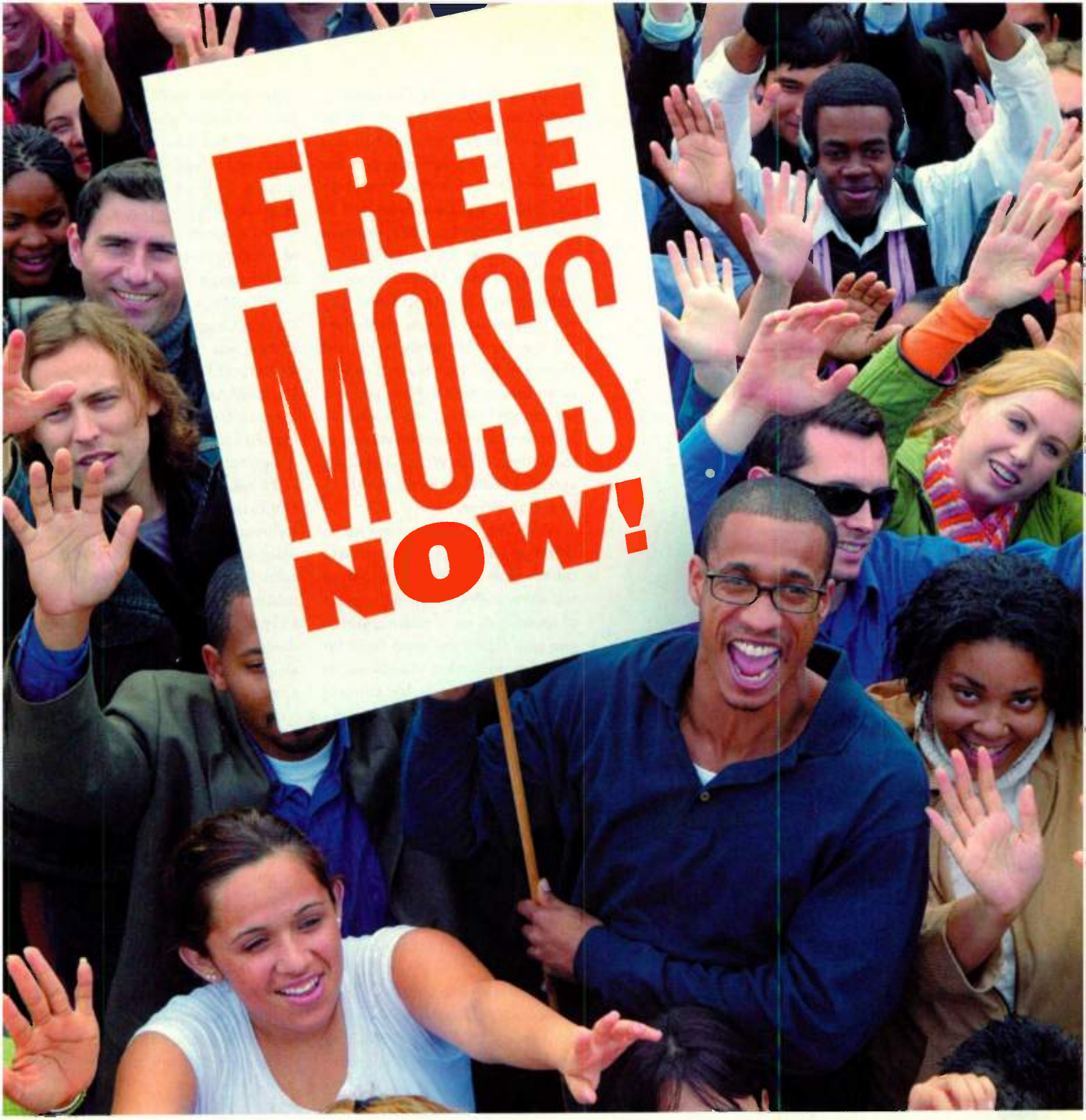
Author Michael Cooper replies: Thank you for your informative letter, Bob. In my article, I probably didn't explain my methods clearly enough vis-à-vis the first point you raise. I start only each track's audio region ("sound bite," in Digital Performer parlance), and not the song's musical content, at 0:00:00:00. The beginning of each sound bite comprises just empty bars, and my hired engineer begins recording sometime after 0:00:00:00 and before the count-off. The actual count-off starts at about 0:00:15:00, and the first downbeat of the song starts shortly thereafter. (I use two bars of count-off.) The merged or consolidated sound bites for each work demo track begin (with empty bars) at 0:00:00:00 to create more certainty that all tracks will sync before and during the tracking session and to provide the important preroll you also espouse. This preroll did come in handy a couple of years ago on one song, when I decided on the spot to record an extended intro preceding and leading into and through the count-off.

The studio I work in, County Q Productions, labels each track with the instrument name and, by default, its take number, and places all takes for a given song in a separate folder named after the song. Your suggestion for naming tracks goes one step further and is a great idea.

Trust No One

I just read Paul Tingen's interview with Daniel Lanois in EM's April 2006 issue. I enjoyed it and agreed with almost everything he had to say. I appreciate the vintage stuff he does, and I share many of his frustrations about some of the music being released today. I appreciate his emotional sensibilities and his search for different sounds. However, he put his foot in it with his blanket statement to the effect that engineers who work in TV are flunkies who roll off everything below a certain frequency because TVs can't produce low end.

That statement, although not specifically aimed at me, only makes



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COVER

Desktop Vocal Production

Five top producer-engineers discuss their tricks for desktop vocal production, including comping, pitch correction, and dynamics control.

FEATURES

Making Your Own Ringtones

We give you the basics on designing MIDI ringtones and audio real tones for cell phones in your personal studio.

Production Values:
Dave Pensado

Dave Pensado, who has mixed for major artists such as Mary J. Blige, Destiny's Child, Christina Aguilera, and Boyz II Men, discusses mixing and working on Blige's new album, *The Breakthrough*.

COLUMNS

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Letters

me think that Mr. Lanois needs to get out more. As an engineer for 36 years—20 in rock 'n' roll and 16-plus in TV—I have never dropped low end on any TV show I have mixed the music for. This includes nine years of *The X-Files*, right up until the current fifth season of *24*, with dozens of shows in between. Maybe I have been freaking out the networks, and they cut it there, but I doubt it. Maybe I am the one who needs to get out there and find that there is indeed no bottom on the TV shows I do, and my 15-inch Tannoy Golds hooked up to my set have indeed been lying to me all these years. What is he talking about? Something that might have been true 20 years ago?

TV shows these days end up on DVDs, and listeners are as critical of the sound as any of us used to be of our stereos. TVs are indeed capable of showing flaws in mixing, and as one who fights the good fight for pristine music that stands on its own, I take offense to Mr. Lanois's elitist statement. For an artist who has the sensibility to know when the vibe is right in music, I would expect more than offhand, misguided, and inaccurate comments.

Larold Rebhun
via email
www.larold.com

Klaus but No Cigar

This is in response to Klaus Heyne's "Claim Check" letter (March 2006), which refers to Rob Shrock's review of the Røde NT2-A microphone (see the January 2006 issue of EM). I'm tired of the old "Gee—if it's more expensive and made in Germany, it has to be better" whining from some shortsighted industry professional who can't accept that microphones costing "only one-tenth the price" of great, failing, discontinued ones sound as good as or often notably better than classic favorites such as the Neumann U 67.

Would it surprise Klaus to know that Ray Charles chose a microphone costing one-tenth the price of a U 47 to record his vocals on multiple Grammy Award–winning albums such as *Genius Loves Company*? I wouldn't consider Ray to have been a "beginner" or "semiprofessional," and I know he was extremely sensitive to all things relating to music and sound. Perhaps it's annoying for Klaus to see newer, more affordable microphones being compared to the classics he restores. But if you go out and pay the $4,000 or whatever for a classic mic, sooner or later the parts are going to fail due to age, if they aren't already shot.

As a reader of EM for many years, I truly appreciate and respect EM's Editors' Choice Award for the NT2-A. And as a person who owns and uses both the U 67 and the NT2-A, I found Rob's comparisons right on the money. Thank goodness there are people in our industry who actually place value on what they hear and not solely on the label and price. Frankly, I felt Klaus's comments were condescending and unfounded. Thank you, Rob, for your honest and helpful reviews.

Brian Hutchison
Vice President, ADK Microphones
Seattle, Washington

We Welcome Your Feedback

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Published letters may be edited for space and clarity.

Error Log

February 2006, "Seizing Control," p. 51. The Edirol PCR-M50 can send Aftertouch when that parameter has been assigned to one of its controllers but cannot send it from its keyboard.

April 2006, "House of Soul," p. 68. One of the smaller Neve consoles that Daniel Lanois uses is called the Melbourne, not Melbourn, as spelled in the article. EM

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EMspotlight

Danny's Big Adventures

After a lengthy stint as the leader of the modern rock band Oingo Boingo, Danny Elfman entered the intense world of Hollywood film scoring in 1985 with *Pee-Wee's Big Adventure*. Since then, the prolific composer has scored numerous big-budget films, including *The Nightmare Before Christmas* (Skellington Studios, 1993), *Mars Attacks!* (Warner Digital Studios, 1996), and *Charlie and the Chocolate Factory* (Warner, 2005). In this interview from the EM archives, Elfman discusses composition, managing deadlines, and what makes a successful film score. By Greg Pedersen. emusician.com/em_spotlight

On the Home Page

EM Web Clips

A collection of supplemental audio, video, text, graphics, and MIDI files that provides examples of techniques and products discussed in the pages of *Electronic Musician*.

EM Guides Online

Get detailed specs on thousands of music-production products with our free online Computer Music Product Guide and Personal Studio Buyer's Guide.

Show Report

The Frankfurt Musikmesse is the biggest annual musical-instrument expo in Europe. Visit emusician.com for Senior Editor Gino Robair's report on the exciting new recording gear, music software, and electronic musical instruments unveiled at this year's show.

EM seminars on deman

The EM Seminars on Demand offer an exciting way to see new products and learn new applications and techniques online and at your leisure. Korg USA's top sound designer, Jack Hotop, shows you how to customize a variety of synth sounds to suit your performing and compositional styles.
emusician.com/editorspicks

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Electronic Musician

WRH

By Geary Yelton

Vienna Instruments Symphonic Cube

Vienna Symphonic Library (its distributor is Ilio, www.ilio.com) is shipping *Vienna Instruments Symphonic Cube* (Mac/Win, $4,620 for the *Standard Libraries* edition), which combines ten virtual instruments and a 550 GB sample collection. *Symphonic Cube* comprises the software instrument application and plug-in and ten volumes of 24-bit, 44.1 kHz woodwind, brass, harp, percussion, and string samples.

Thanks to Vienna's proprietary Performance Detection algorithms—which analyze intervals, repeated notes, patterns, and tempo as you play—you can summon hundreds of articulations in one preset on a single MIDI track in real time. The *Vienna Instruments* series supports AU, RTAS, and VST in Mac OS X, and VST in Windows XP. All ten volumes are also available separately, and range from $415 to $595 each. *Standard Libraries* owners can upgrade to *Symphonic Cube Extended Libraries*, which has more articulations, for an additional $6,370 or less.

MOTU UltraLite

For anyone short on space, the newest FireWire audio interface from MOTU (www.motu.com) is its most compact yet. The UltraLite ($549) is a half-rackspace device that brings 24-bit, 96 kHz recording to your Mac or PC. The UltraLite has two XLR/TRS-combo mic and instrument inputs with preamps, six balanced TRS inputs, ten balanced TRS outputs, a stereo headphone output, 96 kHz S/PDIF I/O, MIDI In and Out, two FireWire ports, and 48V phantom power. A built-in 8-bus mixer lets you create four independent stereo mixes to monitor any combination of inputs through any stereo output with virtually no latency or strain on your computer's CPU. The UltraLite can draw power directly from the FireWire bus or, for use as a standalone mixer, from the included DC power supply. If you need more channels, you can daisy-chain additional MOTU FireWire interfaces.

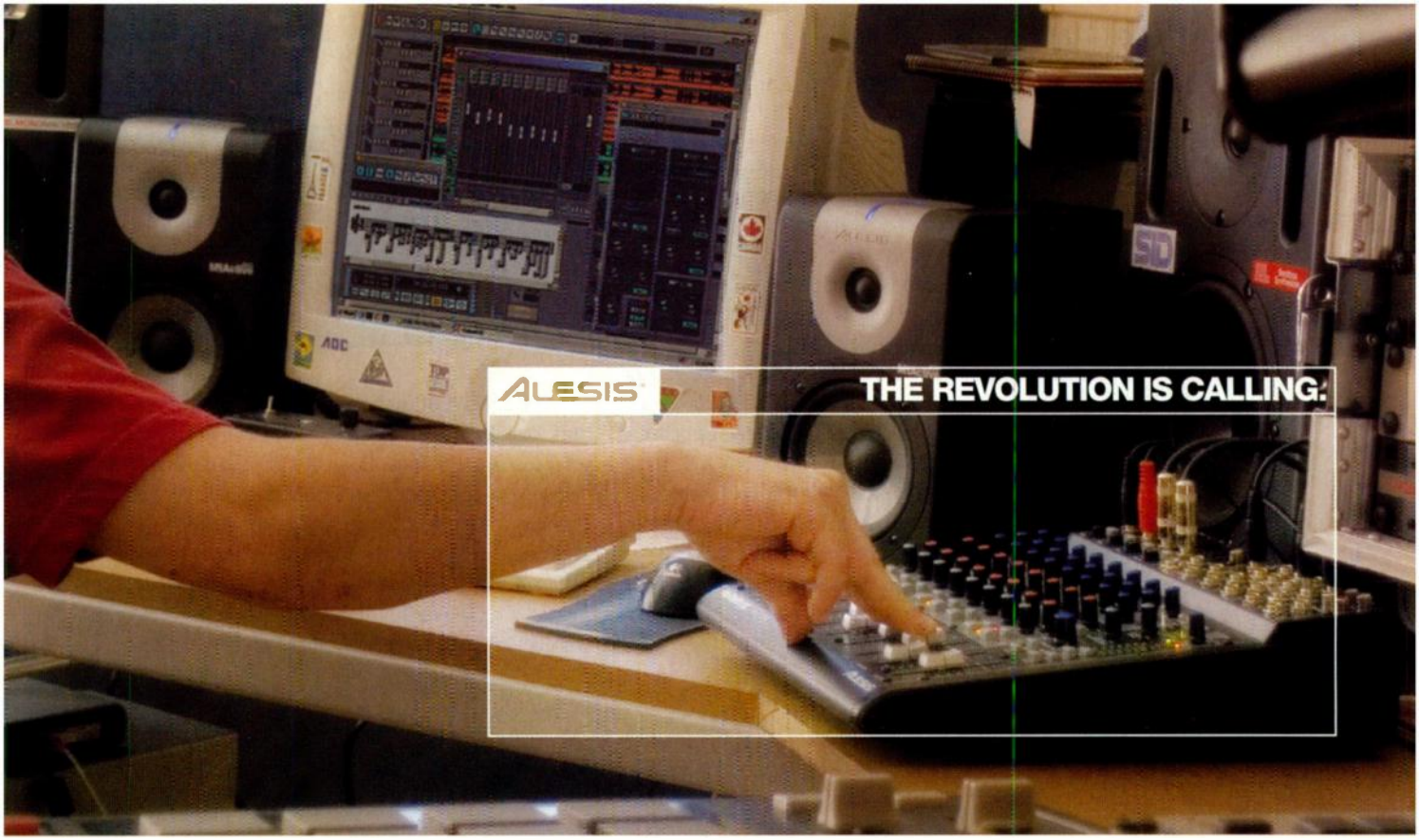
The UltraLite's front-panel trim knobs give you 24 dB of gain in 1 dB increments, and 3-position pad switches let you select 0, –18, or –36 dB, for a total gain range of 60 dB. A backlit LCD shows 8-segment level meters for all inputs and outputs simultaneously. Onboard SMPTE features can generate or sync to timecode. You can control everything either from the front panel or by using the accompanying CueMix Console software (Mac/Win). AudioDesk workstation software (Mac) is also included.

Morrison Digital Trumpet

For more than 20 years since the MIDI revolution began, brass-instrument players were sadly neglected. At long last, Australian manufacturer Marshall Morrison Instruments (its U.S. distributor is Patchman Music, www.patchmanmusic.com) has come to their rescue with the Morrison Digital Trumpet ($2,495). The MDT is an electronic brass-style MIDI controller with a steel trumpet mouthpiece and a standard stainless-steel valve movement that requires a trumpetlike hand position, making it easy to transition from acoustic instruments.

The MDT gives you unique expressive capabilities to play any MIDI sound source and record your performances into any MIDI software. Even brass players who have minimal skill can play more than a 10-octave range for extended periods.

The MDT lets you control loudness naturally, using your breath, when used with breath-responsive patches. There's no need to perfect your embouchure—just blow. The breath sensor facilitates fast tonguing and smooth legatos. You choose notes using a combination of normal right-hand trumpet fingerings and left-hand buttons that select octaves and half octaves; right-hand fingering is identical in every octave. Your right thumb controls programmable parameters such as Pitch Bend and vibrato. The MDT ships with a padded aluminum case, a custom cable, and a universal power supply.



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Alesis continues to push the boundaries of recording technology with the all-new MultiMix FireWire Mixer Series. These plug & play 8, 12, and 16 channel mixers bring the analog and digital worlds together, giving you the quality and flexibility you would expect from Alesis. With ultra-fast FireWire computer connectivity, the MultiMix Series mixers provide instantaneous multi-channel audio recording direct to your computer without the hassle of connecting and routing additional devices. Compact and affordable, the powerful MultiMix series offers the ease-of-use and affordability you need for great recordings, live or in your home studio.

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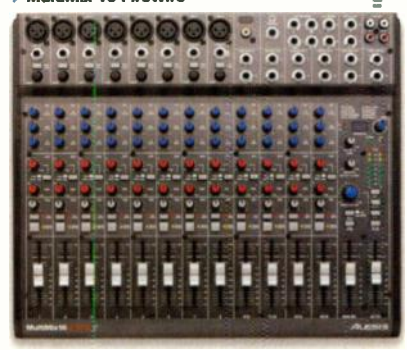
› MultiMix 8 FireWire

› MultiMix 12 FireWire

› MultiMix 16 FireWire



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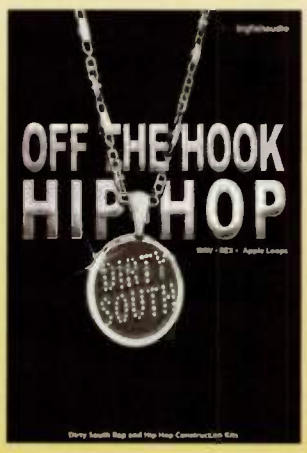
Tascam CD-RW900

Tascam (www.tascam.com) is shipping its CD-RW900 ($679), a rackmount CD recorder that lets you change the pitch and speed of recordings by ±16 percent. What's more, you can change key by semitones by as much as half an octave up or down without affecting playback speed. The unit can change speed without affecting pitch, too. The CD-RW900, which replaces the CD-RW750, can read MP3 files and enables you to navigate to directories on CDs and organize files into folders before burning. The 2-rackspace device can display CD Text and MP3 ID3 tags, allowing you to read the names of tracks as they play. A PS/2 keyboard input lets you enter track names and quickly access menu functions with a single keystroke.

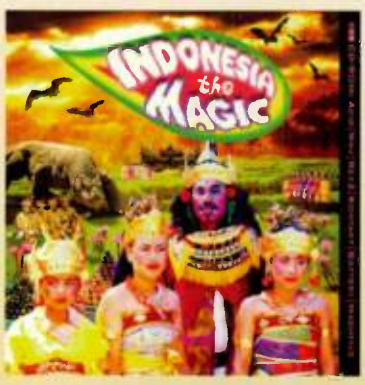
The CD-RW900 has unbalanced RCA inputs and outputs, coaxial and optical S/PDIF ports, and dedicated input-level controls. It records 16-bit, 44.1 kHz audio and converts sampling rates ranging from 32 kHz to 48 kHz. An Auto Track Increment function automatically divides tracks by recognizing the end of one and the beginning of the next. Supported playback modes include All, Single, Program, Random, and Repeat. The CD-RW900's accompanying wireless remote control duplicates most front-panel functions.

Sound Advice

Sony Media Software (www.sonymediasoftware.com) is shipping the second collection of five discs in its *Sony Pictures Sound Effects Series*. The effects in volumes 6 through 10 ($399.95) are generally more abstract than the sounds in the first five volumes. Each CD-ROM contains an assortment of 16-bit WAV files in specific categories. Volume 6 concentrates on science-fiction, fantasy, and horror sounds. Volume 7 focuses on weapons and combat, including explosions in 5.1 surround. In addition to wind and thunder, volume 8 contains recordings of a barnyard, traffic, insects, church bells, and similar ambient backgrounds. The remaining two discs feature vintage vehicles, antique machinery, historical battles, and other period effects.



Three sound libraries from **Big Fish Audio** (www.bigfishaudio.com) aim to give your hip-hop productions a coast-to-coast perspective on the urban underground. *Off the Hook Hip-Hop* is available in three editions: *East Coast*, *West Coast*, and *Dirty South* ($99.95 each, $269.95 bundle). Each DVD-ROM contains one-shot samples, drum loops, and construction kits in 16-bit Apple Loops, REX, and WAV formats. Featuring funky rhythms, guitar licks, piano chords, synth stabs, horn hits, and an assortment of additional elements, the *Off the Hook Hip-Hop* series furnishes tracks you can use to assemble complete songs that reflect the cultural attitudes of cities in three parts of the country.



One of civilization's richest musical traditions comes from Indonesia, home of the highly percussive and otherworldly gamelan and jegog ensembles. Now **Discovery Sound** (www.discoverysound.com) has delivered the sounds of Bali and Java in *Indonesia the Magic* ($55), a sample CD-ROM produced by popular Japanese musician Makoto Kubota. The disc contains 606 MB of loops and phrases in Acidized WAV and REX2 formats, and an assortment of instruments for Native Instruments Kontakt and Battery and MOTU MachFive. Featured sounds include voices singing and chanting, the xylophone-like rindik, a bamboo flute called the suling, a two-stringed fiddle called the rubab, and percussion instruments such as the gendang and barangan.

C300

DUAL STEREO GATE | COMPRESSOR

New Dynamic Duo from TC Electronic

Complex dynamic live sound is now an all access area for sound engineers or performing bands and DJs in charge of their own PA. With the new C300 dual stereo compressor/gate processor, TC Electronic gives you instant access to the most effective dynamics tools - guaranteed to transform your sound. C300 is a dual engine dynamics processor with both analog and digital I/O and it comes with a comprehensive selection of source-based presets. Choose between vocal, guitar, percussion, keyboard, horn, and full-range preset types – all are directly accessible from the user-friendly front panel. TC's new style compression makes it possible to emphasize low-level details and bring out expression and character in vocals, guitars and all other signal sources. C300 is your all access pass to a world of unprecedented dynamics and clarity in live sound.

Main Features

- Dual engine compressor/limiter gate/expander
- 16 compressor/limiter presets and 16 gate/expander presets optimized for selectable audio sources
- Intelligent TC multi-band and full-band technology
- Detail enhancement via new style compression
- Flexible routing gives you all standard combinations of link modes + a stereo serial mode that virtually gives you an extra device
- No nonsense user interface

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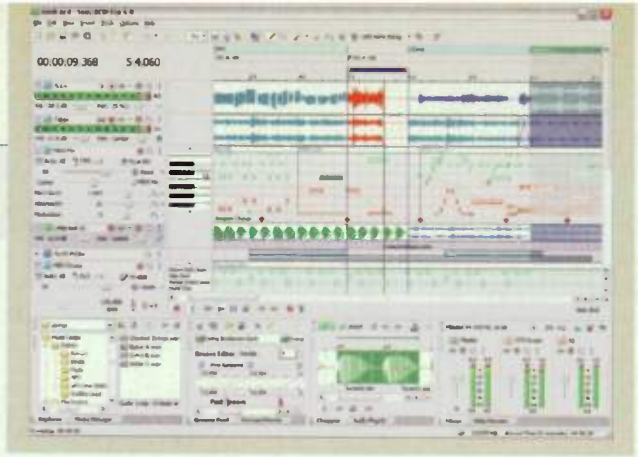
Sony Acid Pro 6



Sony Media Software (www.sonymediasoftware.com) has updated its flagship loop sequencer, Acid Pro 6 (Win, $499.95), with significant enhancements to its multitrack recording capabilities. Now you can simultaneously record multiple tracks of 24-bit, 192 Hz audio and MIDI into the Timeline, using methods such as step recording, continuous looping, and punch-in and -out. As you record, you can monitor your input through the effects, allowing you to hear exactly what's being recorded. Each track can contain numerous media files such as one-shots, beat-mapped events, and disk-based files with automatic crossfades.

Acid Pro 6 lets you manipulate MIDI data on the Timeline using a piano-roll or drum-grid interface. You can edit notes, duration, Velocity, Pitch Bend, quantization, swing, and other MIDI parameters. You can rearrange time-based audio and MIDI segments across multiple tracks using the Project Sections feature, and easily create custom templates using the Drum Map editor. Acid Pro 6 supports external control surfaces, facilitating hands-on mixing, transport control, and effects automation. Bundled with Acid Pro 6 is a special edition of Native Instruments Kompakt and more than 120 sampled instruments.

Download of the Month

NUSOFTING GROOVE ANALOGIZER (WIN)

Groove Analogizer ($29), a Windows VST effects plug-in from Luigi Felici of NUSofting, is a percussion-oriented synth with drum sounds that you trigger using envelope followers rather than playing directly. You can insert Groove Analogizer in either an audio or a virtual-instrument track. It is most flexible when you use it to process a drum synth or a sequencer (see **Web Clip 1**).

Groove Analogizer's control panel tells the whole story: there are three identical channels, each containing an envelope follower and an oscillator geared to synthesizing percussion sounds. The envelope follower incorporates a bandpass filter for limiting the frequency range that triggers the channel. The trigger signal can also be limited to either side of the stereo input, and a sensitivity knob gives you further control over triggering. For example, you could set up two channels with different inputs, each of which triggers on only snare-drum hits, but with one channel triggering on every hit while the other triggers on only loud hits.

Each oscillator has a single release envelope that controls amplitude. Optionally, you can also apply it to pitch to affect positive or negative pitch bend. The release-envelope amount tracks the envelope follower, meaning that louder incoming notes result in more envelope modulation. The oscillator's Timbre knob controls the mix of noise with the oscillator's waveform. You can vary the waveform from a sine wave to what sounds like a narrow-band pulse, and the oscillator can modulate its own frequency for even greater harmonic content.

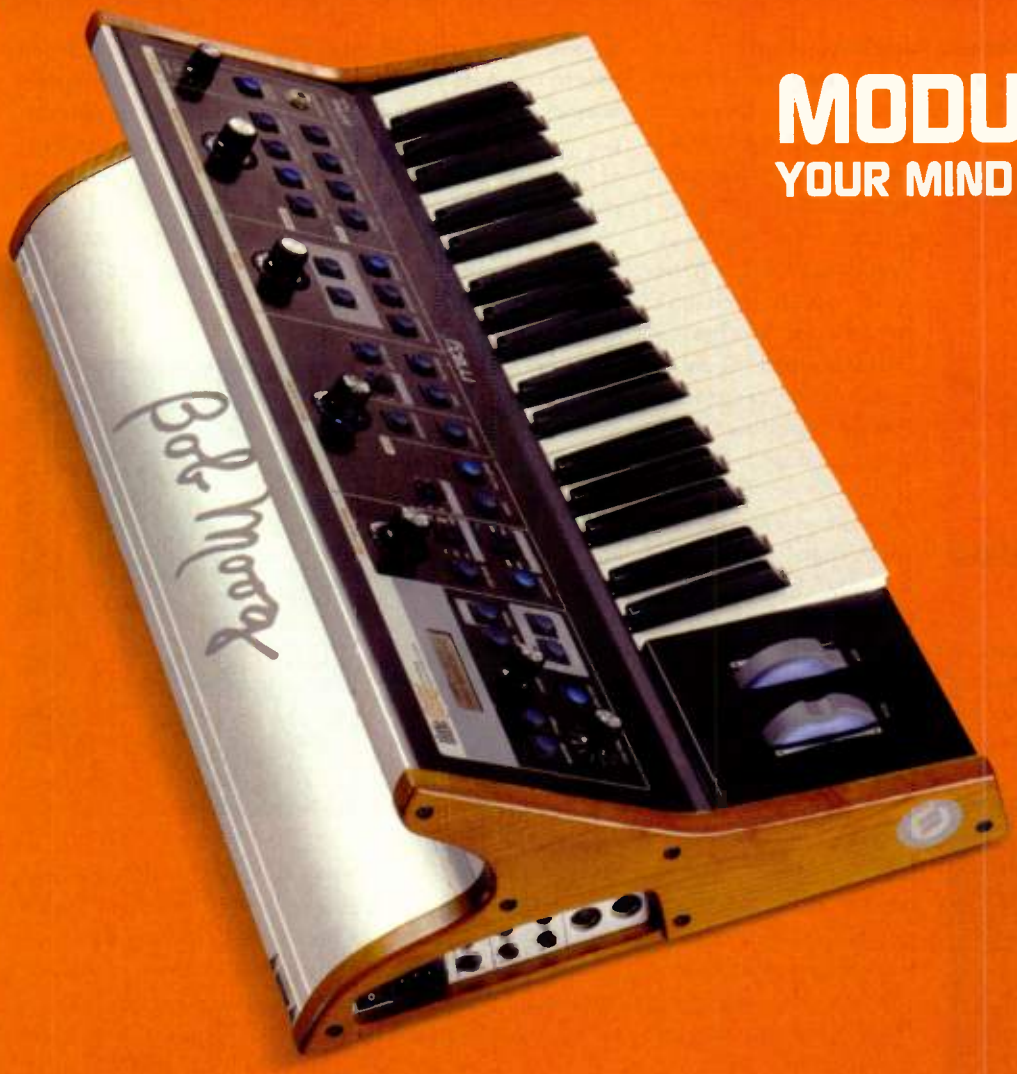
Each Groove Analogizer channel has controls for volume, pan, and a prevolume send to a global stereo feedback-delay line. You can slightly offset the left and right delays using the Stereo Offset slider, and the delay line has its own volume control. Instead of a wet/dry control, the plug-in has separate faders for the wet and dry signals.

As with many envelope-follower effects, setting up Groove Analogizer to follow a drum groove can be a bit touchy, but it's well worth the effort for the spice it can add to a basic drum track. You can download a save-disabled, time-limited demo from the NUSofting Web site (http://nusofting.liqihsynth.com).

EM WEB CLIPS

—Len Sasso

MODULATE
YOUR MIND



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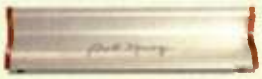

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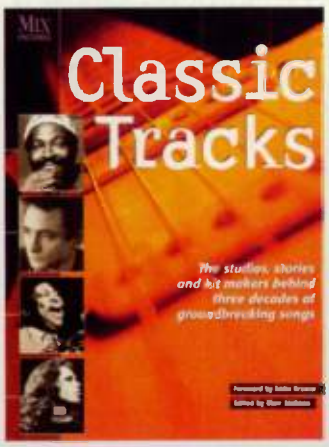
Get Smart

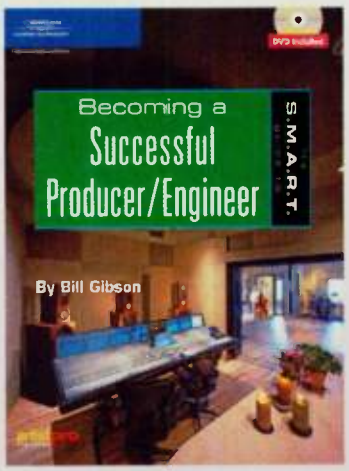
Twelve years ago, Blair Jackson launched a column in *Mix* called "Classic Tracks," in which he and a handful of other authors investigated the stories behind a series of hit songs. Now **Mix Books** (www.buyprism.com) has published a "best of" compilation entitled *Classic Tracks* ($24.95), edited (and mostly written) by Jackson. Thirty-one chapters reveal the backgrounds of recording sessions resulting in hit songs familiar to everyone, from Roy Orbison's "Only the Lonely" to Dire Straits' "Money for Nothing." In fascinating conversations with chart-topping producers, engineers, and artists, the authors present a history of pop music, one song at a time.



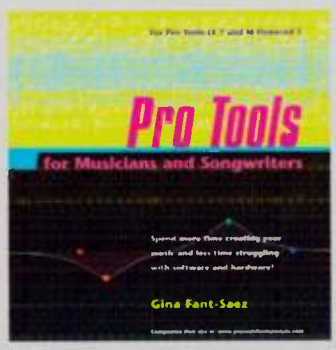
Hot on the heels of its *Absynth 3 Tutorial DVD*, **Native Instruments** (www.native-instruments.com) is shipping the new *Kontakt 2 Tutorial DVD* (Mac/Win, $59). Featuring six hours of QuickTime video content, the 3.87 GB disc delivers clear and detailed explanations of the powerful software sampler. Host Brian Smith guides you through nine chapters offering step-by-step instruction on topics ranging from grasping Kontakt 2's user interface and creating new instruments to beat slicing and convolution. Supplementary materials include interviews with two film composers and Kontakt 2's designer, as well as instrument presets and audio samples used for the hands-on lessons.

If you own Native Instruments Guitar Rig, you've already discovered the broad range of capabilities made possible by software models of guitar amps, speakers, mics, and effects. *Guitar Rig 2 Power!* ($34.99), written by EM author Orren Merton and published by **Thomson Course Technology** (www.courseptr.com), aims to maximize your creative potential by explaining Guitar Rig 2's myriad components. Beginning with an overview, Merton describes every parameter and tells you how to integrate your computer and guitar into live performance and studio setups. You'll learn to select amp and cabinet models, master a wide range of effects, make the most of banks and presets, and exploit Guitar Rig's programming potential to build custom presets from scratch.

Also from **Thomson Course Technology,** *The S.M.A.R.T. Guide to Becoming a Successful Producer/Engineer* ($39.99) is a thorough introduction to the technical and creative aspects of recording. One of half a dozen S.M.A.R.T. (Serious Music and Audio Recording Techniques) titles by Bill Gibson, the 283-page book covers the fundamentals of music production from a practical perspective. In addition to showing you the ropes regarding recording, mixing, and mastering, Gibson tells you how to locate jobs, secure financial backing, establish budgets, and deal with artists' personalities. Case studies examine popular songs by U2, Black Eyed Peas, and Keith Urban. The enclosed video DVD supplies video and audio clips that illustrate various topics of discussion.



When you're trying to learn your way around software, nothing is more helpful than step-by-step guidance. That's just what you'll find in *Pro Tools for Musicians and Songwriters* ($44.99), written by Gina Fant-Saez and published by **Peachpit Press** (www.peachpitpress.com). Packed with color screen shots, the 539-page book focuses on Pro Tools LE 7 and Pro Tools M-Powered 7. It begins by assuming you know nothing about making music with computers and takes you from initial setup through all the stages of recording, editing, mixing, and exporting your song. Along the way, you'll learn about using soft synths, effects, markers, automation, and more. Additional chapters show how to tap into online resources and collaborate with other musicians over the Internet. EM



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New

Off The Hook Hip Hop: Dirty South

$99.95
WAV/REX/Apple Loops

This is as dirty as it gets. From the legendary *Off the Hook* series, these construction kits flow with some serious Southern Hip Hop flavor. 2116 loops and sounds including drums, synths, electric bass, organs, guitars, rhodes, strings, percussion and more. Plus a ton of bonus material! With enough crunk juice to fill your pimp cup twice, you can ride with these tracks from St. Loius to New Orleans and back. Packed with the beats and sounds that make hits, this library is a must.

Platinum Essentials 2

$69.95
WAV/REX/Apple Loops

Well...well...well, guess who's back with another bag full of Platinum hits. The west coast phenomenon Keith a.k.a Clizark can't be stopped. We snatched him outta Snoop's studio to finish this sequel. Loaded with more Hip Hop and R&B construction kits, *Platinum Essentials 2* contains all the sounds you've been askin' for, completely broken down. From bangin' beats and nasty bass samples to wicked synth and vicious sounds, nobody's puttin' it down west coast style like Clizark.

Nu Metal City

$69.95
WAV/REX/Apple Loops

A head-banging collection of construction kits covering a variety of styles, including Nu Metal, Metalcore, Death Metal, and Industrial Rock. Inspired by the music of such artists as Slipknot, Korn, Anthrax, and Nine Inch Nails, *NU METAL CITY* features live and programmed drums,screamin' guitars, electric bass, synths, turntable FX, and atmospheres. If you're looking for butt-kicking loops with a hardcore attitude, welcome to *NU METAL CITY*.

Chill: Downtempo Loops and Beats

$99.95
WAV/REX/Apple Loops

This loungin' set of construction kits draw from jazz, hip hop, dub, funk, soul, ambient, and pop to create a whole new downtempo experience. Drums, guitars, keys, electric and acoustic bass, flutes and more gel somewhere between 60 and 110 bpm. Sometimes a little jazzy, sometimes a little old school, but always the perfect combination of reclined head bobbin' lazy pleasure.

Off The Hook Hip Hop: East Coast

$99.95
WAV/REX/Apple Loops

Anthony Myers and company are back with that East coast flava, it doesn't get any better than Off the Hook. Check out the new hot construction kits, guitar licks and loops, drum hits and sounds, and many extras. Straight from the underground hip hop clubs...this is another one you must have! No doubt about it.

Rush

$99.95
WAV/REX/
Apple Loops

Blood-pulsing, heart racing rhythms and melodies of House and Trance like you've never heard them before. From ethereal synths to driving bass, all the material you need to get your tracks into the biggest clubs is right here. Over 1.3 gigs of pure adrenaline in REX2, WAV and Apple Loops format. You need RUSH.

First Call Horns

$299.95
Kontakt Player/Plug-in
(VSTi/RTAS/AU/Dxi?)

$299.95
GigaStudio

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An incredible selection of samples direct from Andy Inspired by DJ's and Club the finest in soulful and hundreds of drum and soft and expressive male and female synth basslines, pads

Raging Guitars

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Logic/EXS24/Kontakt/
WAV/REX

This is the guitar onslaught you've been waiting for! A guitar virtual instrument done right, with over 11 gigs of multiple amps and levels of distortion, mono and stereo files. Loops that can be time stretched to match the tempo of your tune automatically, Sustained notes, chugs, hammer-ons, bends and lots more, so you can create your own guitar parts.

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Jeff Carruthers
Producer: Boney James, Paul Brown, Peter White, Jeffrey Osborne

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See what the pros say about Big Fish Audio.
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The Rhythm Station

$69.95
WAV/REX/Apple Loops

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Nu Jazz Funk

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Nanoprocessors

By Scott Wilkinson

IBM hints at more powerful processing chips.

It is well known that to make integrated circuits faster and more powerful, the individual elements within them must be made smaller, leading Intel cofounder Gordon Moore to postulate that the number of transistors per square inch within integrated circuits (ICs) would double every 18 months. However, it is also well known that this trend cannot continue forever; at some point, those elements will reach atomic proportions, and where do we go from there?

COURTESY IBM

FIG. 1: IBM's nanotube-based ring oscillator is one-fifth the width of a human hair.

IC elements haven't achieved atomic sizes yet, but research at IBM's Thomas Watson Research Center (www.research.ibm.com) in New York could bring them close to the molecular level. IBM scientists recently announced that they have created the first complete circuit based on a single carbon-nanotube molecule using standard semiconductor processes.

Carbon nanotubes are molecules of carbon atoms that resemble microscopic rolls of chicken wire that are 50,000 times thinner than a human hair. Their unique electrical properties, such as ultralow resistance, could allow them to carry higher current densities than any interconnecting material used in today's chips, which are becoming limited by an effect called *phonon scattering*. As more transistors are packed into chips, an electron's movement is hindered when it becomes coupled to vibrations in the surrounding lattice, increasing resistance and limiting speed. That does not occur in a one-dimensional conductor such as a carbon nanotube.

The circuit built by the IBM team is called a *ring oscillator*, and it consists of 12 field-effect transistors laid along a carbon nanotube 18 microns long, which is about one-fifth the width of a human hair (see Fig. 1). Ring oscillators are used by chip makers to evaluate new manufacturing processes or materials, because their properties provide a good indication of how potential technologies will perform when used to construct complete ICs. As a result, IBM can now use a ring oscillator to test the performance of nanotube-based transistors and circuits in complete chip designs.

"Carbon-nanotube transistors have the potential to outperform state-of-the-art silicon devices," says Dr. T. C. Chen, vice president of science and technology at IBM Research. "However, scientists have focused so far on fabricating and optimizing individual carbon-nanotube transistors. Now we can evaluate the potential of carbon-nanotube electronics in complete circuits—a critical step toward the integration of the technology with existing chip-making techniques."

The nanotube ring oscillator was able to achieve a clock speed of 50 MHz, which is positively poky compared with the gigahertz speed of today's microprocessors. However, it's almost a million times faster than previously demonstrated circuits consisting of multiple nanotubes. IBM believes that new fabrication processes will eventually lead to superior performance from nanotube electronics.

According to IBM research staffer Joerg Appenzeller, "This isn't about making the circuits smaller; it's about making them faster. Nanotubes fit the characteristics we need to advance high-end processing. We are exploring moving beyond silicon-based chips to significantly boost the performance of PCs. Silicon chips will continue to improve, but we need to look ahead decades into the future. There are a lot of issues still to be resolved, but we believe that the nanotubes can complement silicon chip technology." This is great news for all electronic musicians, but don't get too excited—it will be years before nanoprocessors become commercially available. Still, we can dream, can't we? EM

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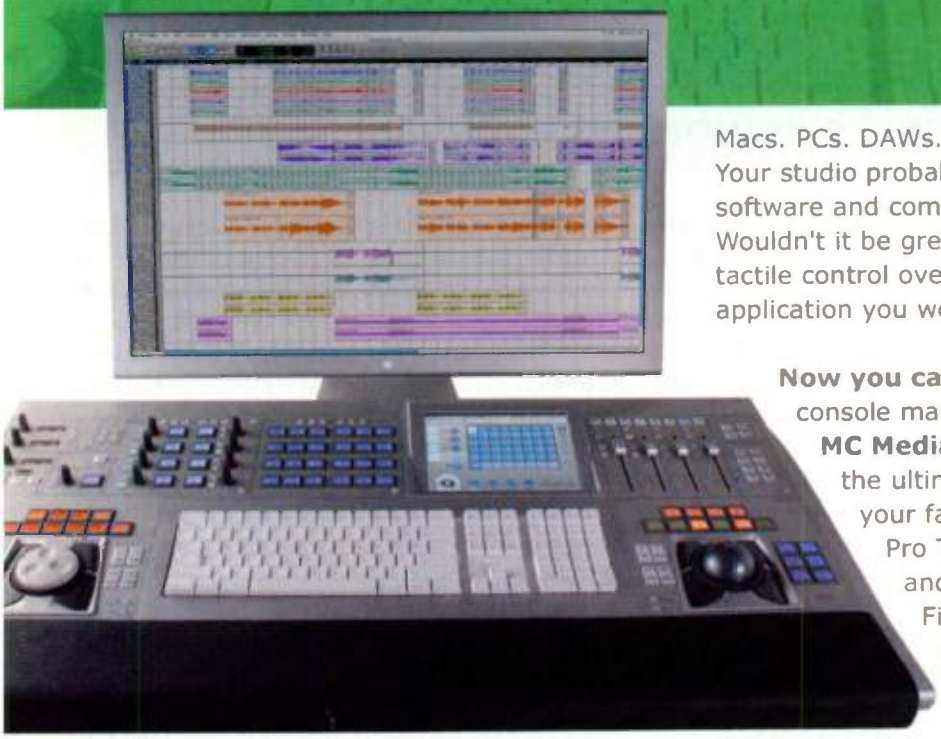

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Sonic Brushstrokes

By Brian Heller

Matthew Smith's improvised symphonies.

Although some of Matthew Smith's symphonies last more than 40 minutes, it takes less than 30 seconds to realize how unusual they are. Smith, a painter for most of his life, abruptly put down the brush eight years ago and has since turned to composing music full-time. *Archaic* (Innova, 2005) is his first release as a composer and solo artist, highlighting three larger pieces created between 2001 and 2003.

Working from his attic studio, Smith eschews traditional orchestration. Instead, he draws sounds for his symphonies out of his collection of odd and exotic instruments—from the anklung (a set of Asian bamboo pitched rattles) to jaw harps to orchestral percussion. His pieces are orchestrated with unpredictable combinations of these instruments. For example, *Archaic* begins with his Symphony 8, which is "scored" for eight jaw harps, six Suzuki violins, strings, and percussion.

I use the word *scored* loosely, because Smith's works are primarily improvised. With few preconceived ideas, he composes by tracking into his Digidesign Pro Tools | HD 1 and 96 I/O rig (running on an Apple Power Mac G4/933) from start to finish. He typically close-mics his instruments with a Neumann KM 184 and a Blue Dragonfly through a Great River MP 2 mic pre. Using a 22-inch Apple Cinema Display for viewing Pro Tools, he builds up extremely dense textures by layering, often tracking more than 20 passes of the same instrument.

COURTESY MATTHEW SMITH

Archaic/Matthew Smith

Smith's process is almost completely intuitive and spontaneous, and is totally organic. He relies solely on recorded acoustic instruments and never uses synths, samplers, or sound-design processing. He deviates from his normal production process on just one piece on *Archaic*, recording some of the tracks with a gifted chamber ensemble called Zeitgeist (for which he named the piece).

Smith prefers strings, and his admitted favorite is the Suzuki violin, a one-sixteenth-size violin designed for small children. "I borrowed my four-year-old son's violin and never gave it back. The sound is hauntingly plaintive and voicelike."

Once his initial tracking is complete, he sifts through the tracks, using a subtractive process involving Pro Tools' mute and volume automation to carve out the form of the composition. Most of the tracks on *Archaic* are complete takes that have been shaped in that way, with relatively little editing. "The digital domain allows me to be the composer, the performer, and the conductor. I spend days finessing the balance of automated volume and muting. The layering of a group of instruments can create a sound that cannot be traced to its original sources." On *Archaic* the technology is a tool that enhances, rather than directs, the process.

Smith then subtly applies EQ and compression using Waves Renaissance plug-ins, and adds dimension using the Renaissance Reverb. "I like the sonic ambiguity of a close-miked instrument mixed with the reverb of an orchestra hall," he says. "It's a kind of unstable marriage of intimacy and deep space." Smith monitors his mixes using Mackie HR824s. *Archaic* was mastered by his longtime friend Greg Reierson at Rare Form Mastering.

One great strength of a DAW is ease of use, which gives musicians such as Smith direct access to high-powered creative tools. "I always tell people how lucky I feel to be around right when all this complex digital gear has become available to the home-studio composer." EM

For more information, visit www.innova.mu/artist1.asp?skuID=226.

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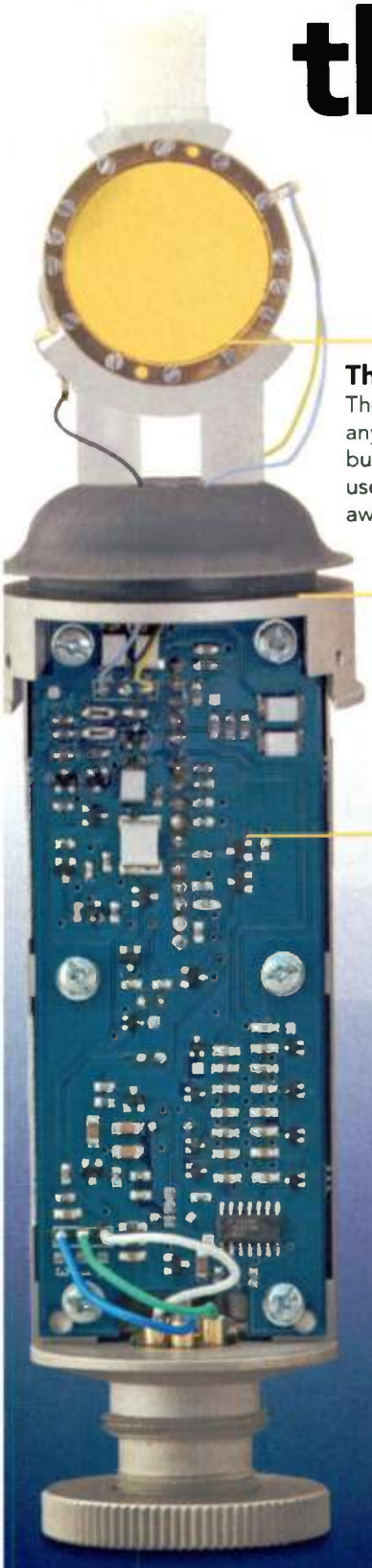

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Acting on Impulse

By Alex Kemmler

The nuts and bolts of recording impulse responses.

Convolution reverb is rapidly gaining popularity as a powerful sonic tool. Though there is a lot of information describing the theory (see the excellent article "Convolution Number Nine" in the June 1999 issue of EM and "Trading Spaces" in the October 2004 issue, available online at www.emusician.com), not much has been written about how to record the impulse responses used by convolution reverbs. As a result, many people do not take advantage of convolution's full potential.

In this article, I will provide a condensed overview of how convolution works and focus on the steps needed to make recordings suitable for use with convolution reverbs. Convolution software offers huge potential for sonic manipulation, and as you will see, even those on a small budget can blaze new trails into sonic territory using convolution and their own recordings.

React and Respond

Convolution software uses an impulse response and a dry signal as input. An impulse response (IR) is what results when you feed an impulse to some system (see the sidebar "Impulse Response Glossary" for a list of terms commonly associated with convolution). It is the sonic signature of a microphone, loudspeaker, filter, concert hall, or anything else a sound might pass through. An impulse, or "spike," is typically an extremely short transient that contains all frequencies, like white noise. In the digital realm, this is approximated as a one-sample-long click at full amplitude. The reverberation that an impulse produces in any acoustic environment is that environment's impulse response.

Convolution, in practice, is the process of multiplying two audio signals in the frequency domain. This involves sending two audio samples through fast Fourier transform (FFT) algorithms, multiplying their spectra, running the product through an inverse FFT (IFFT), and playing back the results. (See "Square One: Look Through Any Window" in the July 2004 issue for more on FFT.) Of course, the phrase "multiplying two audio signals in the frequency domain" doesn't convey the sound of convolution. The results of convolving sounds are completely dependent on the sources, more so than with most effects. The best way to get a sense of what convolution is like is to listen to an example (see **Web Clip 1**). Imagine convolving a drum loop with a short, breathy flute sound. The result sounds a bit like someone playing a staccato rhythm on a flute (see **Web Clip 2**).

Why So Impulsive?

IR-based reverb is exciting because it sidesteps the central problem in designing reverb units. The true test of a reverb algorithm has always been whether it can convincingly produce the warm sound of a good, spacious concert hall. With IR-based reverb, the sound of the fabled "great concert hall" is captured, and then a plug-in convolves dry audio material with the hall's IR. That results in the dry material sounding as if it were recorded in the concert hall. Convolution plug-ins are commonly billed as being able to place your sounds in a "real acoustic environment." It's a hefty claim, but the sound they can provide often measures up.

If you'd like to test the claim for yourself, there are many convolution reverbs on the market, including both software and hardware units (see the sidebar "Manufacturers" for a list of companies mentioned in this article). A perennial favorite of the budget-minded user is Christian Knufinke's free SIR Impulse Response Processor, available in Windows-only VST format (see **Fig. 1**). On the Mac, Tom Erbe's free Soundhack has long been touted for its convolution capabilities. There are also commercial convolution plug-ins with prices ranging from $12.95 to $800, and corresponding feature sets. It's up to you to decide what software is most appropriate, but for the remainder of this article, I'll assume that you're working with only common, basic features. As with many other types of audio gear, the sounds themselves matter most. Starting with good material will always give better results, regardless of equipment.

FIG. 1: Christian Knufinke's free SIR Impulse Response Processor runs as a VST effects plug-in and can use any WAV file as an impulse response. You can alter the IR in a variety of ways before it is applied to an audio file.

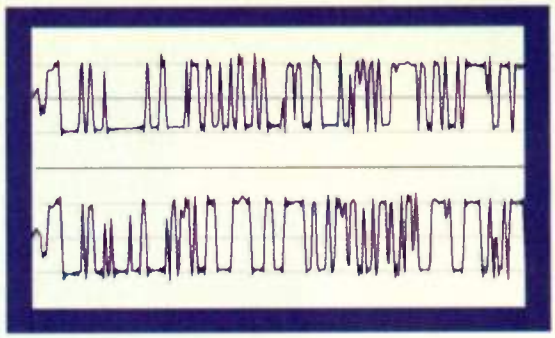

FIG. 2: A loud impulse, such as a gunshot, can overload a condenser mic and clip, as shown here.

"Good" material, however, is not always easy to come by. If you need your guitar to sound like it was recorded in a World War II–era submarine ballast tank, you have limited options. If you're going to use convolution reverb to get the sound, you'll need an IR sample from a ballast tank. The Internet is a good place to start, but often you'll be left cold by low-quality IRs or a lack of anything appropriate. This leaves the would-be guitarist/submariner with the task of recording his or her own IR. Easier said than done, you say? Yes, but luckily not by much.

Truth Is More Practical Than Fiction

Impulse responses are surprisingly simple to record, but attention to detail is critical. There are two general methods of going about it. One uses an explosive sound ("spiking") and the other a frequency-swept sine wave ("sweeping"). Although you can record the impulse response of nearly anything, the assumption is that the IR is reverberant in nature.

A few principles apply to both methods. First, the signal-to-noise level is more important than usual. Minimizing noise is always key, but ambient noise is particularly troublesome when recording IRs. The nature of convolution causes anything that shares frequencies with the input to be emphasized, including background noise. Air-conditioning, heating, road noise, machinery, and wind are things to listen for carefully. Even when using high-quality equipment, unwanted background noise might easily drown out the quiet tail of the reverberation.

When setting up for recording, take a few minutes to listen for any ambient noise in the space and take all feasible steps to reduce it. If the ventilation can be shut off, do it. Noisy appliances? Unplug them. A blanket draped over a loud air vent might work wonders on the noise floor. Similar steps could improve any recording, but especially an IR, since what you're recording is the space itself. You can't take a church hall and put it in a sound isolation booth, so do as much preparation as you can on-site.

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The Sound of Silence

Keep in mind that the recording will be used to process your sound later, and any quirk introduced at the recording stage will resurface noticeably during convolution. You're not just taking the impulse response of the room; you're taking the impulse response of the room, the microphones, the cables, the portable recorder, and everything in between. Because every aspect of the recording affects the results, many IR recordists use equipment that is as flat, transparent, and neutral as possible. Though coloration in other types of recording is often desirable, it's common to avoid this when recording an IR. The goal is to capture the space as accurately and neutrally as possible. Not only the quality but also the arrangement of the equipment will come through, so take care with placement as well.

Documenting your setup is another practice that becomes highly important when recording impulse responses. You'll be using the same setup every time you use the IR, so it's a good idea to keep track of what that setup is. Many experienced IR recordists take numerous digital photos while working, especially of the relative positions of microphones, the room itself, and the sound source. Others keep a voice log on tape with the IRs themselves. When it comes time to organize things, documentation is a bit of extra work that you'll be glad you did.

It's also a good idea to record some reference material in the site you're working in. That way, you can take the recorded reference material, convolve a dry version with the IR, and see how well it matches up. Then you can tweak the convolution parameters to get the most realistic effects from your IR.

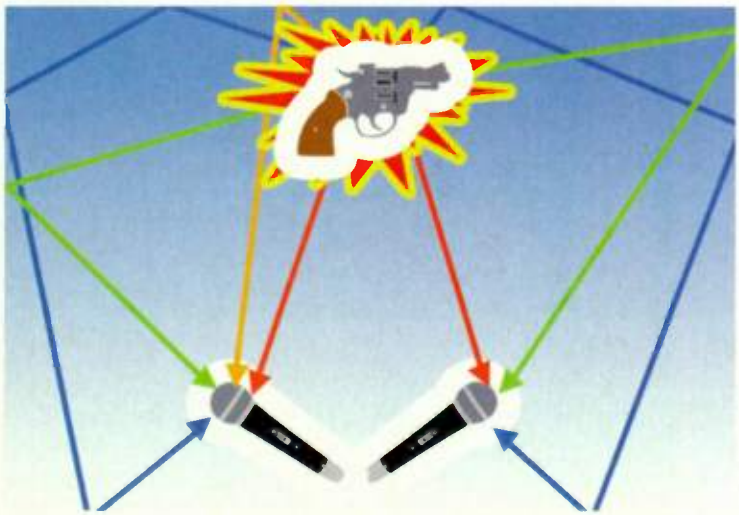

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FIG. 3: Sound travels in a random path within a space, reflecting off walls on its way to the mics. As a result, the sound arrives at slightly different times at each mic. A near-coincident configuration is best suited to capturing this effect and helps ensure that the recorded sound has a sense of space and directionality.

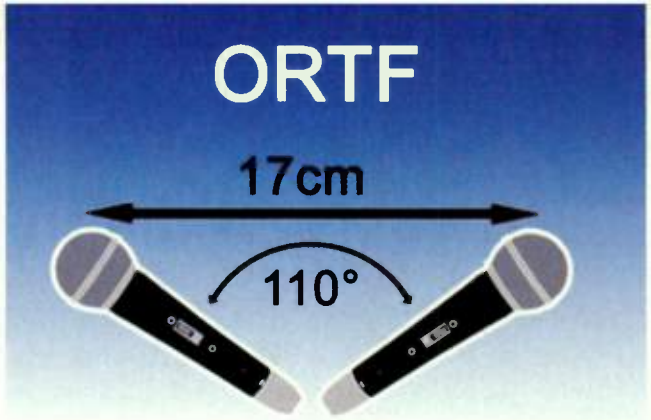

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FIG. 4: The ORTF (Office de Radiodiffusion Télévision Française) setup gives a reasonably wide stereo image, is fairly mono compatible, and generally sounds good over loudspeakers.

Just Shoot Me

Whatever your equipment situation, you need an impulse to record. To capture a true acoustic impulse response, you must excite the room at every audible frequency and record the results. Unfortunately, it's not possible to create a sound containing *every* frequency for use as an impulse, so the next best thing is to use some sort of explosion, which provides a suitable approximation. This has the added advantage of allowing you to capture a wide range of frequencies at the same time. The explosion can be a balloon popping or a starter pistol firing, both of which have broad frequency profiles and are short and loud.

Other advantages of this method are that it's very simple to execute and it requires minimal equipment and preparation. Starter pistols and balloons are cheap, easy to come by, and simple to operate. Also, once the recording is done and the sounds are individually edited, the IRs are ready to drop into a convolver and use.

The disadvantages here are numerous, however. The main technical problem is that any approximation of a "true" impulse (that is, one that spans all frequencies) is bound to be imperfect. Starter pistols and, to a lesser extent, balloons are decent approximations, but they do have their own frequency characteristics that deviate significantly from pure white noise. This in turn will color any material processed with an IR created this way. Low frequencies in particular are often lacking. There are also differences among pistols: a .22 caliber pistol is cheaper but produces much less bass than a .38 caliber. In my experience, many of the cheapest starter pistols are unreliable and can jam or break during use, so remember that you get what you pay for.

Aside from their frequency coloration, balloons are not as suitable for larger spaces because they're simply not loud enough to fully excite the room. When they can be used, problems with consistency arise. A balloon bursting can't be repeated exactly. Even if you could inflate each to the same pressure, significant variations in the balloons themselves would introduce inconsistencies. For example,

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the amplitude and frequency profiles will vary noticeably. Similar inconsistencies also affect starter pistol blanks.

When using a starter pistol, several nonacoustical problems arise. For instance, there are bans on gun replicas in many areas. If starter pistols are illegal, contact the police and try to get dispensation to use the gun, or switch to another method. Even if starter pistols aren't verboten, notifying the police about your plans beforehand will prevent their having to respond to a neighbor's report of gunfire. If starter pistols are permitted, the sound and sight of a gun may still alarm bystanders if you happen to be recording outdoors. Permission is obviously needed anytime you're shooting a starter pistol indoors, and this may be hard to come by at churches, opera houses, or auditoriums. Also, even though starter pistols can't fire bullets, any explosive device carries some physical risk. Eye protection is always recommended. All things considered, the supposed ease and convenience of using a starter pistol seems to evaporate.

Pop Music

However, despite the problems with the explosive methods, using balloons or starter pistols is a lot cheaper and easier than using a sine-sweep rig, and with care and diligence they can give decent results. First, consider where you'll be recording. The location will determine whether you use a gun or a balloon, whether you use dynamic or condenser mics, and where you place the mics.

From here on, I'll assume that the recording will be done in stereo. (For a good overview of stereo recording, see "Double Your Pleasure" in the June 2000 issue.) It is possible to create mono IR recordings, but monophonic reverb is significantly less realistic than stereo. Once preliminary preparations are squared away, the first choice to make is what microphone to use. (This will apply when using the sweep method as well.)

Generally, condenser mics are more appropriate for capturing IRs. Their higher sensitivities are particularly suited to picking up the details in a reverb tail. Although most mic techniques in IR recording apply to both spike and sweep methods, condenser mics are easily overloaded by the high SPL of a gun going off nearby (see **Fig. 2** and **Web Clip 3**). This introduces distortion at the microphone stage, regardless of gain settings. If that occurs, you can move farther away, or try switching to dynamic mics, which can better handle extreme transients. As a rule of thumb, make sure the gun is at least 50 feet away when using condensers.

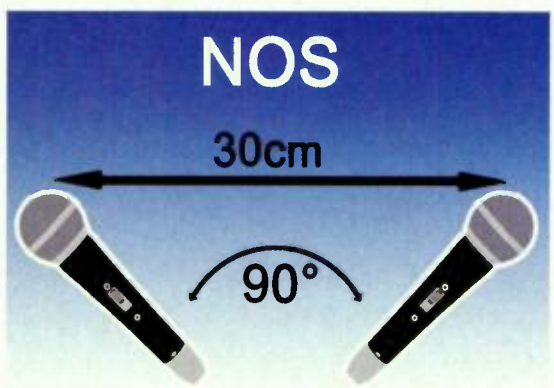

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FIG. 5: The NOS (Nederlandse Omroep Stichting) standard is qualitatively similar to ORTF. When recording impulse responses, choosing the right setup will depend on the room's characteristics and how you want the IR to sound.

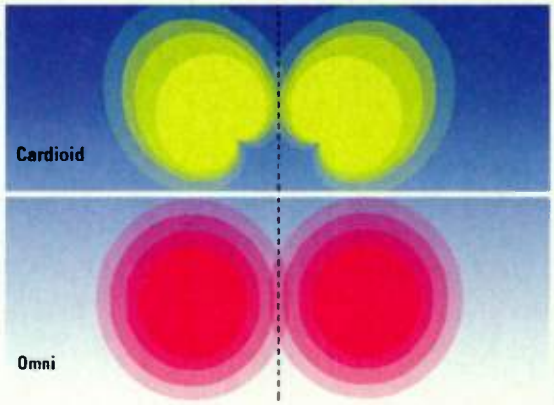

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FIG. 6: When using two omni mics, more sound from the area between and behind the mics is captured. Cardioids, aside from rejecting sound behind and to the sides, also tend to color the off-axis sound that they pick up, giving the neutrality advantage to omnis as well.

There are other special considerations when using a gun. While setting levels, it's important to remember that the gun will produce a very loud, fast transient. The peak should have quite a bit of headroom to avoid clipping. But be careful: due to the extremely fast decay of the gunshot, level meters might not give an accurate reading of the peak level. If that is the case, you'll need to set the gain even lower than the meters indicate. The best way to make sure you have enough headroom is to listen closely to a test recording. In smaller spaces, you may need to use dynamic mics or switch methods if clipping can't be avoided.

Once you've gotten past the pitfalls of distortion, decide what effect you want from the IR. Microphone placement will affect the output when the IR is used, as if the processed material were recorded with that setup. Unless you're looking for a special effect, the mic technique you use will probably be similar to standard distant stereo-recording techniques. With explosive techniques, it is nearly impossible to record much direct signal because of the extreme SPL. However, the goal is to capture reverb, not direct signal, which can be added later at the convolution stage.

Start by thinking about how you might mic an instrument in the room. A practical way to find good spots to set up might look a little silly but is worthwhile.

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Slowly move around the room, loudly clapping your hands each time you change position. Listen carefully to the reflected sound after each clap. This will help in finding a "sweet spot" that has the sound you're looking for. To get a more accurate picture of what the mics will pick up when you're spiking the room from a distance, have a friend stand still and clap while you move around. When using the sweep method, you can play dry recordings over a loudspeaker to get similar information.

When setting up microphones in a smaller room, there aren't many options. Depending on the available space, you might be limited to coincident or near-coincident pairs. Coincident pairs are great in small spaces, but unless you intend to mix to mono, another technique may give more realistic results. Because stereo width is an important perceptual element of reverb realism, XY setups aren't ideal.

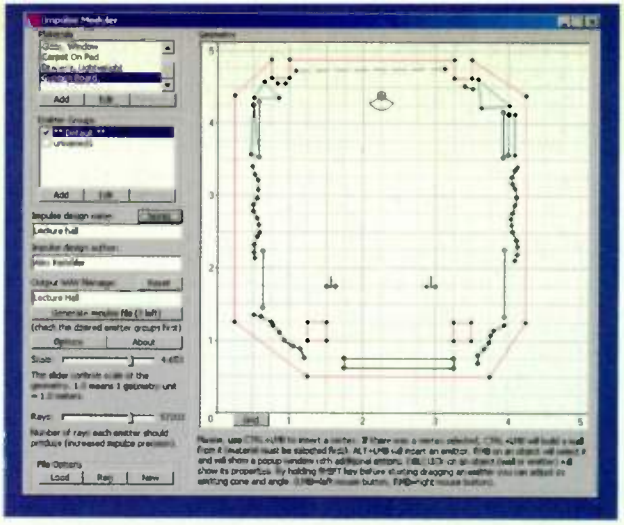

FIG. 7: Voxengo Impulse Modeler allows you to simulate the sound of an imaginary room. The results can range from boring to surprisingly full of character, and they are fairly realistic.

Near-coincident pairs are often better suited than coincident for recording reverb because they allow reproduction of some stereo time delay. One reason for this is that differences in early reflection time help establish perceptual space and directionality (see Fig. 3). There are standardized near-coincident configurations that have proven both popular and effective over the years, notably the ORTF and NOS standards (see Figs. 4 and 5).

A variation involves turning the mics away from the source, normally toward a rear wall. Using a rear-facing setup is a matter of taste and will increase the amount of indirect sound in the recording. Because IR recording is mainly about capturing indirect sound, this technique is fairly popular. Additionally, it may help when using condensers, since the blast of sound from a pistol will be attenuated somewhat before reaching the capsule. If you have the time, try multiple setups. Place the mics closer to the walls, farther apart, and angle them up or down; always remember that if it sounds good, it is good. Any clean IR recording has the potential to become an interesting effect later on, even if it wasn't recorded using standard techniques.

IMPULSE RESPONSE GLOSSARY

Here are some common terms that you will encounter in the world of IR:

convolution: a mathematical process that when applied to audio involves a simple multiplication of two signals in the frequency domain.

convolution reverb: a type of plug-in that uses convolution and impulse responses of various spaces to simulate the reverb those spaces produce.

deconvolution: when the impulse response is known, a signal convolved with that impulse response can be extracted by deconvolution. In practice, this is used to extract impulse responses from sine-sweep recordings.

dynamic convolution: a technique that attempts to simulate nonlinear systems by taking multiple impulse responses at different amplitudes to capture the nonlinearity.

impulse: also known as a Dirac function, an impulse is an audio signal that has a duration approaching zero and an amplitude approaching infinity.

impulse response: the output of a system when the input is an impulse.

spike: another common name for an impulse.

The Big Show

Capturing IRs in a larger room like a concert hall or church isn't fundamentally different from the process previously described. There is more flexibility, however, in mic choice and placement. Generally, the mics are placed in a spaced configuration. Rather than centimeters apart, you may separate the microphones by several meters. Again, you'll want to consider the standard stereo setups as starting points. To decide how to place the mics, consider how you'd like the ambience track to sound if you were recording an instrument in place of the gun or loudspeaker. Focused or very wide stereo? Direct or indirect sound? How distant should the sound be?

With a sound in mind, you can go about creating it. Most IR recording is done with either omni or cardioid pickup patterns. Cardioids are great for creating a sound with more pronounced difference across the stereo field. Even in closely spaced setups, the overlap between the pickup patterns is small. This makes cardioids better for setups in which the mics are angled to either side of the source. As a general rule, a wider angle results in a wider stereo field and wetter sound.

Because they pick up sound in all directions and generally have a more neutral frequency response, omnis are particularly suited for IR recording, especially in larger spaces. It's often necessary to separate omnis more than other mics. A setup with the mics on either side of a stage would be appropriate.

An advantage to using omni mics is that they won't leave as much of a hole in the middle of the stereo field

(see **Fig. 6**). Omni mics are great for capturing ambience and diffuse sound, especially with a wide spacing. With closer spacing they still provide an open sound but may lack stereo separation.

In a large venue, take time to experiment. Even if you've just recorded a great-sounding IR, others are worth capturing: there can be many ways to place mics in a large space and get varied but equally pleasant recordings. Some recordists take this idea very seriously, capturing dozens of spots, from the front row to the upper balconies.

Sweep Me off My Feet

The sweep method of recording IRs is somewhat more complex, but it usually yields better results and, luckily, carries a very low risk of getting you arrested. Rather than generating every frequency at once, you play a long sine tone that sweeps (normally) from 20 Hz to 20 kHz in the space and record it (see **Web Clip 4**). The recording and the tone are then deconvolved, which is essentially the reverse process of convolution. Software utilities for deconvolution, such as Voxengo's free Deconvolver (Win), can also generate the sine sweeps for you. The end result is an IR that is cleaner and more balanced than one created using the explosive method.

There are issues with the sine-sweep method, aside from the additional expense, but careful preparation can provide solutions. For example, many speakers are not particularly flat throughout their frequency range. If you know the frequency response of the speaker you are using to play the sweep tone, you can use an EQ to flatten it. Frequency plots are often available online from the manufacturer. Although they might not give you the exact plot for your specific unit, they should serve as a rough guide. The same logic applies to microphones. Careful equalization may greatly improve your IR recordings.

Another problem is directionality. Many instruments project sound in a 3-D pattern, and a starter pistol or balloon projects sound omnidirectionally. A loudspeaker, on the other hand, mostly projects sound forward. Generally, the speaker (normally only one speaker is used at a time) should face forward, out into the hall, from center stage. Some convolution software, such as Audio Ease Altiverb (Mac), supports a "true-stereo" format, which involves making two stereo recordings per IR, with the speaker first placed to the left and then to the right, symmetrically. In this technique both speakers are placed at the edges of the virtual soundstage. Vertically, the microphones should be placed at the height of the tweeter. The speaker

should also be placed above the stage or floor in order to avoid any odd resonances, and away from any walls. The same goes for mics.

Once these two problems are dealt with, recording a sweep is very much like the techniques described earlier. Aside from microphones, though, there are a few technical considerations. Make sure you record according to the specifications of the deconvolution software you intend to use. It may be tricky to edit the recordings, so read the manual beforehand. When deconvolving, the result will be cleaner and less noisy when the recorded sweep is longer. A totally silent room might need a sweep of less than 10 seconds, whereas an IR recorded with road noise in the background might be very noisy unless the sweep is hundreds of seconds or longer. The signal-to-noise ratio tends to improve with sweep length: a longer sweep means more signal, and more signal means a better noise ratio.

In addition, silence needs to be recorded after the sweep to accommodate the reverb's full decay time. Most software programs require a period of silence after the tone that is equal to several times the decay time.

Also be aware that deconvolution has the potential to cause serious distortion. If the dry and wet sweeps are not trimmed and aligned properly during the deconvolution process, the resulting impulse may be smeared in time or frequency or may have an incorrect length. After all is said and done, however, the sweep method should provide an eminently usable, high-quality IR.

Think Inside the Box

IR recording is not limited to churches and concert halls. Real is nice, but what about great fake reverb? Many musicians have applied IR techniques to studio gear to capture classic sounds from pricey hardware units. This technique is the simplest yet. Feed a sine sweep directly to the device you're capturing, record the output, and deconvolve it. Everything from a pristine Lexicon unit to a toy tape recorder is fair game (see **Web Clip 5**).

This article focuses on stereo, but a lot of IR recording is done for multichannel systems. Recording a multichannel IR is conceptually similar to recording in stereo but obviously requires more equipment and expertise.

Take care once your IRs are recorded. Always keep samples at the highest bit depth and sampling rate possible and avoid unnec-

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essary sampling-rate conversions. It is crucial to preserve a low noise floor when working with an IR. If you can't record directly to a computer, be extra careful to minimize noise during the transfer process.

Before you start running every track through a convolver, consider a few of the limitations you may face. All software convolvers introduce some latency in the signal chain, due to the nature of the algorithm. That is usually on the order of a few thousand samples or several milliseconds. The host application can compensate for this, or you might try a plug-in like Sampleslide (Win) from AnalogX. Also, most convolution plug-ins are static, meaning that the convolution doesn't change based on input. A WAV file of an IR won't change over time, so neither will the effect it produces. This means, for example, a chorus or flange effect would not be properly reproduced by an impulse response, because it depends on constantly changing delay effects. Dynamic convolution does exist, but it lies outside the scope of this article.

Don't Keep It Real

Despite the caveats given in this article, recording an IR is often simpler than recording music. If properly recorded, any IR could potentially add that certain something to an otherwise bland track. Even if you don't have recording gear, remember that IRs are samples that can be edited and synthesized like any other. You can apply effects, including crossfading, reversing, and time-stretching, to IRs you might find online, often with excellent results. Experiment and you may discover something wild and fr esh.

Also consider looking into software that simulates acoustics to create an IR of an arbitrary virtual space, such as Voxengo Impulse Modeler (Win) or Spectra Ramsete (Win) (see **Fig. 7** and **Web Clips 6** and **7**). This type of program lets you create spaces that otherwise might never exist and would be a good starting point for the landlocked guitarist who needs his or her ballast tank.

Whatever you do with your IRs and however you record them, they will be a valuable addition to your effects library. When you set out to record, though, make sure to plan properly and proceed carefully. Finding a location, getting permission, and making test recordings can be tedious, but a project undertaken without careful preparation is bound to be flawed. A good set of IRs is worth its weight in gold, and anyone can strike it rich. EM

EM WEB CLIPS

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Analog Renaissance

By Gino Robair

Although analog modular synthesizers are considered boutique items, often with prices to prove it, their influence on popular music belies their niche status. Check out the gear lists of many of the top creators of synth-based music—Trent Reznor of Nine Inch Nails, Johnny Greenwood of Radiohead, and John McEntire of Tortoise and the Sea and Cake, to name three of my favorites—and you'll see patchable instruments by Analogue Systems, Blacet, Doepfer, Metasonix, Synthesis Technology MOTM, and Wiard, among others.

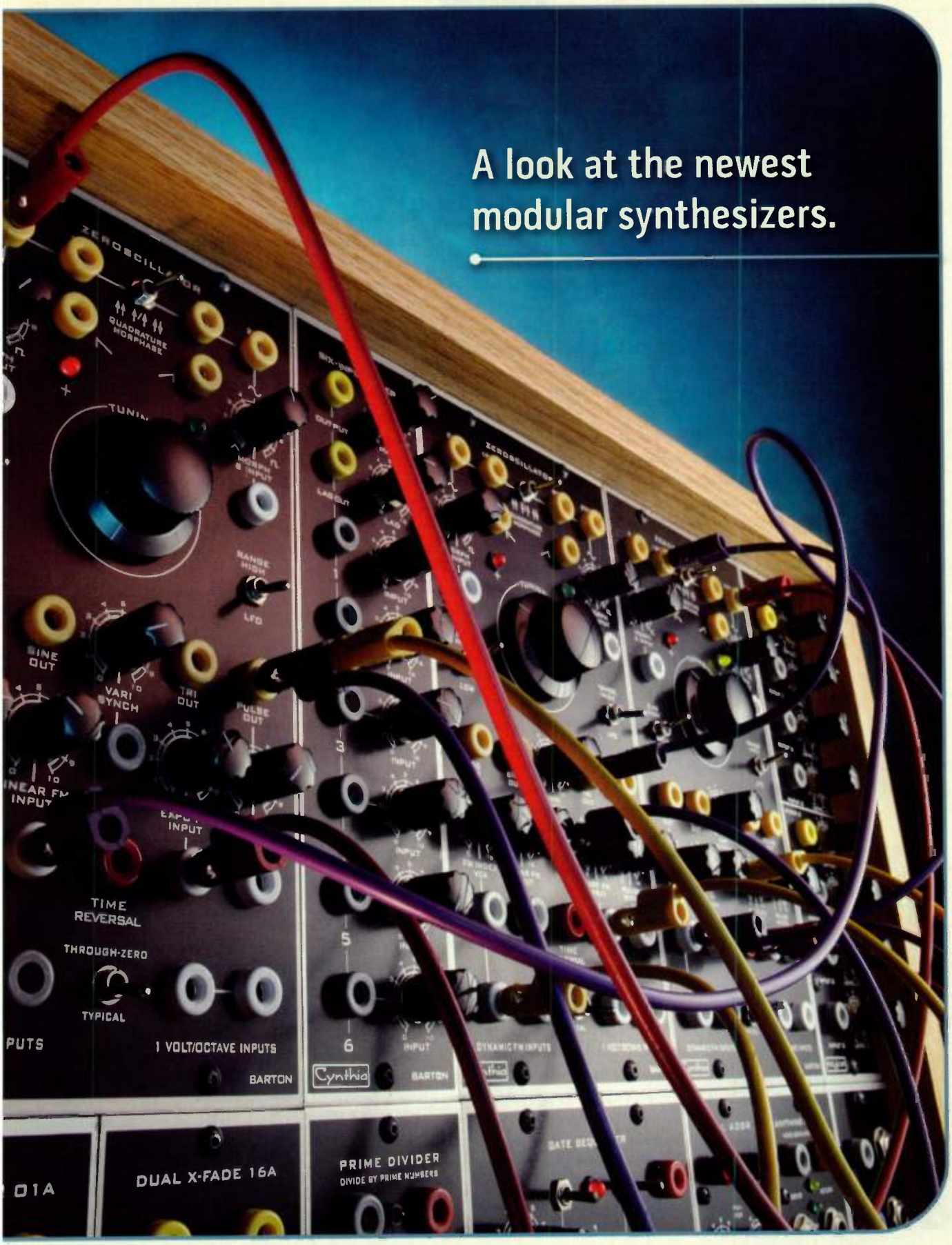
In this article, I will survey 11 product lines of analog modules that have appeared since 2001. The first section ("The New Players") focuses on the products of new companies, while the second ("New Formats") looks at new lines of products created by older companies. (The article "Something Old, Something New" in the April 2001 issue, available at www.emusician.com, covered 20 companies making analog synths.) Although a module or two covered here may contain digital circuitry, the majority of the modules are completely analog based.

Back to the Future

Unlike the first generation of companies in the '60s and '70s, many of today's modular designers create products that support other product lines. For example, Plan B and Livewire modules fit the Doepfer Euro-rack, and both companies have designs that complement rather than duplicate the functionality of the Doepfer product line. Sure, nearly every company has a filter or two in its catalog, but a synthesizer can never have too many filters. However, it's more exciting when a designer comes up with an entirely new concept for a module, and there are plenty of those in this roundup.

Throughout the article, I will refer to products that support the Synthesis Technology form factor—5U panel height, power supply, and use of ¼-inch jacks—as *MOTM-style* modules. Similarly, I will use the term *FracRak* for modules that fit into the racks and use the power supplies sold by Blacet and PAiA, and the term *Euro-rack* to signify modules that fit into Doepfer cases and use the same power connector.

It's likely that the Euro-rack modules in the roundup will also fit into racks from Analogue Solutions and Analogue Systems. However, the power connector that attaches the module to the power bus, as well as the positions of the screw holes, may differ slightly between


A look at the newest modular synthesizers.
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VARI SYNCH
TRI OUT
PULSE OUT
LINEAR FM INPUT
TIME REVERSAL
THROUGH-ZERO
TYPICAL
1 VOLT/OCTAVE INPUTS
BARTON
Cynthia
PRIME DIVIDER
DIVIDE BY PRIME NUMBERS
DUAL X-FADE 16A

BILL SCHWOB

systems, so be sure to ask the manufacturer or distributor about these compatibility issues before you buy.

The New Players

All of the companies in this section have modules that fit into previously available form factors. This is a boon for musicians who have already invested in one type of system and want to expand beyond the main product line. And the manufacturers benefit by being able to tap into an established user base and concentrate on new designs, rather than investing their energy and funds in basic modules and support products, such as racks and power supplies.

Bananalogue. A recent entry into the modular scene is Bananalogue, which is run by Seth Nemec in collaboration with Ken Stone of CGS and Serge Tcherepnin, the designer of the original Serge modular system. Bananalogue modules use 3.5 mm plugs, not banana cables as the company's name suggests. (The name is a tip of the hat to Stanislaw Lem's *Futurological Congress* as well as a nod to the stackable jacks in the Serge system.) Bananalogue modules can be ordered in either the FracRak or Euro-rack format.

The company's first release is the Serge VCS ($195), which is based on the classic Serge Universal Slope Generator. VCS stands for Voltage Controlled Slopes, which in its most basic form is an envelope generator (EG) with voltage controllable attack and decay times. Although that function is useful enough on its own, it is only part of what the Serge VCS can do.

The Serge VCS has an audio input, a trigger input, two outputs (one of which is AC coupled for use with audio signals), and an exponential CV input (see **Fig. 1**). The knobs are bipolar—a typical Serge feature—and the VC rise and fall pots introduce feedback into the circuit when pulled out, resulting in nonlinear behavior. The Serge VCS has a very sensitive response, and I recommend adjusting the knobs slowly if you want to hear the module's full potential.

FIG. 1: The Bananalogue Serge VCS can be used as an EG, an envelope follower, and an oscillator.

Stone's design adds a few new features to the original Serge module, such as voltage controllable attack and decay times. The End Out jack sends a trigger signal after the envelope cycle is complete, letting you use the Serge VCS as a voltage controllable pulse delay. You can also use the module for portamento effects.

The Serge VCS can be used as an envelope follower with a positive or negative peak, depending on the rise and fall settings. Another new feature is the Cycle switch, which connects End Out to the Trigger input so you can use the module as an LFO.

And as if that wasn't enough, the module can be used as an oscillator with a softened sawtooth waveform. The pitch can be controlled manually with the Rise and Fall knobs or by using the Exp CV input at the bottom of the module. The user manual admits that the oscillator has a reduced range and is less accurate than a dedicated voltage-controlled oscillator (VCO), but I found it to be very useful. Additionally, by feeding the trigger input with an audio rate signal, you can use the VCS as a subharmonic generator.

FIG. 2: Cyndustries' Zeroscillator excels at FM synthesis. It is one of the most expensive modules in this roundup, but its sound and feature set make it well worth the money.

Bananalogue's next release will be the WVX wave multiplier ($255). Designed by Ken Stone, the WVX is an update of the lower sections of the Serge module of the same name; it offers voltage controllable waveshaping and distortion effects with a number of output options. (For more on Stone, see the sidebar "The Man Behind the Curtain.")

Cyndustries. Starting with a few designs by Ken Stone, and complementing the original Modcan line (now called the A-series), Cynthia Webster has created an impressive line of modules that, with one notable exception, are based on the Modcan 5V standard and use banana cables (see the sidebar "Going Bananas"). However, all Cyndustries products can handle 10V signals, and with the Anything Module ($260), your modular synth can accommodate the audio levels of nearly every device in your studio.

Cyndustries modules range from the utilitarian—Quad Bandpass Filter ($250), Triple Resonant Filter ($300), Sawtooth Animator ($375), and Gate Sequencer ($425)—to the esoteric—RanDivide ($300) and Logipac ($251)—to the downright bizarre—VC Tabla and Tanpura ($750) and Cynthia Macintosh, a special-order item that puts an Apple Mac mini, as well as MIDI I/O, into a module.

One of my favorite modules in this roundup is the Zeroscillator ($750). Created in collaboration with designer Mark Barton, it is the first Cyndustries product that is available in more than one format (Modcan

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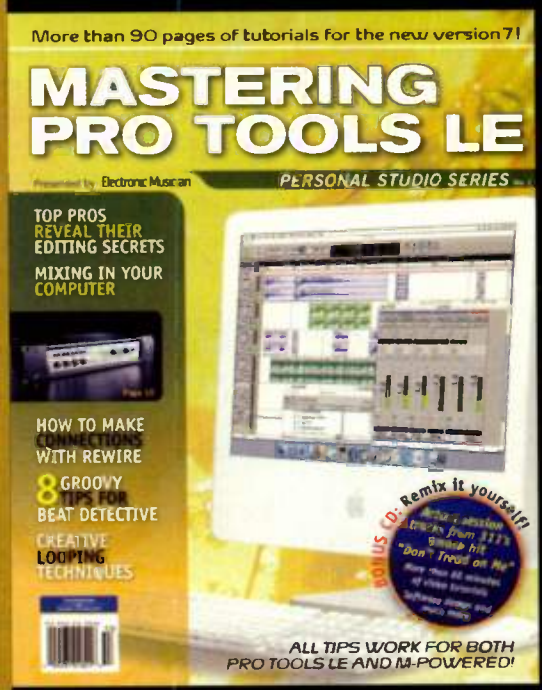

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A-series, FracRak, MOTM, Synthesizers.com, and Eurorack). I will describe the Modcan A-series version, which has the same features as the other form factors. (The one exception is the Euro-rack version, which loses two inputs but maintains virtually all of the module's functionality.)

The Zeroscillator (ZO) has a wide panel in every format, in order to accommodate all the features (see Fig. 2). Behind the faceplate are three large circuit boards attached to the panel-mounted boards. The ZO is well built and feels solid.

The module offers ten bipolar audio outputs (10V peak-to-peak), and the waveform options include Mod (which has an accompanying CV input), sine, triangle, pulse, ramp up, ramp down, and four morphable quadrature outputs. The waveforms of the quadrature outputs can be adjusted—either manually or with a CV—to morph from a triangle wave, through a sine wave, to a square wave. In addition, the four outputs are out of phase with each other in 90-degree steps.

The ZO was designed for FM synthesis, so besides a pair of 1V/octave inputs, it includes exponential and linear "through zero" FM inputs and an FM depth modulation input, as well as pulse-width modulation, a Variable Synch input with attenuator, and a Time Reversal jack. This last input adds a secondary sync option that introduces formantlike timbres: it sounds so good that nearly every patch I created with the ZO used this input.

The ZO's through-zero ability gives the module its name. When you attempt to modulate the signal below zero and into negative frequencies, phase artifacts are introduced. The result is an exciting timbral effect that is substantially different compared with typical analog FM capabilities. In fact, the ZO has a switch that selects between Typical and Thru Zero behavior, so you can tone down the effect if you want.

Other switches include Bias, which sets the module's overall response to frequency modulation, and Range, which has High and LFO settings. The large ten-turn master tuning knob has a satisfyingly smooth action.

But what really matters with an oscillator is the sound, and that's where the ZO shines. Forget using a filter: its rich timbre is capable of exceptionally tasty sounds on its own. Add frequency modulation, and you can get an FM sound that is reminiscent of classic digital FM instruments. Because of its myriad modulation opportunities, the ZO works equally well in a self-generating patch or in more traditional keyboard-based situations.

FIG. 3: In the Livewire Dual Cyclotron, three oscillators interact with each other, sometimes in seemingly mysterious ways.

However, swirly effects and complex bell sounds are only part of the picture. The quadrature outputs can also be used for spatialization when the module is set to LFO. For example, you can use the quadrature outputs to control the levels of four voltage-controlled amplifiers (VCAs) in a 4-channel environment. I experimented with this using an oscilloscope to view the movement of sound in a virtual space, and the results were very exciting.

Cyndustries has also released the Sub Mux Deluxe ($330), a suboctave multiplexer that offers four simultaneous suboctave outputs—from one to four octaves below the input signal. Based on a similar MOTM module by Synthesis Technology's Paul Schreiber, the module includes a stepped voltage output.

A number of exciting new products are also in the works at Cyndustries, including the ScanOpan, an 8-channel high-speed interpolator that can be used for panning, scanning, scrambling, and analog granular effects, and the Sawtooth Animator in the other module form factors.

Livewire. One of three companies under the Electro-Acoustic Research (EAR) banner, Livewire's products are well built and lots of fun to use. Designer Mike Brown's electronic-music aesthetic is definitely old-school, harking back to the days when composers used lab equipment to make music.

Livewire's first two modules—the Dual Cyclotron ($275) and the FrequenSteiner ($225)—share a vintage look but couldn't be more different from each other in operation. The simpler of the two in terms of feature set is the FrequenSteiner filter, a reproduction of Nyle Steiner's filter in the Steiner-Parker Synthasystem modular. Like the original, the FrequenSteiner lets you switch between lowpass, bandpass, and highpass modes and gives you knobs for cutoff frequency and resonance.

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Some people just don't get it.

Although the original module had three unattenuated audio inputs, the FrequenSteiner has one attenuated input. In addition, it has two VC inputs with trim pots, whereas the original had a trim pot on only one of the two VC inputs.

The FrequenSteiner is a colorful filter that has a buzzy, growling pungency reminiscent of its namesake. It's the perfect antidote to vanilla filter sounds, and it nicely complements the Buchla-like woodiness of its EAR-related cousin, the Plan B Model 13 Dual Timbral Gate.

The Dual Cyclotron, on the other hand, is a complex voltage generator with three oscillators that interact with each other in unconventional—and occasionally counterintuitive—ways (see **Fig. 3**). The obscure parameter names certainly don't help much: their functionality is intentionally oblique, forcing you to think about what you are hearing rather than relying on old patching habits. That's a good thing.

The upper section has two identical oscillators—the "cyclotrons"—with Cycle Frequency and Symmetry (waveshape) controls, and switches for speed (Stretched, Normal, Compressed) and waveform (linear or "discrete"—triangle and square). In the center are knobs for Axis Tilt, which controls the balance between the two oscillators, and Intensity, which acts as a modulation depth control.

The master oscillator, which morphs between triangle and square waves using the Shape Shifter knob, includes a rate control and a high/low frequency switch. The bipolar Symmetry pot changes the horizontal symmetry of the waveform from the 12 o'clock position: turning the knob clockwise gives you a square wave with a positive shape and a sawtooth wave with an ascending ramp; turn the knob counterclockwise, and you get a negative pulse wave and a descending ramp for the sawtooth wave.

The Control switch allows the master oscillator to be controlled manually, externally, or by the cyclotron oscillators. When the Control switch is set to External, a signal going into the External CV jack affects the master oscillator's behavior, and it can be difficult to predict the results as you change the Initial Rate and Symmetry settings. As these knobs approach their extreme ranges, things change in a surprising way.

The Dual Cyclotron has two outputs, which provide a mixture of all three circuits. The main output favors the master oscillator, with the cyclotrons acting as modulators. The auxiliary out seems to reverse that algorithm. The Shape Shifter knob controls the waveform shape for the main oscillator output, and the Focus control is a slew limiter that smooths the waveform.

The Dual Cyclotron is another one of my favorite modules. Although its seemingly bizarre behavior may not be for everyone, its modulation potential is nearly unmatched by the other modules in this roundup, and I highly recommend it to Euro-rack owners.

Upcoming Livewire modules include the Sub Divider, which is based on a Nyle Steiner frequency divider, and the Chaos Computer series modules. The main section of these latter modules, the Core Chaos Engine (CCE), has dual 32-bit shift registers with programmable feedback paths and cross-modulation capabilities that are set using 16 3-position probability switches. Eight random stepped-voltage outputs are available, each with a different probability weighting. The result is like a set of complex, yet mathematically related, sample-and-hold sequences. An eight-by-eight LED matrix displays the module's behavior and is fun to watch.

Three expansion modules support the CCE. The Random Gates module gives you 16 additional quasi-randomized gate signals based on the CCE's settings. The Exponential Curve Calculator provides individual

MODULAR SYSTEM OVERVIEW

COMPANY	FORM FACTOR	CABLE TYPE
Bananalogue	Euro-rack, FracRak	3.5 mm
Cwejman	Euro-rack	3.5 mm
Cyndustries	Modcan A-series	banana
Livewire	Euro-rack	3.5 mm
Magic Smoke Electronics	Euro-rack, FracRak	3.5 mm
Metalbox	FracRak	3.5 mm
Modcan	MOTM	¼"
Oakley Sound Systems	MOTM, Euro-rack	¼", 3.5 mm
Plan B	Euro-rack	3.5 mm
Synthesis Technology MOTM	FracRak	3.5 mm
Wiard	FracRak	3.5 mm

FIG. 4: The Plan B Model 15 Complex VCO is a beefy-sounding oscillator that gives you voltage control over the waveshape at the Morph output.

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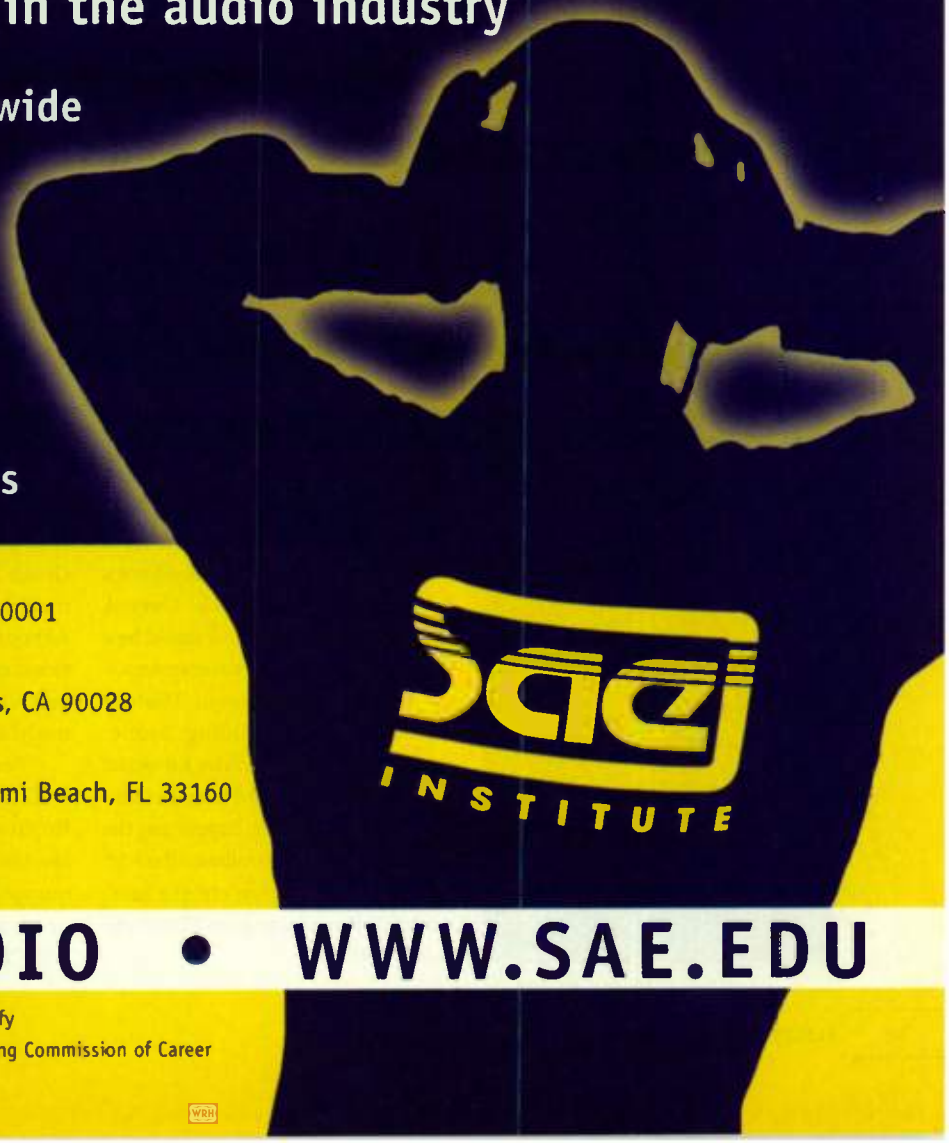

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slew rate control of the CCE's eight outputs, as well as three random fluctuating voltages. The Analogue Computation module offers a set of related CV outputs based on various mathematical functions. The combination should offer new levels of complexity for synthesists interested in creating evolving, organic patches.

Magic Smoke Electronics. Manufacturing designs by the influential DIY-synth advocate Thomas Henry, Magic Smoke Electronics has entered the modular market with the TH-201 Mankato lowpass filter. The module features inputs that can be configured as AC coupled for audio use or DC coupled so you can use the module to add slew to CVs for portamento effects.

The TH-201 is available as a 2-in/4-out model—the TH-201/4 ($250)—and a 4-in/8-out model—the TH-201/8 ($330). Initially the TH-201 voltage-controlled filter (VCF) will be available as a kit, in both Euro-rack and FracRak versions. PCBs of each module ($22 or $35) are also available for the more adventurous builder.

With a resonant frequency range of roughly 0.1 Hz to 23 kHz, the TH-201 can be used as an LFO and oscillator. According to the company, lowering the frequency range further is simply a matter of replacing the timing capacitors, and details will be included with the kit.

The TH-201/4 has pairs of 12 and 24 dB outputs, two of which are inverted. The phase difference between each output is 90 degrees, allowing you to use the module as a quadrature sine wave VCO when set into resonance.

The TH-201/8 has 6, 12, 18, and 24 dB outputs, with inverted versions of each. When in resonance, the phase difference between the eight outputs is 45 degrees, giving you an "octature" oscillator when the module is in full resonance.

FIG. 5: The Cwejman MMF-1 multimode filter offers three dual bandpass modes, each of which gives you two sine tones when the filter goes into resonance.

As a lowpass filter, the TH-201 has a deep and beefy sound that is very musical. When resonating, the module makes an exceptional LFO because of how slow it can go. It's also refreshing to have the entire frequency range available from a single control (most modules have a high/low frequency switch). Overall, the TH-201 is handy and would be a nice addition to nearly any system.

Metalbox. Although Michael Ford has been building Stone-designed modules to order for years, he only recently decided to make them more readily available. Supporting the FracRak format, Metalbox offers 15 modules that complement the functionality of modules from Blacet and Wiard very well.

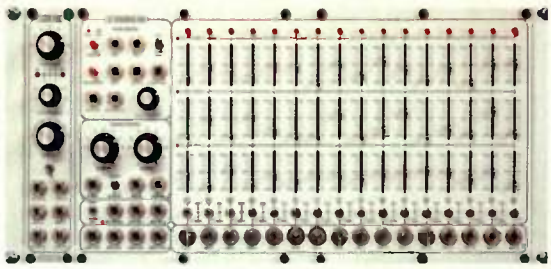

FIG. 6: The Modcan VC Sequencer 54B (shown here with the Clock 53B module) gives you three rows of 16 steps that can be summed to create a 48-note sequence.

His voltage sources and processors offer a wide range of features. The Sequential Switch ($400) is an 8-step sequencer switch with eight Gate outputs, eight Stage inputs with attenuators, and Clock, Inhibit, Reset, and Direction inputs. The module can be clocked with audio rate signals as well. Other modules in this category include the 3-stage Analog Shift Register ($125), the Gated Comparator ($225), and the Pulse Divider/Logic module ($250).

A standout in the line is the versatile Wave Multiplier ($300), a voltage controllable 2-in/2-out waveshaper that includes the independent Grind circuit and Lockhart Folder circuit. However, one of my favorite Metalbox modules is the Psycho LFO, which gives you a pseudorandomized voltage that you can rein in with the Rate, Range, and Glide controls. Its unpredictability is perfect for subtle timbre animation, and it is available in three speeds.

The Burst Generator ($225) can be used as an audio or triggering source. You can select the number of pulses (one to nine), the length of the pulses, and the internal clock speed. The module also accepts an external clocking signal.

Other Metalbox audio generators include the Dual Chime ($145), the Dual Drum ($125), the 8008 Bass Drum ($150), and the Cynare ($400), a full percussion synthesizer named after the famous '70s-era analog drum synth.

Plan B. After years of being one of the go-to guys for synth module customization and repair, Peter Grenader went public by launching Plan B and cofounding the EAR Group. Inspired by Buchla and Serge modulars, Grenader's modules have multifunctional, feature-rich designs. Although they can easily be incorporated into a more traditional melodic synth, Plan B modules are perfect for experimental work, and their features nicely complement the modules by other companies in the Euro-rack form factor.

The first module released, the Model 15 Complex VCO ($289), is a triangle-core oscillator with outputs for five different waveforms: sine, triangle, ramp-up sawtooth, square, and Morph (see Fig. 4). The Morph output lets you pan from a sine wave to either a triangle or square wave—the secondary waveform is selected with a switch. The morph circuit involves a Vactrol,

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so it can be modulated only into lower audio rates.

The Model 15 has a 1V/octave input with master tuning and fine-pitch controls, two linear VC inputs with bipolar controls, an exponential FM voltage input with level control, a sync input, and a pulse-width modulation input with bipolar control. The oscillator has a range of roughly 1 Hz to 20 kHz, so it can be put to use as a pseudo-LFO or a heterodyning modulator.

Overall, the Model 15 has a rich timbre thanks to its discrete core circuit (no ICs are used). Like the Buchla 258 that inspired it, the Plan B VCO sounds great unfiltered, and its wealth of modulation inputs makes it a very colorful module.

Plan B's Model 12 State Variable Vactrol Filter ($225) is a multimode filter that offers simultaneous highpass, bandpass, lowpass, and allpass output. The module has an unusual bandwidth control that allows you to select a mix between a pleasing 1-pole (6 dB/octave) response and a more strident 2-pole (12 dB/octave) response. Besides frequency, resonance, and input level controls, it offers two VC frequency inputs with level controls (one of which is bipolar). Although the filter does not go into self-oscillation when you crank up the resonance, the sound sharpens nicely. In addition, as the input gain approaches its maximum setting, a pleasing and subtle overdrive is introduced into the signal.

FIG. 7: The 1000-series MOTM modules are FracRak-size and accept 3.5 mm plugs.

Based on the Buchla 292 Quad Lopass Gate, the Model 13 Dual Timbral Gate ($225) has two independent circuits that offer voltage controlled gating, lowpass filtering, and a combination of the two effects. The circuit uses a Vactrol, which helps give it its unique, plucked-string quality. The Offset control for each gate allows signal to pass through as it is turned clockwise. Getting the classic, woody Buchla-style sound requires you to set the Offset control so a tiny bit of sound is heard even when the gate and filter are completely shut down. As the filter and gate are quickly opened by an incoming voltage, you get a resonance that is reminiscent of an acoustic instrument. And with the right source material, it can produce a nice growl.

A welcome feature of the Model 13 is the Sum output. It includes a mix control for setting the balance between the two filtered channels.

Inspired by a module in Native Instruments Reaktor, the Model 17 Triple Event Timer ($200) has three amplitude-dependent comparators that can be controlled independently or, more interestingly, serially cascaded. The module has three inputs that can handle audio and CVs, each with a level control and two delayed outputs, one of which is 180 degrees out of phase. Flip the upper Slave switch, and comparator 2 relies on the level of comparator 1, as well as its own level, to trigger. Comparator 3 can be slaved to 2 in the same way. You can use the individual jacks for separately timed pulses, or use the A+B+C outputs, one of which is inverted, to get all three pulses from one jack.

What makes this effect useful is that the relationship between the comparators remains the same no matter what speed the incoming signal is. Altering the threshold setting of each comparator will change the rhythmic characteristic of the output, letting you create swinging or loping patterns that shift in response to the input signals. Cross-patching within the module itself yields the most satisfying results.

Plan B has a number of new modules in the fire, none of which were available for demonstration as of this writing. Among them are the Spectral Multiplexer, which is similar to a fixed filter bank with VC capabilities; the Model 14 Dual Voltage Processor; the Model 19 Gate Delay; the Model 23 Dual Analog Shift Register, which has two 3-output registers that can also be configured into a single 6-output register; and the Model 21 Milton Sequential Controller, which is a highly programmable voltage controllable sequencer that comes in two sizes: the Grande, with four banks of 8 steps, and the Vente, with four banks of 16 steps.

New Formats

Of the companies I covered in the last roundup, several have crossed into other form factors by introducing new lines of modules. Although in some cases the switch to a new format was mostly cosmetic, other companies have come up with new ideas to fill the format.

Cwejman. Swedish manufacturer Cwejman made a big splash a few years ago with its S1 and S2 rackmountable semimodular synths. The instruments are solidly built and have a tight, clear sound with plenty of punch.

This year Wowa Cwejman has released a line of modules in the Euro-rack format that let you create a more personalized system using his exceptional designs. The modules are as ruggedly built as the semimodulars, with thick panels, heavy-duty 3.5 mm jacks, and the use of surface mount technology (SMT) on the boards. The SMT design keeps the circuit boards small enough to be enclosed and positioned flat behind the panel. And Cwejman's attention to detail is evident elsewhere, as with the tuning controls, which have frequency indications—a very nice touch.

Based on the core of the oscillator in the S1, the VCO-2RM ($515) contains two independent oscillators and a built-in ring modulator. The VCOs have seven

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waveforms and a range of 0.01 Hz to 22 kHz, so you can use them as LFOs, too. Each oscillator includes three FM inputs as well as sync and pulse-width modulation inputs. The oscillators are normaled to the ring modulator circuit, but external inputs are also included.

The MMF-1 ($399) is a multimode filter that lets you select a 12 dB/octave or 24 dB/octave response (see Fig. 5). Besides lowpass, highpass, bandpass, and notch modes, the module offers three dual bandpass modes with voltage controllable resonance and spacing. The module has two audio inputs, one audio output, two CV inputs for controlling the cutoff frequency, and CV inputs for resonance and spacing. When the MMF-1 is in resonance in the dual bandpass modes, you get two sine tones, with the interval determined by the spacing control.

The VCEQ-3 ($515) is a 3-band parametric equalizer with voltage controllable frequency (5 Hz to 22 kHz), bandwidth (0.02 to 1 octave), and level (0 to 16 db). Bandwidth and level use 0 to 5V control signals, and the module can handle 20V peak-to-peak signals. Each band can be independently switched to boost or cut.

A number of other modules have been announced by Cwejman. The D-LFO ($499), which has the same oscillator core as the VCO-2RM, offers two independent, 7-waveform oscillators as well as a built-in ring modulator. The module has several sync capabilities, including the ability to sync the second LFO to any voltage point of the first LFO.

The VM-1 ($599) is a complete synthesizer voice in one module. It offers a VCO, a 4-pole multimode filter, and an EG, as well as a VCA and external audio input. Other modules that have been announced include the VCA-2P stereo panning VCA, the ADSR-VC2 dual envelope generator with voltage controllable segments, the RM-2S stereo ring modulator, and the M-CV master voltage control module.

Modcan. In the 2001 roundup I was very impressed with the Modcan system: it has a functionally diverse selection of well-built modules with an appealing sound quality. Modcan was one of two systems in that roundup that used banana jacks (the other was Serge/STS). However, until Cyndustries stepped in, the module size was unique and unsupported by other manufacturers. The format has since been dubbed the A-series.

Since then, Modcan's Bruce Duncan has created the B-series, which uses a panel format based around ¼-inch jacks, as well as the same 5U height and similar power supply requirements as the Synthesis Technology MOTM system. However, you will need a conversion cable, which Modcan sells, to go from each module to the power supply if you're using Modcan modules in an MOTM system or vice versa.

One difference between the Modcan system and most of the others in this roundup is that its modules operate at 5V peak-to-peak. However, Duncan's designs easily support 10V systems: many of the modules have attenuators for scaling down the amplitude of higher signals, and the audio inputs are designed to handle 10V. Duncan also notes that his VCAs, for example, have a gain factor of 2, so you can scale them up to work with 10V modules.

The B-series includes the same selection of A-series modules, which I covered last time, as well as a number of new releases. The most significant is the VC Sequencer 54B ($1,450), which can be driven from the Clock 53B module ($300; see Fig. 6). The sequencer offers three rows of 16 steps, with sliders to set voltage levels; an output for each row and gate inputs for each step; a summed output for creating a 48-note sequence; two gate buses; manual and pulse reset; voltage controlled step selection; and a skip-step function; among other features.

Besides giving you a tempo control, the Clock module lets you divide and filter the clock pulse in a number of ways, including by musical values. The module offers a chip with eight Division Tables and a Divide by N control. Jacks for external clock input, as well as Rate and Table CV inputs, are also available.

The Dual Quantizer 55B ($375) puts two identical but independent quantizers into one module. The quantizers take a continuous CV signal and convert it into a stepped voltage that conforms to musically useful pitches. Each quantizer offers three banks of 16 scales or arpeggiated chords, ranging from the common (major, minor,

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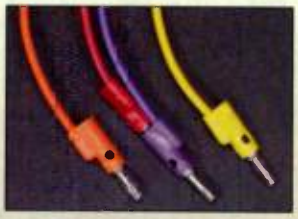

FIG. A: Banana plugs have holes that allow you to stack them.

The use of banana cables in modular synthesizers dates back to the Buchla 100- and 200-series (where they were used for control and timing voltages only) and, later, the Serge and Fenix systems. Banana cables are particularly useful because each plug has a hole in the top, allowing you to send an output to more than one input simply by stacking the plugs rather than using a mult module (see Fig. A).

Some synthesists don't like the single-conductor banana cable because of potential noise issues. In contrast, ¼-inch and 3.5 mm plugs have two conductors, one of which connects to ground. Personally, I don't think unwanted noise has ever been an issue with modern instruments, such as those from Cyndustries and Modcan, and the convenience and utility of stackable plugs far outweigh any potential noise risks.

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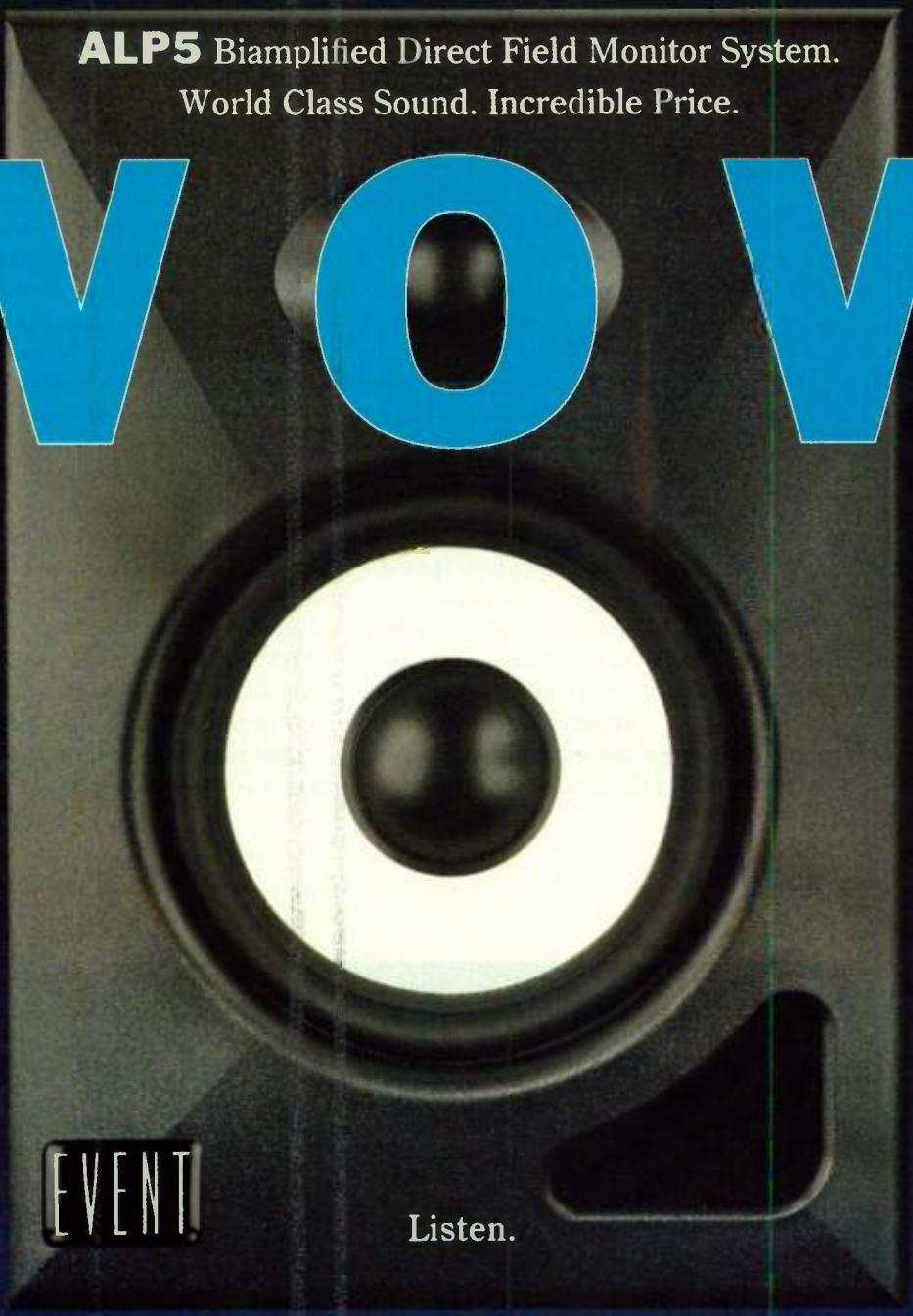

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Phrygian, and so on) to the exotic (Balinese, Octatonic, Sixtone Symmetric). A knob is included for transposing the pitch set up an octave in half steps.

FIG. 8: Wiard's Joystick Axis Generator lets you control ten voltage inputs using a single joystick controller.

The Dual Quantizer can be used in two ways. When used with a sequencer, a pulse or rising ramp waveform is applied to the Clock input to step through the pitches. When used in Free mode, the stepped voltage output changes when the input voltage crosses the conversion threshold set by the selected scale. A 5 ms pulse is sent from the Pulse output jack during each transition when in Free mode, which you can use to trigger other events, such as envelopes. Each of the quantizers includes input and output jacks, Scale and Transpose CV inputs, a Clock input, a Pulse output, and an Invert input for changing pitch direction.

Also appearing in the B-series is the Dual VCA 13B ($265), which gives you two independent channels that can be switched to have a linear or exponential response and to accept AC or DC inputs; and the Switch 56B ($290), a voltage-controlled switch that lets you route one of four inputs to the output jack. The Switch cycles sequentially through the four inputs when a Gate signal is sent to the Clk input. The module's Pulse out jack sends a 5 ms pulse when the switch changes, which can be used to initiate events. The module responds to both audio and CV signals.

Oakley Sound Systems. For many years, Tony Allgood's U.K.-based Oakley Sound Systems was the source for high-quality MOTM-style modules in kit form. When Allgood closed shop a few years ago, his great-sounding designs were sorely missed by the DIY crowd.

It was a welcome surprise to the synth community when the Oakley name reappeared in 2005, this time as part of the EAR Group. Four modules supporting the MOTM and Euro-rack formats were announced. However, this time the modules are not available in kit form.

The modules were not shipping as of this writing, but they should be available by the time that you read this. Two of them, the Wavefolder and ADSR/

VCA, were covered in "Something Old, Something New."

According to the manufacturer, the Octal Resonator offers eight resonant fixed-frequency bandpass filters tuned to 250, 350, 500, 700, 1,000, 1,400, 2,000, and 2,800 Hz. Three outputs are provided: a mix output, the output of the four left filters, and the output of the four right filters.

The State Variable Filter is a voltage controllable, resonant 2-pole filter offering simultaneous highpass, lowpass, bandpass, and notch outputs. Included are three audio inputs and three CV inputs, one of which is for 1V/octave control.

Synthesis Technology MOTM. Paul Schreiber of Synthesis Technology has expanded his MOTM system into the FracRak format with the introduction of the 1000-series modules (see **Fig. 7**). Although the smaller modules occasionally borrow designs from the larger series, new designs are also being introduced.

To reduce the module size by 50 percent, as well as to keep costs down, the new system is built using SMT. Although Synthesis Technology is well known to DIYers for offering its modules in kit form directly, the new modules are only available fully assembled through Analogue Haven.

Two of the first four modules are borrowed from the older series: the 1490 Lowpass Ladder VCF ($199) and the 1485 GX-1 Diode Filter ($229). These filters cover two timbral extremes. The 1490 has a 24 dB/octave Moog-style response and offers two audio inputs with attenuators, an FM input, a resonance control, and two outputs.

The 1485 is based on the filter in that vintage monster of a polyphonic synth, the Yamaha GX-1. It has a colorful, snarly character and can be used as a highpass or lowpass filter. The 1485 offers two audio inputs with attenuators, an FM input, and CV controllable resonance.

First in the category of new designs is the 1800 Looping ADSR EG ($139), which has three modes of operation and a very wide timing range: less than 1 ms to more than 15 seconds. Besides being a traditional 4-stage envelope generator, when the 1800 is set in Loop mode, the end of the release cycle triggers the attack cycle, giving you a complex LFO. In Burst mode, the module loops when the gate signal is high. The module includes positive and negative outputs, gate and trigger inputs, and a manual gate button.

The 1190 Dual VCA module ($249) holds two independent voltage-controlled amplifiers with a discrete transistor path rather than ICs. The module has a soft

clipping feature, and it can accept linear and exponential CVs simultaneously.

Wiard. Largely inspired by the open-ended and experimental aesthetics of the Buchla modular system, Wiard's original line of modules was well crafted and wonderfully expressive. (A full review of the system is in the February 2002 issue, available at www.emusician.com.) However, since the last roundup, the 300-series modules have gone out of regular production and are now available by special order only.

For his 1200-series modular, designer Grant Richter has settled on the FracRak format. But instead of simply repackaging his designs behind the smaller faceplates, Richter has implemented new and often innovative ideas into multifunctional modules that are as musically useful as they are deep. The new modules are available with black faceplates that match the Blacet look, as well as metallic blue with the Celtic designs of the 300-series. (When two prices are listed for a module, they represent the black version and blue version, respectively.)

The Noise Ring ($249/$299) is a pseudorandom voltage source that takes into consideration the musical usefulness of long-form repetition. Consequently, the module not only lets you determine the level of randomness, but also lets you control how often and how quickly new information appears. Richter refers to the Noise Ring as a "data resonator modulated entropy voltage source."

The module is built around an analog white-noise generator and a digital shift register. You can manually set the percentage of new information entering the shift register with the Change control, and the probability weighting of the bits in the shift register with the Chance control. Both functions are voltage controllable.

The Noise Ring is internally clocked by a VCO with a range of 1 Hz to 10 kHz, but you can use an external clock signal. An attenuator is provided. There are two audio outputs: one changes between 9 voltage levels, and the other between 256 levels.

In its simplest form, the Noise Ring can be used for sample-and-hold-like sequencing effects. Clocking the device into the audio spectrum produces a variety of colorful noise timbres. The Noise Ring is great for creating irrational rhythmic patterns that slowly evolve.

Another innovative module is the Joystick Axis Generator (JAG; $206/$299), which gives you control over as many as ten VC inputs simultaneously using a single *x-y* joystick controller ($90/$150). The JAG has

THE MAN BEHIND THE CURTAIN

If you spend enough time haunting the analog-modular users groups, you're bound to see the name Ken Stone. The Australian synth enthusiast is responsible for scores of module designs under the name of CGS, which stands for Cat Girl Synth and is based on the artwork from a couple of his own modules (see Fig. B).

Stone has designed a wide variety of modules, including a tribute to the Steiner-Parker Synthacon VCF, an analog shift register, the Infinite Melody semirandom CV generator, and the Burst Generator. He was inspired to create the Psycho LFO, which also offers pseudorandomized voltages, when he decided to use up printed circuit boards (PCBs) left over from a model-railroad project that produced a flickering fluorescent-light effect. He also has a module that simulates the sound of a V-8 engine.

But he has created plenty of utilitarian modules, too, including a VCO, an LFO, a bandpass filter, and a DC mixer. He plans to add a VCA and EG to the list in the future. His creations have been put into production by several manufacturers, including Bananalogue, Cyndustries, and Metalbox, and more are on the way.

"In my younger days I simply could not achieve much in synth DIY because the resources were few, and available components fewer," Stone explains. "I sought to change that, and to give people who are in the same position a chance to make their dream synthesizer.

"I do all the synth design work for fun and to achieve things I want my own synthesizer to be capable of doing," he continues. "I may as well share the results so my efforts are put to good use and others can have some fun, too."

If you are interested in the DIY approach, you can purchase Stone's PCBs directly at www.cgs.synth.net. The Web page for each module includes a detailed description of the circuit as well as a parts list.

FIG. B: Ken Stone's creative panel designs earned his home-brew modular the name Cat Girl Synth.

two sets of *x* and *y* input jacks, and eight output jacks that are mapped to the joystick's *x*-*y* coordinates. The Edge and Dome outputs are for taking a summed voltage from the outer and center joystick positions, respectively (see **Fig. 8**). The Dome Height knob sets the peak voltage value for the Dome output jack, and the Polarity switch sets the input response to ±5V or 0 to 10V.

Suggested uses for the JAG include vector synthesis and quad panning. However, it's a fun module to experiment with by connecting the various outputs to any number of parameters of a patch.

The Wiard 1200-series also includes a pair of interesting filters. The Boogie Filter ($312) is a Vactrol-based, 4-pole lowpass filter with a ballsy, Moog-like vibe. The module has two audio inputs, Control and Key CV inputs, and separate outputs for each pole—6, 12, 18, and 24 dB. Knobs are provided for setting the cutoff frequency, attenuating the Control input, and setting the amount of resonance. This punchy filter is perfect for shaping melodic lines in any register.

Like its big brother the Borg filter in the 300-series, the Borg 2 ($312) combines features from the legendary Korg MS-20 filter and the Vactrol-based Buchla 292 Quad Lopass Gate. However, the Borg 2 has a Vactrol with a quicker response than the Borg, which gives it a faster decay time than the original and allows it to be used with faster bpms.

The auto-squelch feature from the MS-20 filter, which automatically rides the gain of the resonance control as the input amplitude increases, is a jumper selectable option.

Plug and Play

Historically, the biggest drawback of an analog modular synthesizer has been the incompatibility between products from different companies in terms of module and rack size, the type of patch cords used, and the voltage requirements. However, all the modules in this roundup play well together, and the variety of rack sizes has been standardized to a greater degree than ever before. This means you can create a system that fits your musical tastes fairly easily, although you may end up with different rack types in your system. Fortunately, all the racks themselves are a standard 19 inches wide.

Serious modular enthusiasts who have a variety of manufacturers represented in their system but want a uniform look will take a DIY approach and design their own faceplate to standardize the overall appearance of their synthesizer. With a little time and ingenuity, there is no limit to what you can do to create your own highly personalized electronic instrument. EM

Gino Robair is a senior editor at EM. Special thanks to Tim and Tom Duff, Analogue Haven, and Big City Music for their help with this article.

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DENNIS SHIRLEY

Recording the Genius

By Mike Levine

Terry Howard, Ray Charles's longtime engineer, talks about recording the legend and more.

Terry Howard spent almost 20 years working as Ray Charles's engineer, winning three Grammy Awards in the process and getting an insider's view of Charles's musical brilliance. Although his work with Charles is clearly the centerpiece of any narrative of Howard's career, it would be wrong to assume that Charles's death marked the end of Howard's professional life. Indeed, he's now in a new career phase, working as an independent engineer and producer. He's got a state-of-the-art 64-bit Cakewalk Sonar system in his studio, along with a Digidesign Pro Tools|HD system. The technically savvy Howard has vast experience in both the analog and digital realms, and has no shortage of opinions on today's recording technology.

Howard's post-Charles career did not get off to an auspicious start, however. In February 2005, Charles's management, with whom Howard had never gotten along, accused him of stealing the artist's master tapes. Howard was arrested and charged with theft. He protested his innocence, saying that the tapes he had in his possession had been given to him by Charles for safekeeping. The judge agreed with Howard and threw out the charges.

Hailing originally from the Cleveland area, Howard started his musical career in his teens, recording bands on a Sony 2-track reel-to-reel with sound-on-sound. He later joined the air force, where he worked on Doppler radar and electronic countermeasures for airplanes. "I was working with a lot of high-end electronics," recalls Howard, "which really developed my electronics skills, and ironically, Doppler radar has a lot to do with the physics of sound. That helped build my acoustics skills."

In the late 1970s, Howard left the air force and moved to Santa Cruz, California. He studied recording arts at nearby Cabrillo College, continued recording bands, and subsequently took a job as a technician at Otari, which was developing its line of 24-track multitrack tape recorders. Howard's job put him in contact with artists such as Frank Zappa, Neil Young, and many others. He

worked on Otari machines at many of the major studios in San Francisco at that time. In 1983 he decided to move to Los Angeles to try his luck in that city's thriving recording scene. From that point on, his career really started to blossom.

Howard spoke to me recently on the phone from Los Angeles, and he filled in the details of how he started working for Charles and what Charles was like in the studio. Howard also offered some cogent technical observations about digital recording technology, and talked about his Sonar rig and a lot more.

COURTESY TERRY HOWARD

Left to right: Ellis Hall, Howard, and Willie Nelson.

So you first met Ray after you moved to Los Angeles?

Yes. I was doing independent work for a lot of the Otari customers, and spent my first two years in L.A. working with Fleetwood Mac on the album *Tango in the Night*. I befriended this guy, Ike Benoun at a company called Audio Industries, who was the local distributor for MCI, so I got hooked up with MCI tape recorders and consoles. I worked as the tech for his distribution company. And that's where I started meeting people like Christopher Cross, started working for Tom Jones, and that's when Ike introduced me to Ray Charles.

FIG. 1: Charles recorded with several different vocal mics over his career, including the ADK Area 51 TT tube condenser mic, which he used for much of the vocal recording during the sessions for *Genius Loves Company*.

When did you actually start working for Ray?

Almost immediately on a part-time basis. Then in 1988 I started working on more of a full-time basis.

Did you engineer all of his albums from then on?

I did a lot of engineering with his vocals. By that time, when Ray was doing albums—he was signed to CBS at the time—the various studios would do their recording in Nashville, or other studios in L.A., and they'd send Ray pretty much a finished tape, and I'd help Ray put his vocal tracks on.

So he wasn't involved in recording the basic tracks?

Not at that point. He was doing a lot of stuff in his own studio that was not for those record labels. We would bring the band in and we would record the orchestra, and stuff like that. Ray never stopped recording. If he wasn't doing it for a record label, he was doing it for himself.

What happened to those recordings?

They're still in his vault. They're still with the estate.

Talk about recording Ray's vocals. What kind of mics did he like?

It varied with the song, with the way he felt at the time, or with the way I felt. Sometimes I would suggest he use a different mic and he'd go along with it. But typically we used a Milab mic; I believe it was from Sweden. During the recording of *Genius Loves Company*, he started using an ADK Area 51 TT tube mic [see Fig. 1]. It was the last mic Ray fell in love with.

I've heard that Ray also used a Neumann M149 a lot for vocals.

Yes, the new one they made. See, I'm not into model numbers like a lot of these other engineers are. I know what it is when I look at it, but I don't remember the numbers *[laughs]*.

Do you remember if you used a particular preamp after the mic in Ray's vocal chain?

Yeah. Typically, for vocals, we would use a Universal Audio LA-2A. We'd use the mic pre off the mixing board. By that time, when I was doing most of his engineering, we'd switched from a Sound Workshop console to a Quad/Eight console. And the Quad/Eight had some improved mic pres that Ray really liked. Ike would always bring over mic pres to Ray, to try and have him switch over to an outboard mic pre, and we would A/B them, and the mic pre in the Quad/Eight board was always, as Ray would say, "Good enough." In other words, the outboard pre wasn't spectacular enough to make him change. There was a difference between the Sound Workshop model and the Quad/Eight, because the Quad/Eight had 56 inputs. That's when we went into a 48-track digital recorder. We bought one of the first Studer digital tape recorders.

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So he'd go from the mic into the Quad/Eight's preamp and then through the LA-2A?
Yes.

Did you have to use much compression to tape with Ray's vocals?
When we recorded to analog, I'd use less compression. When we recorded to digital, I had to use more because, especially with the way Ray sang, it was so easy for him to "go over the top" and clip. We got into digital when Studer developed their 48-track, because Ray heard the difference between the Sony and the Studer, and loved the sound of the Studer. That was one thing with Ray, we always A/B'd stuff when he would purchase something. He would get the one he thought was the best sounding. But the thing that we always hated about digital was the distortion you got once it [the level] went over.

How did that affect the way you recorded him?
It caused us to change our thinking when recording. We couldn't just push the button and fly; we had to sit back and do a rough take, and this was something that always would aggravate Ray: we had to do a rough take to make sure that we got the level. He couldn't just sit there and "one-take" it. And that's what he usually loved to do. As a matter of fact, when we first got the digital machine, we were still recording on the 2-inch [analog] machine, because of that forgiving sound that the 2-inch has—we didn't have to worry about clipping—and then we would bounce it to the 48-track digital with all the other instruments and everything else to do the mix.

FIG. 2: Howard's digital audio sequencer of choice is the 64-bit version of Cakewalk Sonar 5, which he says has sound quality superior to its competitors'.

The problems he had with distortion and going over, were those because of his vocal style?
Yeah, he had a lot of dynamics, and he knew how to work a microphone. That's the whole thing: when you get into working a microphone with the proximity effect and knowing when to get close and far and how it changes the sound, you're not necessarily paying attention to the level. And the other problem, when everything was 16-bit you could not go that low [with the recording level]. Once you got down to a certain level, the resolution started to change and the sonic quality was not as good as analog. At 24-bit, you can record stuff down 20 dB, and have that headroom. People forget that.

Explain.
When those tape machines were developed, they were developed with unity gain at –18 dB or –14 dB. But everyone started slamming them to the top because 16-bit didn't have the resolution at lower decibel levels. When 24-bit came about, with the computer systems and Pro Tools, I was able to back off, because the resolution was there. You could now go back down with the level, have that headroom like you had with an analog tape, and you wouldn't lose that resolution.

So the extra headroom of 24-bit recording is a real help.
It's got 130 dB of dynamic range. The math is very simple: 16-bit is 96 dB of your dynamic range. You got an extra 30-plus dB going to 24-bit, that means you don't have to stay at the top to keep the resolution there.

TERRY HOWARD: A SELECTED DISCOGRAPHY

Ray Charles, *Genius and Friends* (Rhino, 2005); engineer

Johnny Mathis, *Isn't It Romantic* (Columbia, 2005); engineer

Ray Charles, *Genius Loves Company* (Concord/Hear Music, 2004); producer, engineer

Ellis Hall, *Straight Ahead* (Crossover, 2004); engineer

Percy Mayfield, *His Tangerine and Atlantic Sides* (Rhino, 2004); remastering engineer

Duran Duran, *Encore Series* (Encore Music, 2003); engineer

Ray Charles, *Live at the Montreaux Jazz Festival* (Pioneer, 2002); producer

Ray Charles, *Ray Charles Sings for America* (Rhino, 2002); arranger, producer, engineer, mastering engineer

Ray Charles, *The Definitive Ray Charles* (WEA International, 2001); remastering engineer

Ray Charles, *The Very Best of Ray Charles*, vol. 2 (Rhino, 2000); engineer, remastering engineer

Ray Charles, *Love Songs* (Rhino, 1999); remastering engineer

Ray Charles, *Ultimate Hits Collection* (Rhino/WEA, 1999); remastering engineer

Ray Charles, *Standards* (Rhino, 1998); remastering engineer

Ray Charles and Betty Carter, *Dedicated to You* (Rhino, 1998); engineer, remastering engineer

Fleetwood Mac, *Tango in the Night* (Warner Brothers, 1986); technical engineer

Merle Haggard, *The Epic Collection (Recorded Live)* (Epic, 1983); technical engineer

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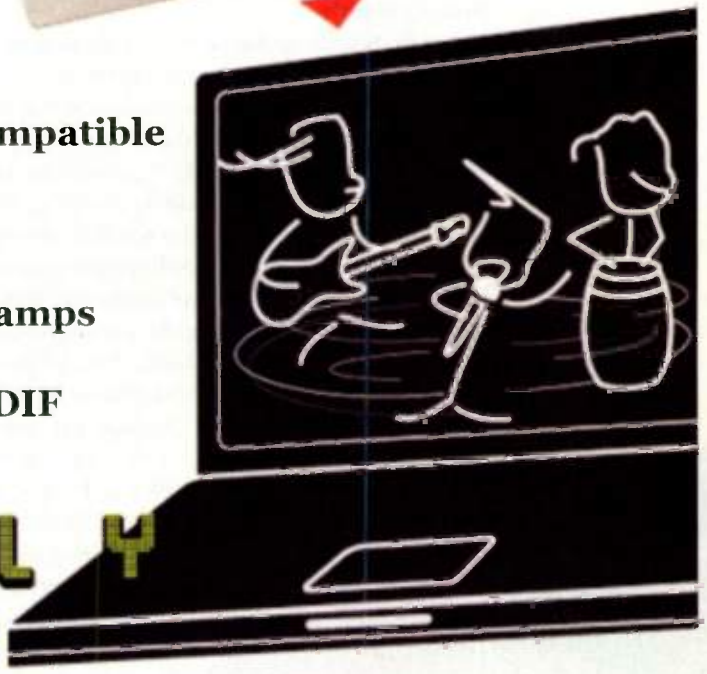

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You try to explain this to a record label and they don't know. All they know is that the last guy came in with everything at the top and made a hit record.

The labels would complain that the levels were too low?

Yes. I'm talking about a multitrack, a Pro Tools session, or whatever digital system we were using. On the 48-track—they would sometimes complain, but especially on computers they were complaining. I had to say, "Look, you guys have got to understand resolution," and that's the problem with a lot of things today. People only know what they see, they don't know the technical side. They see everybody else hitting it to the top, and they think the top is where it's got to be.

What was Ray like to work with? Was he easygoing in the studio?

If you could keep up with him. Ray had very good ears, and it wasn't because he was blind. He had a true engineer's golden ears. He could listen into the music and hear the nuance. That's what makes Doug Sax at the Mastering Lab such a great engineer, and the same with Bernie Grundman [at Bernie Grundman Mastering]. They can hear the nuance. They can hear the fly walking across the speaker. And Ray had that same ability. I had it, too. Because whenever Ray would say, "Listen," I would hear it.

Can you think of a story that demonstrates Ray's hearing abilities?

One of the first things that got me in tight as an engineer with Ray was when he called me into the studio one night, it was about 8 p.m., and he was complaining that the left speaker wasn't playing the kick drum right. He said it was too soft. So I listened, and I said, "It sounds pretty damn balanced to me." And Ray would do this thing, that he would stand in front of one speaker and then sidestep over to the other speaker. He kept sidestepping in front of each speaker, stopping in the middle each time. And he said, "No, I'm telling you, the left speaker isn't right on the kick." So I said, "Well, let me do an alignment." I took an MRL [Magnetic Reference Laboratory] tape, put it up on the machine. He was doing a mix, so it was a 2-track tape we were working on.

JOHN JENNINGS

Howard, Norah Jones, and Charles during the recording of *Genius Loves Company*.

On the left channel, at 100 Hz, it was .25 dB down. Now in college I was taught that the average person is able to hear a 3 dB difference and a trained ear can hear 1.5 dB to 1 dB, and below that it's supposed to sound the same. And I knew that I could hear a .5 dB difference, from tweaking machines most of my life and all the work I did being a factory tech when they were designing 24-track recorders. I had to learn what .03 distortion sounded like. I had to start listening and hearing those things. Like I said, I always felt comfortable that I could hear a .5 dB difference. Here's Ray telling me it's .25 dB. So I'm going, "This guy is testing me. Somebody came in this room and tweaked it .25 dB. He's not hearing it, he's testing me."

COURTESY TERRY HOWARD

According to Howard, Charles had "golden ears" and was quite particular about what he wanted in the studio.

So what happened?

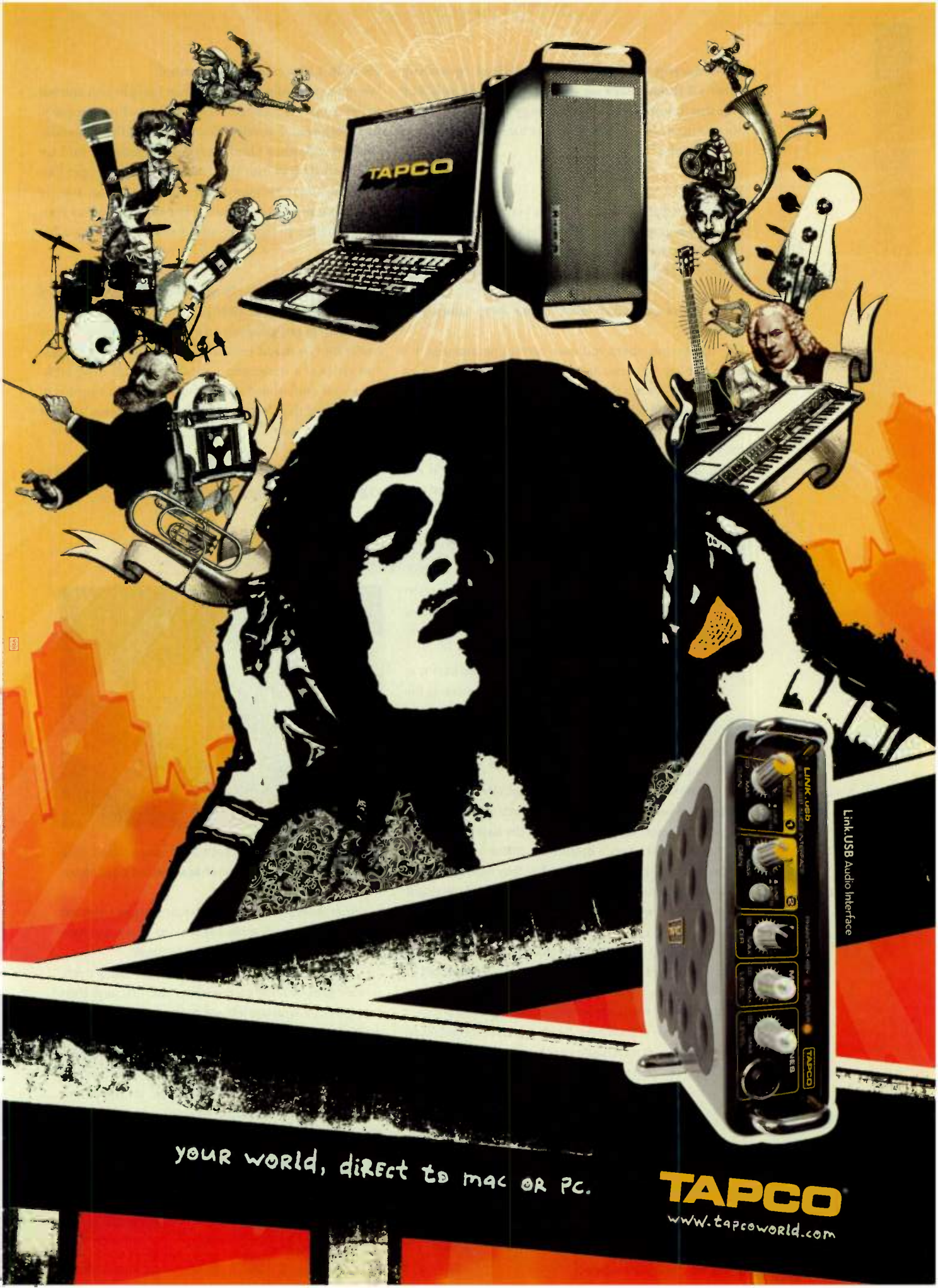
I put the screwdriver into the alignment, I had just barely tweaked it, and Ray started jumping up yelling, "That's it, that's it, put the music back on. You got it!" I knew he wasn't testing me *[laughs]*. Whenever Ray loves something and things fell into place, he'd start dancing to the music. And now he was dancing, he was slapping his hand on his chest with the kick drum, and he was saying, "That's it, Mr. T, you got it, you got it."

He called you "Mr. T."?

Yeah, that was the nickname he gave me.

Was Ray technically knowledgeable?

Yeah. When he was in his late teens, he was a ham radio operator. And was a ham radio relay operator during World War II. Veterans overseas would work in relaying messages back to the families from soldiers over in Europe. And he was part of this organization that did that. And he also would do Morse code. A lot of times, for the longer-distance messages, he would use Morse code instead of talking. It was so funny, because Ray would often mimic Morse code; he'd go, "Did did did dit did did did did did!" And I'll tell you what that word was." And he was right. Ray could mimic that sound. He did have a good ear.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Considering that he adopted digital recording after all those years on analog, it sounds as if Ray was not averse to new technology.

He was in the later years. He really hated recording into the computer.

Why?

Because he was old and set in his ways. A lot of it was that the programmers would not design DAWs for a blind man. Here's a man who's got a computer, because he had his laptop. And he used a program called Windows-Eyes.

Is that the one that speaks the keys when you hit them?

No. This is one where you have certain parameters, it's like a hot-key scenario. And it will talk back to you when you're doing certain things. It will repeat your functions. And there are levels of integrity that you have depending on how you are used to using it. You can use it where it will tell you everything you do, or it will tell you items you're doing. Instead of telling you every stroke you do, it will tell you what the finished stroke that you did related to.

He didn't like using that system?

We never got fully into it, because Ray's health started to deteriorate. Cakewalk, along with another company, had worked and developed something called Caketalk. And several other blind artists were using it. And we were getting Ray into that, and we just didn't get him fully into that because his health was going. But he was using the Caketalk and other things. He was running Sibelius for writing and arranging music on his laptop.

What was your feeling about the movie *Ray* [Universal Studios, 2004]?

They did a great, great job on it. I think it was one of the better movies made, because it showed the real struggle and strife of a musician. It showed how his drug problems were sometimes a help and sometimes a problem, and the fact that he got over his drug problem because of his love of music.

Can you talk a little about your legal hassles regarding Ray's tapes?

3-MIC MINIMUM

Working with Ray Charles and others, Howard has often been called upon to mic a piano for recording. His basic method is a 3-mic stereo configuration that utilizes large-diaphragm condensers (see Fig. A).

He centers this configuration around the back mic, which he generally puts in omni mode. "That picks up the full sound," he explains. "I've noticed that when a lot of people mic pianos, they tend to get a left-right sound—they mic it the way a keyboard sampler would play it back. Too much is hard left and right."

He places the other two mics, typically both cardioid, over the bass strings and the treble strings, respectively, each back from the hammers, with the bass mic the farther back of the two. "I do it a little different than a lot of people," he says. "Most people, when they use the triangular configuration, tend to put the left and right mics right around the hammer area."

Howard tilts the treble-string mic slightly off-axis. "I have it off-axis so that it doesn't pick up the percussion of the hammers," he says. The left and right mics are typically about a foot over the strings, and the omni mic in the back is lower to pick up some of the reflections from the piano's cabinet.

His rule of thumb for avoiding phase problems is to keep all mics at least nine inches from each other and from the source. "With the microphones themselves being more than nine inches away—you're at a minimum optimum distance for phase," he says. "Further apart is even better."

When possible, he will open the piano's top completely, but if there are other instruments playing in the room, the top is necessary for isolation. In that circumstance, Howard will also throw a moving blanket over the strings and mics for additional separation from the room sound.

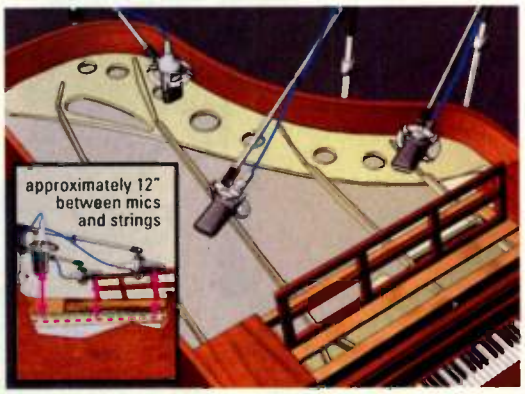

FIG. A: This shows Howard's basic 3-mic, stereo-piano-miking configuration, which he often used with Charles.

Each mic feeds a separate track. When mixing them, Howard likes to bring up the center mic first, and then supplement it with the left and right cardioids to give it a wide stereo image.

Although he'll sometimes vary this miking scheme—such as by setting the rear mic to a figure-8 pattern and maybe substituting a hypercardioid mic for the treble-string mic—he says it's hard to go wrong with his standard 3-mic configuration. "You'll make the producer happy and the band happy. Nine times out of ten it will work."

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30 DAY MONEY BACK GUARANTEE

Ray had asked me to take care of his music after he died, and that's not being done, and that's all that I can say.

Can you tell me where things stand with it?

I can talk about that. The case was thrown out of court. The judge basically said, beyond a shadow of a doubt, that I had permission from Ray Charles to have the copies I had, and what masters I did have I had under his permission. And nobody asked for me to return these tapes in the proper manner that labels and other people are supposed to.

What was the reaction from your associates in the music business to your arrest?

There were a lot of people from the industry that really believed in me. A lot of people put up money for my defense, and a lot of people showed up in court in my defense. A lot of important people, who will remain nameless. Those are the ones I really want to thank, because they're the ones that kept me going through the whole ordeal.

Let's talk about your current recording work. What kind of setup do you have in your studio?

I've got a Quad/Eight board, and I've got a couple of Otari tape machines. I also have a Pro Tools|HD system, because I have to have it for the labels. My DAW of choice is Sonar [see Fig. 2]. Cakewalk was the first company to come up with a true 64-bit program to run. And you can hear that difference.

You talked earlier about the differences in headroom between 16-bit and 24-bit recordings. What about high-resolution recordings that use sampling rates higher than 48 kHz?

You've got to look at the trade-offs. Your file size is large, and you're asking the computer to do a lot more work, especially when you're doing multitrack recording.

Do you mix in the box [totally within the computer]?

I do all my rough mixes in the box, but I never do the real mix in the box. I do all my editing, get my balance, what I want left, what I want right, all that done in the DAW. When I'm ready to really mix it, then I go to one of the studios, like the Village, the Record Plant, or any of the major studios. At that point, my DAW is now working like a tape recorder or a tape player. I run through a real mixing board.

What don't you like about in-the-box mixes?

I have noticed that no matter what the program—and Sonar is the most forgiving on this, but I don't care if it's Pro Tools, Nuendo—the moment you start mixing more than 32 channels in the box, the stereo image starts to collapse. You start getting a bottleneck sound, where it's now starting to sound like it's compressing itself. It only makes sense; you're trying to throw so much data down a pipe. When you start listening to it, you start hearing the stereo image collapsing. The

next thing you know, everything must be panned hard left and hard right to get a stereo image.

But if you don't have that many tracks, then the computer has enough horsepower to deal with it.
Yes, and so does the software program.

But once you get over a certain amount of tracks, you start to have problems?
To give you an idea: back when they began designing boards for multitrack recording—because of the laws of physics and analog—when adding channels without putting buffer amps in each channel, you could only get up to 16 channels of analog before it would start to bottleneck. That's why they started putting buffer amps and other things to get in more than 16 channels on a mixing console.

With analog, what causes that bottleneck?
It's a function of the laws of physics. Every time you add a channel, you're adding that noise to it. The same thing happens in digital. You're adding noise—it's not like a dither—it's digital noise. We use dithering to cover this artifact noise. And all dither really is, is about 20 dB of noise injected into the signal so the computer has something to chew on when there's nothing there *[laughs]*.

Do you think that a strong tech background makes a significant difference for someone recording in their own studio?
The technical background made me realize how important my ears are. You don't necessarily need to know how to build circuits, or what makes the music go round and round inside. But it does help to learn how to hear distortion. What the true sound of dynamic range is. What headroom is. Learning frequencies.

Do you have any advice for people who are recording in their own studios?
The main thing is start listening. Start using your ears. I find more and more people just do what so-and-so says, or what they saw so-and-so do. Here's a quote from Ray Charles: "I don't care what it does, how does it sound?" I think the engineering would get a lot better if engineers could start listening. Don't worry about throwing that thing up to that red line on the digital, and having just 3 dB of dynamic range left when you're doing a mixdown. Pay attention: dynamics are good, and if you know how to do dynamics right, the mix can still sound loud. EM

Mike Levine is an EM senior editor. Thanks to Ike Benoun for additional information.

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ReWired for Effects

By David Darlington

Get your project's DSP from another program.

Producers and engineers are constantly trying to come up with something new when mixing their latest creation. To that end, they invest in plug-in and hardware effects for DAWs, and work them to death until they fall out of fashion or become so commonplace that they no longer distinguish their users' music from anyone else's. Where can you find exciting effects that haven't been worn thin? More important, how much will they cost? The answer may be lurking in your applications folder, ready to help your DAW create new effects combinations.

Running audio programs simultaneously is easy with ReWire, the code developed by Propellerhead Software. ReWire allows your host program to connect to slave applications that run in tandem with the host. The host project's tempo is synchronized to the slave's, while audio from the slave is routed back to the host. Because of ReWire, for example, Propellerhead Reason and Ableton Live integrate seamlessly with Digidesign Pro Tools, Apple Logic, MOTU Digital Performer, and other digital audio sequencers. Most musicians use the slave applications as composition tools, creating content with the programs' loop-playing capabilities and virtual-synth engines. In addition, the apps can function as powerful effects tools during mixing. You simply export audio into the slave program, process it with the slave program's tools, and route the output back to the host program. Here is a step-by-step guide to unlocking the effects in Live for your mixes.

FIG. 1: Here an Ableton Live plug-in has been inserted into a stereo aux channel in a project assembled in Digidesign Pro Tools.

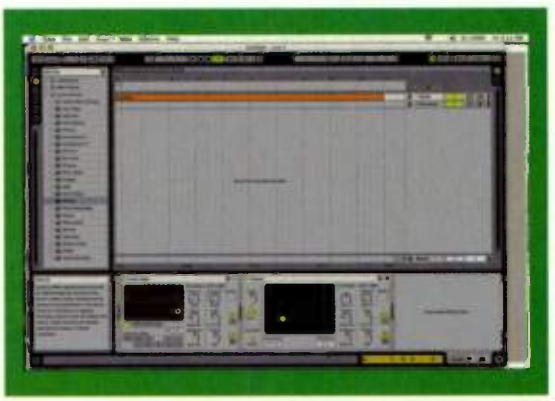

FIG. 2: Built-in effects and virtual instruments in Live can be applied to imported audio and auditioned while running in sync with Pro Tools.

ReWired

To run a ReWire application, first launch your host application, and then route the audio from Live back into your host program. In Pro Tools, a Live plug-in can be inserted into a stereo aux channel (see Fig. 1). For details on how your sequencer interfaces with Live, check the Ableton Web site (www.ableton.com). When the Pro Tools session is set up, launch Live, which will run as a slave. The transport controls on either program will start and stop both sequencers. Because Live plays back audio as "clip" files, anything in your mix that you want processed in Live will have to be exported from your main application as an audio file. Depending on what audio application you have, you may be able to simply select, say, four bars of a simple loop for export. Or you may need to create a longer audio file by selecting multiple regions from different tracks and mixing the selections down to a single audio file using your sequencer's Bounce To Disk function. Certain sounds, such as drum loops, strings, and vocals, are always prime candidates for treating with effects, but sometimes it's useful to export combinations of instruments, like guitars with keys, percussion families, or even entire mixes.

After exporting the audio, import it into Live and drop it onto a track in the Arrangement window. The bar numbers in the Arrangement window correspond with the bars in the host software, so place the audio where it occurred in the original program. In Live, double-clicking on the track's name opens the Device window at the bottom of

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the Arrange page. This is a drag-and-drop insert point for the various effects that are available in the Live Device browser. Access the browser by clicking on the folder icon in the upper left corner to display a list of Live's built-in effects and virtual instruments (see Fig. 2).

While the mix is running in your sequencer, you can drag any effect from the browser and drop it in-line on the audio channel that's playing your exported sounds. Most of these effects have clear graphical interfaces, and you can adjust all their parameters by dragging them with the mouse.

You can also easily reorder plug-ins by dragging them to new positions. Does the bit reducer sound better placed before or after the tempo delay? Audition it on the fly. The great thing is that you can record all these tweaks into Live as automation events in real time while you're reacting to the mix as it plays in your DAW.

Control Freaking

If you're more of a fader jockey than a "mouseketeer," you'll like that any parameter in Live can be assigned to a MIDI controller using the program's MIDI Map mode, and accessed by clicking on the MIDI switch in the upper-right control bar. Any parameter that can be assigned is now highlighted. Just click on the control you want to automate, and then send a MIDI message from your controller by touching the appropriate knob or switch to direct that control input to the parameter. You can completely customize your control interface to "play" the effects musically as the mix progresses. You can use your computer's keyboard, a MIDI input controller, or a MIDI synth like Novation X-Station or Access Virus. In fact, a cottage industry of Live-specific controllers has sprung up, featuring multiple units from Faderfox (www.faderfox.com) and M-Audio (www.m-audio.com).

Using the effects in Reason is somewhat easier, because Reason doesn't deal specifically with audio playback. For externally created audio to play through Reason, you must load the audio into a Reason sampler, and then trigger the playback with MIDI notes. Since ReWire also routes MIDI information from the host to the slave, these triggers are easily inserted at the appropriate point in the host sequencer. As with any sampler, it's easier to chop the audio into smaller pieces and use multiple triggers than to trigger a long sample that has to be retriggered from the beginning each time you stop playback. Like Live, Reason can route effects in-line, or as sends and returns on its mixer. Reordering the effects, however, is not simply a drag-and-drop move, but rather is accomplished by tabbing to the back of the rack and reconnecting the patch cords. Parameter changes can be fully automated in the Reason sequencer. When you're satisfied with the effects settings, simply route the aux channel carrying the slave program to a new audio track and rerecord the processed audio back into the digital audio sequencer.

FIG. 3: Arturia's Minimoog V soft synth is inserted into an audio channel with the synth's External Input preset selected.

Alt Effects

You can use other software (without ReWire) to serve as an effects unit. If you own Arturia's Minimoog V soft synth, try inserting it into a drum-loop audio track and choosing the External Input preset. Turn the oscillators down and the external volume up, and hold down any key to trigger the VCA gate (see Fig. 3). The drum loop will be playing through the Moog and can be filtered with the excellent emulated Moog filters or treated with the onboard chorus and delay plug-ins that you can access from the rear panel. It's like having the Moog chorus, delay, and filter plug-ins all at one insert point. One caveat: you may have to rerecord audio that has been processed this way back into the host, because the Minimoog V consumes a lot of CPU cycles, and this method may not work in real time on older computers.

You can also use wrappers to access plug-ins that haven't been designed for your platform. FXpansion (www.fxpansion.com) manufactures wrappers that make VST plug-ins work with DAWs that support RTAS and AU. The wealth of VST plug-ins and virtual instruments available on the Web (many of which are free) makes this a cool option for non-VST apps. One favorite of mine is the Korg Legacy bundle, which gives you four virtual-synth instruments and two effects units derived from Korg's vintage hardware units. These plug-ins function as a multi-effects unit with lots of algorithms and plenty of usable presets. Apple also ports its great Logic plug-ins to TDM with the Epic TDM bundle, giving Logic users with TDM hardware access to the native effects that other Logic users enjoy.

Everyone wants to avoid the same old everyday plug-ins they've used for years. Don't forget to look at programs you already own for new options. The coolest effect may be right in your own backyard, tucked into an unexplored corner of your hard drive. EM

David Darlington was the composer for the HBO series Oz *and is a Grammy winner for engineering on Wayne Shorter's* Alegria.

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Fun with Formants

By Len Sasso

Formant filters do more than imitate vocal sounds.

Formants are usually associated with vowel sounds; they are the natural resonances of the vocal tract that give vowels their character. Acoustic instruments also have formants, which are derived from the body of the instrument. Many synths now come with formant filters and can be used in many ways to add character to sounds in the way a vocal tract or an instrument body does. I've used VirSyn TERA 3 here, but any synth or filter plug-in with parallel bandpass filters can do the job.

The three lowest-frequency vocal formants are the most important in producing intelligible vowel sounds. For that reason, formant filters on synthesizers are typically composed of three resonant bandpass filters working in parallel. The lowest three formants also characterize acoustic instruments. Vowel formant frequencies vary considerably, but the first three fall roughly into the 500, the 1,500, and the 2,500 Hz range, respectively (see **Fig. 1**). That's a good place to start when setting up your synth's formant filters. (For a detailed look at the role of formants in speech synthesis, see the article "Voices from the Machine" in the February 2004 issue of EM, available at www.emusician.com.)

Three's a Crowd

First, find a harmonically rich, bright, and sustained sound, such as TERA 3's PadSounds 04, that doesn't already use a formant filter. Next, turn off any active effects, and then modify the preset by inserting the formant filter just before the amplifier in the signal path. If there's another filter in the signal path, you might want to take it out.

FIG. 1: TERA 3's formant filter is at the upper right of the control panel. The center display shows the three formants for the vowel *A*.

Ensure that the formant filter's output is fully wet, and then set the low-, mid-, and high-band levels with boosts of 6, 3, and 0 dB, respectively—lower-pitched formants are usually louder. Formants are fairly broadband, so set the bandwidths, or *resonance* (as in TERA 3), to low values. A good way to temporarily focus on the effect of individual bands is to set the levels of the other bands to their minimum values (–50 dB in TERA 3).

A Nice Gesture

Vocal formants move around as you change the shape of your throat and mouth (that's how we speak), whereas instrument formants are mostly fixed. You can use fixed formants to alter the character of any sound, but synth filters are made for motion, and that's where things get interesting.

Moving one band of a formant filter relative to the others can have a profound effect. Set up an envelope generator with a short delay, a medium attack, and a full sustain, and then use it to modulate each formant's frequency up or down. Next, apply a single envelope, with opposite polarities, to the bottom and top formants. In TERA 3 you can use the envelopes by themselves or multiplied by Velocity, which results in more motion for louder notes.

Once you've enveloped the outer bands, apply an LFO to the middle band. Try multiplying the LFO by a delayed envelope to bring in that effect after the outer bands have settled down. Also try modulating the LFO rate with Aftertouch or the Modulation Wheel. In TERA 3 those are all source options in the modulation matrix.

A Step in Time

Modulating the band levels can also be effective. Multisegment envelopes or breakpoint automation with different rhythmic patterns for each band make good sources (see **Web Clip 1**). Bandwidth (resonance) is another good modulation destination for multisegment envelopes, but be sure to start with the minimum initial setting and a modest modulation amount to avoid damage to your speakers and ears.

While instrument formants are not pitch dependent, you can use key tracking to make one or more formants follow pitch. Set the formant frequencies to harmonic intervals of the pitch of an oscillator or sample, and assign full key tracking. Cutting and boosting the formant bands can be effective.

Bypassing effects and other filters helps you focus on the action of the formant filter. But once you have the formants under control, combining pre- and postfilter effects and lowpass and highpass filters in parallel with the formant filter is fair game. So leave realism behind, and give your tired presets a new voice. EM

EM WEB CLIPS

Len Sasso is an associate editor of EM. Visit his all-new Web site at www.swiftkick.com.

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matrix is easy: just choose a source and a destination, and then adjust the amount slider while playing the keyboard to hear the effect of the modulation.

All too often, the sounds produced by synthesizers are lifeless and boring.

But though the concept is simple, it's worth looking at several subtleties.

First, modulation signals are potentially bipolar. That is, the value of the signal can be either greater or less than zero. A signal that drops below zero may seem absurd: how can you have less than no modulation? In fact, the idea makes sense. If, for example, an envelope generator's output is applied to oscillator pitch, you may want the pitch to rise as the envelope rises, or you may want the pitch to fall as the envelope rises. For that reason, the amount sliders in a good modulation matrix will have zero in the middle and let you set either a positive or a negative modulation amount. When the amount is less than zero, the modulation signal is *inverted*.

In some synths, however, the modulation signal is inverted in the source module (usually an LFO or envelope generator) before being sent to the matrix. That design is less flexible, because if you invert the signal being sent from that source to one destination, you'll wind up inverting it for all destinations. The source module may also have its own output-amount parameter, which means the modulation amount can be programmed in two different places. That opens the door to confusion.

Instead of having just one amount slider, some mod matrices have minimum- and maximum-amount settings (see Fig. 2). The minimum setting will be sent when the modulation signal is at zero, and the maximum setting will be sent when the modulation signal is at its greatest value (usually 127). The amount of modulation is reduced (scaled) by setting the minimum and maximum values closer together. When the minimum is set to a value that's greater than the maximum, the modulation signal is inverted: a lower input produces a higher output, and vice versa.

Secondary Modulation

I've already mentioned one of the most common forms of modulation: MIDI CC 1 to LFO amount. That is used for controlling vibrato depth from a mod wheel. But how do you set that up in a modulation matrix? Unless the LFO has its own amount parameter, which can be chosen as a destination, it would seem you couldn't do it. Many modulation matrices, however, provide an easy work-around: the amount parameter of one modulation routing can be chosen as a destination for a different routing.

In that case, you'd set up one routing with your vibrato LFO as the source and oscillator pitch as the destination. The second routing would have CC 1 as the source and routing 1 as the destination.

Secondary modulation opens up a lot of musical possibilities (see **Web Clip 2**). For instance, you can control LFO amount from an envelope generator, which is useful for vibrato that deepens gradually after the beginning of the note. By routing the LFO to panning and using Velocity as the secondary modulation source, you can increase the depth of the panning by striking the keys harder. That might not seem very exciting by itself, but when used in combination with other modulations (such as Velocity to LFO rate), it can produce useful musical effects.

Trying out random connections in a modulation matrix will sometimes produce happy surprises. But ultimately, a better way to use modulation is to start with an idea. Figure out what changes you want to make in your sound, and then choose the ingredients that will do the job. Modulation can give tired sounds a new lease on life. EM

FIG. 2: The modulation matrix in Camel Audio Cameleon 5000 has minimum- and maximum-amount sliders. Here, the High setting is lower than the Low setting for the fourth routing, so the modulation will be inverted.

Jim Aikin writes about and has fun with music technology in his home studio in Northern California. He also plays electric cello in a jazz/folk quartet called Night Harvest with ace violinist Jim Hurley (of Dan Hicks and of Queen Ida).

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No Spam, No Foul

By Fran Vincent

How to practice safe email marketing.

You've just opened your email box, and a deluge of unwanted, suspicious, and possibly fraudulent messages glare back at you, smugly daring you to open them. You open one up. Hmmm—you don't remember signing up to receive *that* promotion. So you hit the Report Spam button, and off it goes into the void, hopefully never to bother you again.

With any luck, the sender's email address, and possibly the entire domain name, will end up on a spam blacklist. This blacklist is a continually updated collection of supposed spammers that will be blocked out by any email service provider who consults the list. That's the good news.

The bad news is that you, as a musician innocently sending email to fans to announce your gigs or new releases, may end up on that same list—banished from the cyberworld. And if you're not carefully monitoring your email list and removing anyone who requests (or demands) to be taken off, you may face hefty fines. Following a few simple rules will help you comply with U.S. laws and craft more effective promotional email.

Can Your Spam

The U.S. CAN-SPAM Act went into effect in 2004 and puts in place rules about the sending of all commercial email, both solicited and unsolicited. The acronym stands for Controlling the Assault of Non-Solicited Pornography and Marketing. It sounds serious because it is. Violators can incur large fines and can even receive jail time.

Hopefully, those threats won't cause you to forgo all future email communication. Instead, you should brush up on the dos and don'ts of CAN-SPAM so you can continue to promote using email without your messages crossing over into the realm of spam.

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Never use fraudulent headers. Use your own email account or a separate email account created for email promotions. It must be traceable and accurate, and cannot be created using false information or names. Be sure to register and update your domain name with your correct and most current information, including mailing address, phone number, and a working email address. Your From line must not be misleading or false, or ambiguously list the always suspicious "unknown sender."

The Subject line must not be deceptive or misleading. Have you ever opened an email because the Subject line said "Hi, sorry I haven't called back" or something similar, only to find an advertisement inside for cheap software or erectile-dysfunction drugs? The safest Subject line is one that clearly states who you are and what you are writing about, such as "Joe Musician Performing at the Tropical Club This Weekend."

Provide an opt-out option. Sometimes after people sign up to receive your promotions, they later change their minds. Don't take it personally, but do take their names off your list. Every email you send must offer the recipient a way to opt out. It can be as simple as "To unsubscribe from all future email communications, please click Reply and write 'Remove' in the body of the email."

More sophisticated promoters may want to try an email service such as Constant Contact, which lets you automatically monitor and update lists through a link method ("Click here to unsubscribe"). (See the sidebar "Where to Find Help.") Whichever opt-out method you prefer, the mechanism of your choosing must remain in effect for at least 30 days after the promotional email is sent.

Remove unsubscribers immediately. Now that you've provided a way for people to tell you "Thanks, but no thanks," it's important to honor that request as quickly as possible. The law gives you ten days. Along with your opt-out mechanism, you can write something like "It may take up to ten days for your information to be removed from the list. Thank you for your patience." Then be sure that they are taken off the list before that time.

Include your valid postal address. In every promotional email you send, put your mailing information at the bottom. It doesn't have to be your home address if you're uncomfortable sending that out to a sea of strangers. It can be a business address, and it can be placed in small type at the end with your copyright information, after the unsubscribe info. Providing valid postal information reinforces that you are a legitimate entity.

"We Had a Hit Single with Jesse McCartney, and it all Began with TAXI"

Andy Dodd and Adam Watts – TAXI members
www.reddecibelproductions.com www.adamwatts.com

Adam and Andy's success through TAXI is a little bit different from all the other stories you've probably heard. They got their *biggest* deal after their membership ran out!

Here's how it happened: "We joined TAXI in 2001 and found that it was a great motivator for us. We were members for two years. We learned a lot, wrote a ton of songs, and got a few film and TV placements -- some through TAXI, and some on our own.

We submitted a song we wrote with Jenn Shepard called "You Make Me Feel" to one of TAXI's Industry Listings. We didn't hear anything back for a while and eventually our TAXI membership ran out. Thankfully, we began to get so busy with production and writing gigs that we decided to wait and renew our membership at a later date.

Little did we know that TAXI had sent our song to a production/management company that was looking for material for a young, male Pop artist they were developing.

Later that year, Jesse McCartney's managers called us saying they had just heard "You Make Me Feel" on a CD they got from TAXI and wanted to have him cut the song. Although Jesse decided not to record "You Make Me Feel", his managers asked us to write more songs for him. We wrote a handful and they ended up putting his vocal on two of the tracks we produced, "Take Your Sweet Time" and "Beautiful Soul".

"Beautiful Soul" got played on Radio Disney, and Jesse's management got the song to a label executive at Disney. Soon after, Jesse was signed to Hollywood Records. "Beautiful Soul" became his first single, and we both signed publishing deals with Disney Music Publishing.

Jesse McCartney's album (entitled "Beautiful Soul") has gone Platinum in the U.S. and Australia.

"Beautiful Soul" went to #3 on Radio and Records CHR Pop Chart, #5 on Billboard's Top 40 Chart, #19 on Billboard's Adult Top 40 chart, it's a Platinum Digital Single Download, it's on the Gold-selling 'Cinderella Story' Motion Picture Soundtrack, the Gold-selling 'That's So Raven' TV Soundtrack, and the video was nominated for Best Pop Video at a 2005 MTV Video Music Awards."

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Use legitimate list sources. Using harvested email or randomly generated email addresses is not allowed. Use only lists you have cultivated through opt-in mechanisms from your Web site, sign-ups on paper from your gigs, or by purchasing a reputable list. Be sure to qualify email addresses you obtain from your Web site or gigs *before* adding them to your database. Send email to those who signed up, saying that you received their information from the Web site or through the gig sign-up sheet, and ask them to reply in order to be added.

Remember that anyone can put a friend's email address on a list, so it's wise to make sure you are sending your promo email to someone who really wants it (and to cover yourself in case there is ever a question). You can also purchase lists from magazines and Web sites whose subscribers fit your target market. Contact them directly or enlist the help of a reputable list broker.

WHERE TO FIND HELP

Enlisting the services of a company specializing in email marketing is the way to go for many time-pressed musicians. These firms handle any unsubscribing and keep your lists clean. Here are some worth checking out.

Campaigner (www.campaigner.com) Powered by GotMarketing, Campaigner is a set of self-serve marketing tools also used by Yahoo to promote Yahoo Stores.

Constant Contact (www.constantcontact.com) A popular subscription service that also tracks your email campaigns and how well they did.

Email Express Direct (www.emailexpressdirect.com) Build and manage custom databases and track your results. Offers subscription and pay-as-you-go pricing.

VerticalResponse (www.verticalresponse.com) Design beautiful email promotions and pay per promotion you send out. The more recipients you send to per promotion, the cheaper it is per email.

Identify unsolicited advertisements. If you are sending unsolicited email (meaning the recipient did not opt in), then you must clearly identify your message as a solicitation. It can be in understated letters at the top ("Advertisement") or incorporated into the body of the email ("Jane MusicFan thought you would enjoy my music and recommended you to me"). Companies that purchase email addresses often put at the bottom of their email, "You are receiving this email advertisement because you have opted in to a list that indicated interest in products and services similar to the above."

Honor your privacy policy. If you collected email from your Web site—or another Web site—that had a stated privacy policy saying that you wouldn't sell, give, or transfer email, then you must honor that policy. In addition, if you are selling a list of email addresses (and it is not in violation of your privacy policy), then you must be sure not to include anyone who previously asked to be removed.

The preceding pointers on CAM-SPAM compliance are no substitute for actual legal advice. For more information, and to read the full law, go to www.ftc.gov/spam.

Avoid the Blacklist

Anyone who uses email to keep large numbers of people informed will likely be reported as a spammer at least once. The day might come when the email you sent out comes screaming back to your in-box as undeliverable, with the headers of the returned messages containing words like "abuse" and "spam blocker." At that point, you'll know you've been blacklisted.

A number of things may have happened. A message you sent out may have been reported as spam by somebody who forgot that they once signed up for your list. Or someone may have reported messages previously sent through your ISP or hosting company as spam—and they might not even be ones *you* sent. Email from your provider's IP address that has been tagged as spam can affect your ability to send promotions as well.

"Tagged" IP addresses are reported by the recipients' ISPs to various spam blacklists such as SpamCop .net and Spamhaus.org. Then, service providers like AOL, Yahoo, MSN, and others consult those blacklists before delivering mail to their customers. If your IP address is on that list, your mail won't go through. It ends up in the Bulk or Spam folder, or simply never sees the light of day. Consider it a blessing that your email was sent back as undeliverable, because now you know there is a problem, and you can report it to your ISP so you can get off the blacklist.

Spam-Free

Email is one of the most inexpensive ways to promote yourself or your band. Not only is it cheap, but when done respectfully, legally, and with consideration to your audience, it will help you build your image, as well as a fan base that looks forward to finding out about your performances and recordings. EM

Fran Vincent is the president of Retro Island Productions, Inc. (www.retroisland.com), a music-marketing and public-relations consulting company. She teaches music and entertainment industry courses at the University of Miami.

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NATIVE INSTRUMENTS Guitar Rig 2.0.1 (Mac/Win)

Guitar amp- and effects-modeling to the max.

By Mike Levine

When Guitar Rig 1.0 was released last year, it garnered acclaim not only because it offered a large model collection and flexible routing structure, but also because it integrated software and hardware (its Rig Kontrol pedal) in an innovative manner. So the release of Guitar Rig 2.0 begs the question, what can Native Instruments do for an encore? The answer is plenty.

Guitar Rig 2.0 (see **Fig. 1**) introduces four new amp models (including a dedicated bass amp); ten new effects and stompbox models; six new cabinet models; five Modifier components including a step sequencer, envelope generator, and LFO; a high-resolution audio mode; and a revamped hardware controller: the Rig Kontrol 2.

FIG. 1: Guitar Rig 2.0 has more amp, cabinet, and effects models than its predecessor and integrates a new hardware controller pedal.

Rigging It Up

Like its predecessor, Guitar Rig 2.0 is amp-, cabinet-, and effects-modeling software that runs as a VST, RTAS, or DirectX plug-in in Windows; a VST, AU, or RTAS plug-in in Mac OS X; or as a standalone program on either platform. In addition to its collection of models, Guitar Rig 2.0 gives you utilities such as a tuner, a metronome, two digital recorders, and, new to version 2, the Loop Machine. (For more details on features and models introduced in Guitar Rig 1, see the review in the January 2005 issue of EM, available online at www.emusician.com.)

GUIDE TO EM METERS

5 = Amazing; as good as it gets with current technology
4 = Clearly above average; very desirable
3 = Good; meets expectations
2 = Somewhat disappointing but usable
1 = Unacceptably flawed

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You get a large selection of editable preset rigs, for a variety of musical styles, but you can also build your own rig by dragging visual depictions of the various components into your virtual rack in any order you want. You can then tweak them using the various parameter knobs and buttons. The Rig Kontrol 2 can be assigned to control or turn on or off virtually any parameter using its expression pedal or one of its six footswitches.

On the Platform

For PC users, the minimum system requirements are Windows XP Service Pack 2, a Pentium 700 MHz or Athlon XP 1.33 GHz processor, and 256 MB of RAM. The minimum on the Mac is OS X 10.3.*x*, a G4 733 MHz processor, and 512 MB of RAM.

I tested Guitar Rig 2.0.1 and the Rig Kontrol 2 on both a Mac and a PC. For the former, I used a dual 2 GHz Apple Power Mac G5 (with OS X 10.4.4) running MOTU Digital Performer 4.6 and Apple Logic Pro 7.1 through a MOTU 828mkII FireWire interface, and the same computer running Digidesign Pro Tools LE 7 through an original Digidesign Mbox USB interface. My PC setup included a Dell D610 Pentium M laptop running Cakewalk Sonar 5 Producer Edition through the FireWire audio interface of an M-Audio Ozonic.

RIG KONTROL 2 SPECIFICATIONS

Audio Inputs	(2) unbalanced ¼"
Audio Outputs	(2) balanced ¼" TRS, (1) ¼" TRS headphone
Additional Ports	USB 2.0, MIDI In, MIDI Out, (2) ¼" pedal inputs
Bit Depth	24-bit (32-bit floating-point internal processing)
Sampling Rates	44.1, 48, 88.2, 96 kHz
Input Impedance	1 mΩ
Output Impedance	200Ω (balanced); 100Ω (unbalanced)
Programmable Footswitches	6
Programmable Expression Pedal	1
Power	USB bus powered
Dimensions	14.1" (W) × 4" (H) × 9.3" (D)
Weight	5.7 lbs.

FIG. 2: Guitar Rig 2.0 offers four new amp models: Lead 800, Jazz Amp, Tweedman, and Bass VT.

Getting Amped

The addition of four amp models doubles the number of Guitar Rig amp models to eight. The new amps (see Fig. 2) help round out the collection. My favorite is probably Tweedman (modeled after a Fender Bassman head), which offers a variety of vintage-Fender-type sounds, mainly on the warm and crunchy side.

Also new is a Roland JC-120–inspired model called Jazz Amp. When set correctly, it sounds a lot like a JC-120, and it gives you a choice of chorus and vibrato effects that are similar—although not quite as warm, to my ear—to those on the original amp. I found that I had to be pretty careful with Jazz Amp's tone settings or it ended up sounding brittle and overly bright.

The Lead 800 amp model emulates a Marshall JCM-800 and includes all the same knobs. It provides high-gain, Marshall-type sounds that are more heavily distorted and sustaining than those on Guitar Rig 2.0's other Marshall model, Plexi.

The other new amp is Bass VT, an Ampeg SVT–like bass head. It's the first dedicated bass-amp model in Guitar Rig (technically, Tweedman is also a bass-amp model, but like the real Fender Bassman, it's likely to find more use as a guitar amp). Bass VT offers a range of tones, from bright-and-thin rock to round-and-fat reggae and a lot in between. You can even dial in distortion from it using its Gain control. In addition to its virtual knobs, Bass VT also has a 9-band graphic EQ, similar to that on certain models of the Ampeg SVT-Pro.

Native Instruments also added six new bass-amp cabinet models to pair with Bass VT, ranging from a 1 × 15 to an 8 × 10 configuration. In addition, it added several new mic models aimed at bass-cabinet miking.

I tried Bass VT with a Fender Precision and was able to get some very usable bass tones (see **Web Clip 1**). The addition of Bass VT won't change Guitar Rig's primary mission as a guitar modeler, but it does enhance the program's utility, giving you a number of choices for processing bass sounds.

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Effects Central

Ten new effects have been added (see **Fig. 3**). Highlights include Mezone, which is modeled on a Boss MT-2 Metal Zone pedal and offers a thick-sounding, harmonic-rich distortion. TransAmp emulates a Tech-21 SansAmp pedal and provides many impressive-sounding distortion options (see **Web Clip 2**). I used it in a rig with no amp or cabinet models, and like the box it emulates, it gave me some fat, distorted "direct" sounds. I particularly liked its California Amp setting.

Gain Booster lets you dial in up to 30 dB of boost, and it adds a little extra oomph to any tone. AutoFilter gives you plenty of options for auto-wah effects. Stomp Compressor is a smooth-sounding emulation of the Keeley Compressor, a boutique pedal from Robert Keeley Electronics.

Cry Wah is an excellent-sounding wah based on the Dunlop Crybaby. And Pro Filter is a synth-style filter that's great for automating with the new Modifiers.

Mod About You

The Modifier (MDF) components are a significant addition, opening up Guitar Rig 2.0 users to a wide range of beat-synced effects (see **Fig. 4**). The Modifiers modulate and rhythmically affect your sounds in a multitude of ways.

The LFO component introduces a low-frequency oscillator into your signal, and it's really easy to control its effect on the sound. You can choose from several waveforms, including Sine, Square, Saw, Triangle, and Random.

The Envelope component is an envelope generator that can be programmed using its large graphic breakpoint display. Step Sequencer lets you program up to 16 rhythmic control signals. Analog Sequencer also gives you 16 control signals, but they can be individually adjusted for level, which provides a lot more possibilities. Input Level generates a control signal that's triggered by the input of your guitar.

You can use one MDF or a combination of them, and each one can be assigned a target parameter to modulate by simply dragging-and-dropping its Assign control on top of the knob or button of an effect. You can assign multiple targets to a single MDF. With the exception of Input Level, all of the MDFs can be synced to your host's tempo (see **Web Clip 3**).

FIG. 3: Mezone, TransAmp, Stomp Compressor, and Gain Booster are among the new effects added in Guitar Rig 2.0.

FIG. 4: The Modifier components include LFO, Envelope, Step Sequencer, Analog Sequencer, and Input Level.

Programming the MDFs is relatively easy. You can find a lot of ideas for how to use them by checking out the presets in the Modifier bank.

The Loop Scoop

A powerful addition to Guitar Rig 2.0 is the Loop Machine component. It lets you record up to 99 layers of looped audio, which can then be exported—either layer by layer or as a mix—in WAV format. To get the most from Loop Machine, it's best to set one of the Rig Kontrol's footswitches to govern the Rec/Play/Dub function.

Once you get the hang of how to start and stop Loop Machine's record function at the right time, you can start seriously looping. You get options such as reversing one of the loop layers, comparing your new loop with a previously recorded one, panning your parts (on input), and automatically extending the length of the loop when overdubbing (great for soloing over your loop; see **Web Clip 4**). If you want, you can change sounds before recording each layer, which opens up a lot more sonic territory.

Every once in a while, when using Loop Machine, the audio dropped out for a fraction of a second. Although it was distracting, it appeared to have no impact on any layers I was recording.

Upping the Ante

When you activate Guitar Rig 2.0's High Resolution mode, it upsamples the audio, reducing aliasing and adding more definition in the high end. I found its effect to be noticeable, especially on high-gain patches. However, engaging High Resolution mode doubles the CPU load, so unless you have a really fast computer, you may find yourself using it only selectively.

Even at its normal resolution, Guitar Rig 2.0 requires a lot of CPU power. The more components you drop into

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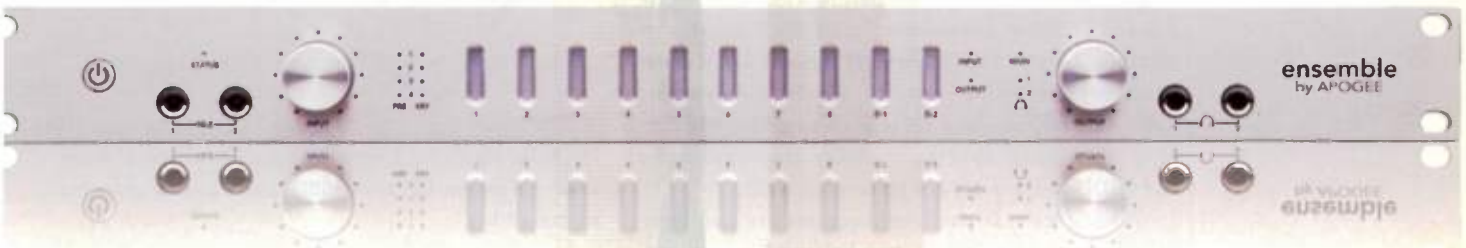

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your rig, the more it uses. When using Guitar Rig 2.0 as a plug-in, I found it helpful to freeze or bounce down the tracks I'd applied it to, once I'd dialed in the sound I wanted. That way I could still benefit from its sounds without too much stress on my processor.

Pedal of Metal

Much about the Rig Kontrol 2 pedal is different from the original. Besides having an entirely new look (see Fig. 5), it uses USB 2.0 to control the Guitar Rig 2.0 software. Not only does this USB capability make it much faster to set up than the Rig Kontrol 1, which used an analog control signal and was a bit tedious to get up and running, but it also gives it the capability to act as an audio and MIDI interface. It's bus powered as well.

Among its rear-panel connections are two high-impedance ¼-inch inputs, two balanced ¼-inch outputs, a ¼-inch headphone out, MIDI In and Out, a USB 2.0 port, and two pedal inputs for connecting external expression pedals and switches.

The Rig Kontrol 2's own expression pedal can be linked to virtually any editable parameter, and it has a toe switch for turning on and off effects like wah. You also get six programmable footswitches for stepping through patches or turning on or off effects or parameters. As with the previous Rig Kontrol pedal, programming is a cinch and is accomplished entirely within the Guitar Rig software.

FIG. 5: The Rig Kontrol 2 features a rugged metal casing, analog inputs and outputs, USB audio, MIDI I/O, an expression pedal, and six footswitches.

The Rig Kontrol 2 lets you input audio into Guitar Rig through its USB 2.0 port. The audio is then output through USB to the Rig Kontrol 2's analog outputs. These audio capabilities will be extremely handy if you're planning to use Guitar Rig 2.0 live with a laptop. You'll

be able to patch Guitar Rig's output directly into the P.A., using the Rig Kontrol's balanced ¼-inch line outs. Doing so is markedly preferable to using the flimsy ⅛-inch stereo output found on many laptops' audio cards.

In order to get the Rig Kontrol 2's audio I/O to work with the Guitar Rig 2.0 software, you must set it as both the audio interface input and output in Guitar Rig's preferences. Therefore, in a studio situation, all of your audio will have to come through its analog outputs (or be monitored through its headphone jack), rather than through whatever audio interface you normally use.

If you use a DAW that lets you specify multiple audio interfaces (like MOTU Digital Performer), you can work around that limitation. Simply set the Rig Kontrol as your input and your regular interface as your output.

If you're running Mac OS X 10.4 (Tiger), you could theoretically use the Audio MIDI Setup utility to construct an Aggregate Device that utilizes the Rig Kontrol 2 for input and the Mac's built-in audio for output. I tried this approach on Guitar Rig 2.0 in standalone mode, and as a plug-in in Apple Logic Pro, but was not able to get the aggregate driver to function correctly.

Buffer In

When you use the Rig Kontrol 2 as your audio interface and run Guitar Rig 2.0 as a plug-in, latency is controlled by the buffer setting of your host sequencer. When you run Guitar Rig in standalone mode, you have to adjust the latency slider in the software's preferences. When using my MOTU 828mkII and the M-Audio Ozonic as Mac and Windows audio cards, respectively, I was able to set the latency slider down to its lowest setting, 2 ms.

PRODUCT SUMMARY

NATIVE INSTRUMENTS Guitar Rig 2.0.1

amp-modeling software with hardware controller
$579
upgrade, $399
software-only upgrade, $119

PROS: Excellent new amp models. Bass VT model offers bass processing. Modifiers add tempo-synced effects. Rig Kontrol 2 is easy to set up. Loop Machine component adds multilayered looping. High Resolution mode provides improved sound quality.

CONS: Glitches from Rig Kontrol's USB I/O when latency set too low. Loop Machine exhibits occasional audio dropouts. Uses a lot of CPU power.

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However, on my G5 when using the Rig Kontrol 2's audio interface, once I got the slider below about 6 or 7 ms, I started to hear clicks and other audio artifacts. To be fair, the latency wasn't noticeable at 6 or 7 ms, so it wasn't necessary to go any lower.

My PC wouldn't let me set the latency any lower than 8 ms when using the Rig Kontrol's USB I/O, and at that setting I did notice a slight latency delay. It wasn't enough to disrupt my playing, but it was clearly there. What was odd was that when I used the Ozonic as the audio interface and set it to 8 ms, I didn't notice that delay. The only explanation I can think of is that perhaps the Rig Kontrol's Windows XP audio drivers aren't as efficient as the Ozonic's. Unless you're going to be using Guitar Rig in a live situation, you'll probably find it easiest to use the Rig Kontrol 2 only as a controller, and let your primary audio interface handle the audio I/O.

If you already own the Rig Kontrol 1, you don't necessarily have to purchase the Rig Kontrol 2 when you upgrade to Guitar Rig 2.0. If you don't want or need the features of the new pedal, you can save yourself $280 and just upgrade the software. That said, I do recommend getting the Rig Kontrol 2 if you can swing it. It's much easier to set up and gives you many more options than the original Rig Kontrol pedal. If you're buying the full version of Guitar Rig 2.0 (rather than upgrading from Guitar Rig 1.*x*), you can't buy the software without the pedal.

The Big Rig

With the Guitar Rig 2.0 release, Native Instruments has taken an excellent product and made it even better. The fine new effects and amp components make its model collection even more formidable. Adding the bass amp gives the software another layer of usefulness. The Modifiers offer a whole new dimension of tempo-synced control, providing the tools to really stretch out your sonic palette.

If you already own Guitar Rig, you'll find a wealth of desirable new features in this upgrade. If you're not already an owner but are shopping for an amp- and effects-modeling product, you'll definitely want to give Guitar Rig 2.0 heavy consideration.

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Mike Levine is an EM senior editor.


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FIG. 1: TERA has everything the dedicated synthesizer fanatic could desire: knobs, modules, signal routings, waveforms, filters, complex envelopes, and more.

VIRSYN TERA 3.1 (Mac/Win)

A playground for sound designers.

By Jim Aikin

With so many great virtual analog synths on the market, finding the one that's right for you is getting harder. The ideal synth would include not only multiple analog-style oscillators and a couple of resonant filters, but also other features that can take sound in new directions.

Calling VirSyn TERA 3.1 a virtual analog synth would be selling it short. Yes, it does virtual analog. Also on tap are FM and additive synthesis, rudimentary sample playback, waveshaping, formant filtering, rhythmic multisegment envelopes (four of them), and a couple of arpeggiators. The 16 multitimbral parts can be split and layered for monstrous thick sounds or kept separate to sequence a multitrack song. The effects are basic but useful. And let's not forget the built-in multitrack step sequencer.

> Very few software synthesizers offer this much sound-shaping power.

TERA was reviewed in the April 2002 issue of EM (when it was known simply as VirSyn) and included in the article "Virtual Workstations" in March 2003. To save you the trouble of digging through back issues, this review will cover the program from top to bottom (though out of necessity I'll skip over some details). The new features in version 3 include simple multisample layouts for the oscillators, a second vowel-formant filter, a basic arpeggiator to supplement the more complex arpeggiation features found in the step sequencer, new envelope modes and stereo routings, new types of synthesis for the spectrum oscillator, an internal voltage-controlled amplifier for amplitude modulation, and numerous other goodies.

Lay of the Land

TERA can run in standalone mode or as a VST, AU, or RTAS plug-in. Installation requires only the code printed on the

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The 128-note polyphony tone generator, Studio Connections compatibility, mLAN expansion slot, and PLG expandability give it all the synthesis power and control capabilities of our Motif ES line. That's why we feel the S90 ES is the perfect balance between synthesizer and piano.

THE PERFECT BALANCE OF SYNTHESIZER AND PIANO

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CD, with no online authorization. Both a printed manual and a PDF version are included. Installation in my PC went smoothly, although I had to copy the TERA DLL file manually into my VST folder.

The user interface sports plenty of knobs and drop-down menus, but it lacks standard menu headers (see **Fig. 1**). The file menu is tucked away under a floppy-disk icon, and various areas have context-sensitive pop-up menus containing copy and paste functions. There's no undo command, and when you quit the program, TERA won't prompt you to save edited patches or sequences.

Because TERA's voice design is so complex as to be intimidating to the uninitiated, half a dozen simplified front panels are provided. Each of them sets out the necessary controls for a particular type of synthesis—virtual analog, FM, waveshaping, and so on. You can easily port the sounds created in these panels over to the main panel if you want to combine them with the other modules.

The factory sound set shows off everything from delicate harp and glassy piano to massive pads, delicate washes, funky rhythms, frightening special effects, distorted and vintage leads, solid and colorful basses, classic keys, strings, organs, electro percussion, and plenty of presets that defy categorization. It's a bit tricky to get an exact count of the included programs, because they're stored in 27 different bank files, many of which are less than half full. More than 35 MB of sampled waveforms are supplied, some acoustic and some borrowed from VirSyn's other synths, Cube and Cantor.

Still can't find a sound that inspires you? Click on the Slot Machine icon in the upper right corner of the panel, and TERA will generate a random patch. I found a very high percentage of the sounds produced this way to be usable, probably because the program recombines settings from existing presets rather than rolling the dice with each parameter.

TERA can address eight stereo outputs when used as a VSTi within a host sequencer (see **Web Clip 1**). It also has its own 16-channel step sequencer with numerous features, including the ability to switch patterns during playback from a MIDI keyboard. The sequencer hasn't been upgraded significantly since version 1.0, other than gaining the ability to transmit MIDI to external devices (in Windows only). It's not truly competitive as a composing and recording environment.

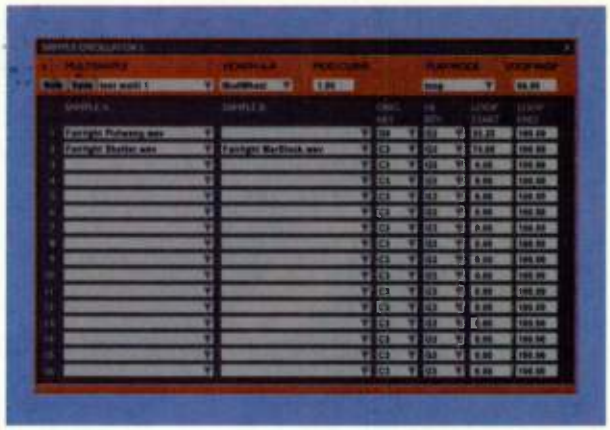

FIG. 2: Multisample playback has been added to the oscillators in TERA 3.

Finding Your Voice

TERA has four sound sources: three standard oscillators and a more complex spectrum oscillator. In addition to two resonant multimode filters, it has a peak/notch filter and a morphing vocal-formant filter. Other signal-processing options include a waveshaper with preset and custom shaping functions, a wave delay for physical-modeling effects, and two ring modulators that double as VCAs.

In addition to MIDI control messages, the modulation sources include four standard DADSR envelope generators, four multisegment envelopes with up to 64 breakpoints each, and four LFOs. Up to 20 modulation routings can be programmed in each preset.

Audio routing is handled by a 5-input mixer that produces both a full mix of inputs 1 through 5 and submix outputs of 1 through 3 and 4 and 5. With so many audio inputs to choose from (the oscillators, the filters, the waveshaper and ring modulator, and so on), having a larger mixer might seem useful, but in practice I found that I never ran out of mixer channels before I achieved the sound I was aiming for.

Each preset includes distortion, delay, and chorus and flange effects, which are all fairly basic. In addition, TERA has a global chorus and reverb, which are shared by all of the multitimbral parts. Given how much RAM most computers have these days, it's unfortunate that TERA's delay lines are capable of no more than a single quarter note of synced delay at a tempo of 81 bpm or greater. The maximum delay time is 749 ms.

Oscillations

The three standard oscillators give you a choice of 64 preset waveforms, as well as custom wave and multisample options. The custom wave is designed in a window where you can specify the amplitudes of more than 200 partials, though only partials 1 through 32 can be edited individually (the others are grouped).

PRODUCT SUMMARY

VIRSYN TERA 3.1

software synthesizer
$339

PROS: Extremely versatile sound engine includes additive, FM, virtual analog, and other technologies. Highly patchable semimodular design. Syncable multisegment envelopes.

CONS: The documentation could be more informative.

FEATURES
EASE OF USE
QUALITY OF SOUNDS
VALUE

MANUFACTURER
VirSyn
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TERA antialiases the composite waveform, so playing up the keyboard after choosing lots of high partials produces no artifacts. You can generate six detuned copies of any wave except the user samples using the 6x button and its associated Spread knob. All of the single-cycle waves, even those you design yourself, can be made more colorful with wave modulation (equivalent to pulse-width modulation, for old-school analog aficionados).

The multisample setup is bare-bones but functional (see Fig. 2). Though creating a realistic multisampled electric piano is beyond TERA's reach, sampled drum kits work well, with the added advantage that you can process the samples through TERA's filters, waveshaper, and other processors. You can use up to 16 keyboard zones, each of which can hold two stereo samples. The two samples in a zone can be crossfaded using Velocity, the mod wheel, or Aftertouch. You can switch looping on or off (globally, not per sample), and a loop crossfade parameter (also global) will help smooth out the loops. Loop start and end points can be adjusted by a percentage; the same settings will be used for both samples in a given zone. Because of the limitations of the looping parameters, TERA shouldn't be thought of as a substitute for a full-featured sampler. When you create a multisample, TERA conveniently copies the audio files to a new directory so that they'll always be available with the preset.

The spectacular-sounding spectrum oscillator is TERA's additive-synthesis engine. Its features are not too well documented in the rather terse manual, to the point where I thought one of the knobs wasn't working until I poked around for a while. You can draw two different additive spectra, called Osc A and Osc B, with the mouse. The Morph knob, which can be modulated, blends the two. Each of these virtual oscillators passes through its own filter, which can have up to 128 peaks and notches across the frequency spectrum. Filter contours are also edited graphically. The result: Individual partials can change amplitude as you play up or down the keyboard, depending on whether they happen to hit a filter peak or a filter notch (or something in between). In addition, you can use the Spectrum knob, which itself can be modulated, to sweep the filter contours up and down. The effect can be both complex and beautiful in a shimmering electronic way, though it's hard to describe in words (see Web Clip 2).

The spectrum oscillator can produce up to six detuned signals for a truly broad sound. Here's where it gets tricky, though: there are two Spectrum knobs, and

FIG. 1: The Portico 5042's front panel features continuously variable rotary controls and button-style switches; the latter are backlit by status LEDs when depressed.

RUPERT NEVE DESIGNS Portico 5042

Heat wave in a box.

By Michael Cooper

For the past dozen years or so, I've searched for a box or plug-in that could deliver the big, warm sound of a large-format analog tape recorder, without the hiss. Most products I've tried have failed. The Rupert Neve Designs Portico 5042 Two-Channel "True Tape" Emulation and Line Driver comes closer than most. Unlike products that use DSP for their emulation, the 5042 incorporates the actual record and replay circuitry of an analog deck along with a tiny magnetic head. All that's missing in the audio path is the tape itself.

Plays Well with Others

The dual-channel 5042 belongs to Rupert Neve Designs' new line of affordable, all-analog signal processors dubbed the Portico Series. Products in the series are designed to either work independently or be interconnected to form a larger system with many of the capabilities of an expandable, modular production console. The 1U, half-rack 5042 features rubber feet for tabletop placement. Alternatively, units can be rackmounted (singly or two side by side) or fitted into the company's 8-Way Vertical Rack Frame using optional kits.

Identical controls and metering grace each independent channel (see Fig. 1). A continuously variable rotary Trim control, positioned immediately after an input transformer in the audio path, boosts or cuts gain by as much as 12 dB; the 0 dB gain setting reflects unity gain with processing disabled. When the Engage Tape button is pushed in, the output of the Trim stage is sent to the tape-emulation circuitry, for which a continuously variable rotary Saturation control provides additional gain as needed. An 8-segment multicolored LED bar graph displays level either posttrim or post-saturation, depending on the setting of an associated meter-select switch.

A front-panel switch toggles between 7.5 ips (inches per second) and 15 ips emphasis and deemphasis; these settings emulate the electronic record and replay characteristics and distinctive sonic qualities of an analog tape recorder operating at tape-transport speeds of 7.5 or 15 inches per second, respectively. Another switch sends the processed audio signal to jacks on the rear panel. The front-panel switches are all buttons, which are backlit by status LEDs when depressed. The meter-select and tape-speed buttons don't have screened symbols to indicate which position is for which setting, but I quickly intuited the setup by looking and listening.

The manufacturer decided to forgo hardware bypasses for the 5042 in deference to its line-driving amplifiers. These feature proprietary I/O transformers that impart their own subtle sonic conditioning to signals passing through the unit, whether or not the tape-emulation processing is engaged. (Tape emulation is bypassed when the Engage Tape button is out.) The

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PORTICO 5042 SPECIFICATIONS

Line Amp	
Frequency Response, Main Output	–0.50 dB @ 10 Hz, –3 dB @ 200 kHz (measured at +10 dBu, trim @ unity)
Maximum Output Level	+25 dBu
THD + Noise	<0.0015% (@ 1 kHz, +20 dBu output level, no load)
Crosstalk	better than –90 dB @ 16 kHz
Tape FX	
Frequency Response	7.5 ips: –3 dB @ 16 kHz; 15 ips: –3 dB @ 20 kHz
Maximum Output Level (trim @ unity)	saturation at min.: +25 dBu; saturation at max.: +6 dBu
THD + Noise	approx. 1–2% 2nd and 3rd harmonic below 1 kHz
Crosstalk	better than –80 dB @ 16 kHz (maximum saturation)
Dimensions	9.5" (W) × 1.73" (H) × 8.5" (D)
Weight	8.2 lbs.

5042 incorporates Class A circuitry throughout its audio paths, which are unbalanced internally (meaning that single-sided amplifiers are used to reduce noise).

It Takes Connections

Each channel features an input and output using balanced XLR connectors on the 5042's rear panel. Each channel also sports two unbalanced, high-impedance buses on ¼-inch TRS phone jacks (see Fig. 2). As more Portico Series products are released, you will be able to connect them together in various configurations by way of their bus jacks. That will allow you to build an expandable, modular recording and mixing system. The 5042 is planned to interface with the 5014 stereo-bus mixer and the 5043 2-channel compressor/limiter, neither of which had been released at the time of this writing. The two bus jacks for each 5042 channel are normaled together, allowing one to be used as an input and the other as an output so that multiple units may be daisy-chained. That's useful for busing several tracks to a common compressor, for example.

A power switch and a DC input jack for the included external power adapter round out the 5042's rear panel. Multiple 5042s can purportedly be powered from an optional P-2 power supply or a car battery, suggesting use in sound-reinforcement or field applications.

The Heat Is On

Patching audio through the 5042, I quickly discovered an undocumented feature: the unit's top red LED lights to indicate clipping, and it remains lit longer for higher levels of clipping. I also found out that as long as the Engage Tape button is pressed in, the tape-emulation circuitry receives input—often at very high levels—even with the Saturation control turned all the way down.

In all cases, turning up the Saturation control provides negligible gain boost at the unit's output. That's because the 5042 was designed to automatically reduce the gain of its replay amplifier by an amount equal to the additional gain sent to its magnetic tape head. In short, you can dial in increasing levels of tape warmth and compression without having to compensate by turning down output levels. In fact, the 5042 doesn't include output-level controls.

Although boosting the Saturation control doesn't boost the unit's output level, it can cause the tape-emulation circuitry to clip if you aren't careful. The 5042's line-driver audio path has a lot more headroom than the tape-emulation circuitry, so high signal levels at the 5042's input usually require a low or even minimum Saturation setting (unless, of course, the Trim control is lowered substantially).

PRODUCT SUMMARY

RUPERT NEVE DESIGNS — Portico 5042 Two-Channel "True Tape" Emulation and Line Driver

tape-emulation hardware
$1,795

PROS: Fully independent channels. Emulates 7.5 ips and 15 ips tape speeds. Can control the amount of tape saturation. Trim control allows use with a wide range of input-signal levels.

CONS: Headroom capability compromises gain staging with high-output mixers in 2-bus applications. No makeup-gain controls. Somewhat pricey.

FEATURES
EASE OF USE
AUDIO QUALITY
VALUE

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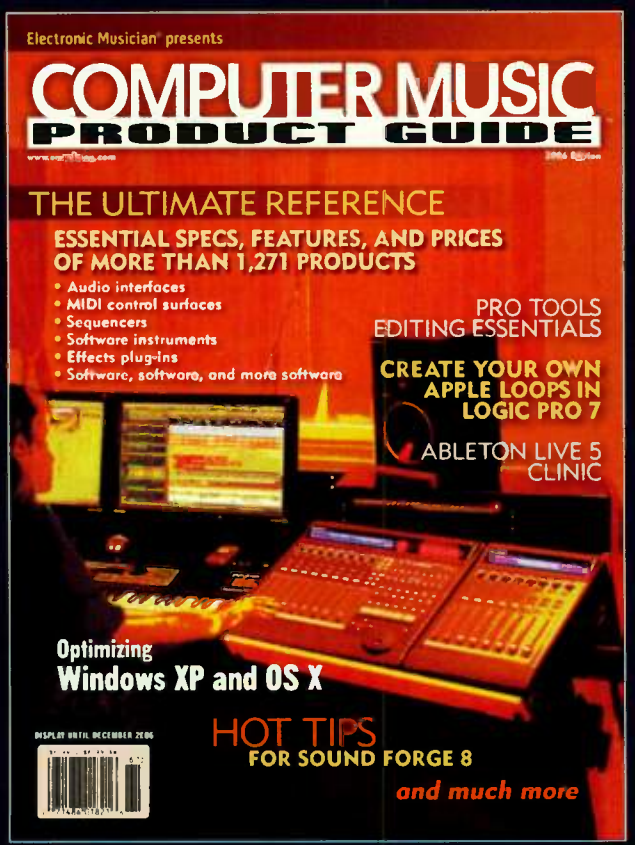

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I connected the 5042 to my Yamaha 02RV2 mixer's +4 dBu stereo analog outputs to process a stereo mix. The 15 ips setting provided a little less rounding in the highs, more-transparent mids, and less head bump (bass boost) in the bottom end than the 7.5 ips setting. This made 15 ips my preferred setting for processing mixes of well-recorded material that didn't need extreme processing, and for which maintaining transparency was a primary concern. Both ips settings lent a pleasing, slightly compressed sound to the processed mixes.

However, the 5042's headroom—while much higher than that of any tape recorder ever made—presented a problem when used in mixing applications with my high-output mixer. My 02RV2's +4 dBu stereo outputs produce +26 dBu at 0 dBfs (all 02RV2s are slightly different in this regard), a level that exceeded the 5042's +25 dBu maximum output level. That caused clipping unless I lowered the Trim control below unity (0 dB).

When using the 5042 to mix well-recorded material at the 15 ips setting, I typically used less than two-thirds of the saturation effect available before clipping. Even with the Saturation control set to its minimum setting, I had to lower the Trim control to at least 3 dB below unity to reduce the amount of processing to this moderate level. I then had to boost the signal by the same amount downstream of the 5042 to make up for the lost gain—not good gain-staging practice. This problem may not arise for you if your mixer's stereo-bus output is considerably lower than that of an 02RV2 (which is relatively hot). In any case, the 15 ips setting noticeably warmed up the mix by softening the highs, broadening the mids, and rounding the mix with subtle compression, all the while keeping detail largely intact. The processed mix sounded a tad warmer and fatter overall.

I preferred the 7.5 ips setting and full saturation for mastering a poorly recorded, thin, harsh mix. That tamed the original mix's edginess and fattened up the sound considerably. However, I found myself wishing I could obtain a more dramatic effect than was possible with the 5042. The manual states, "We did not set out to make a 'bad' tape recorder!" But I prefer having enough rope to hang myself for those instances when brute force is necessary.

Cooking Individual Tracks

The 5042 interfaced easily with a MOTU HD192 I/O box (which outputs much lower levels than most mixers' stereo buses) and my DAW (MOTU Digital Performer). I kept the 5042's Trim control at 0 dB most of the time and routinely preferred using the more dramatic 7.5 ips setting and full saturation when processing kick, snare, bass, and electric-guitar tracks.

The 5042 did an excellent job of warming up a thin, harsh electric-guitar track, softening piercing highs, fattening thin mids, and adding pleasing compression. After receiving the 7.5 ips treatment, electric bass sounded fuller and more thunderous, due in part to a dramatic boost in lower bass frequencies wrought by the processing. On the other hand, the bass did not sound quite as tight. Combining the processed bass sound with

the original digital track sounded incredible—ballsy, yet defined. On kick and snare tracks, the 5042 added girth to bass and lower-midrange frequencies, but also dulled highs and the snap of transients. Combining the processed kick and snare tracks with their originals gave the best of both worlds—punchy and fat drums.

I didn't like what the 5042 did to lead vocals. Even with very moderate processing, the track lost too much focus for my taste. The effect sounded much like the added proximity effect from a cardioid mic, causing blurriness and adding a little unwanted bottom end. (I prefer miking vocals in omni mode whenever feasible.)

Warming Trend

If you want to add only a subtle effect and maintain optimal gain staging, the 5042 works best when placed on the outputs of devices producing no more than about a +23 dBu level. A makeup-gain control—omitted on the 5042—would have been useful to fine-tune levels going to fixed-gain I/O boxes; input levels at a MOTU HD192 (placed after the 5042's output) often fell 2 to 4 dB shy of 0 dBfs even with the 5042's meters showing full saturation.

Does the 5042 sound like an analog tape recorder? There's no definitive answer, because all tape recorder models sound different. The 5042 doesn't sound quite like any of my analog tape recorders of yore—without the actual tape, part of the full effect is missing. But forgetting about what the 5042 isn't, and evaluating it for what it is, the verdict must be that this box does a great job of warming up individual tracks and full mixes.

FIG. 2: Bus jacks on the 5042's rear panel accommodate interconnection with other modules in Rupert Neve Designs' Portico Series.

Michael Cooper offers out-of-area clients flat-fee mixing and mastering services via Fed Ex delivery. He can be reached at coopermb@bendbroadband.com.

FIG. 1: Garritan Jazz and Big Band is a plug-in and standalone virtual instrument that delivers more than 50 sampled instruments, ranging from saxes and trumpets to piano, drums, and guitar.

GARRITAN Jazz and Big Band 1.15 (Mac/Win)

A sampled ensemble that's close enough for jazz.

By Marty Cutler

The press release accompanying my review copy of Garritan Jazz and Big Band states that it is not intended to replace live jazz musicians. Garritan cites the nuanced, improvisatory vocabulary of rhythm, timbre, and articulation that characterizes the music as evidence of the futility of the task. Who am I to disagree? Gary Garritan and his team have taken extraordinary measures to provide a hyperrealistic set of instruments for jazz arrangers and just about anyone with a studio that can't host Maynard Ferguson's band.

It's hard to take a MIDI arrangement for big band seriously if it sounds like the world's largest accordion rather than a finely honed ensemble of individual players who can shape the tone colors in different ways. Jazz and Big Band (which I'll call J&BB) offers a set of clever resources to avert the accordion syndrome, however. It is considerably more ambitious in its scope than a collection of brass and woodwind instruments; you get basses, guitars, electric and acoustic pianos, drums, and percussion, too.

It's hard to take big band seriously if it sounds like an accordion.

Getting Jazzed

J&BB's program and sound content come on a single DVD-ROM (see Fig. 1). Installation is simple, concluding with a challenge-and-response procedure. The 2.7 GB sample collection uses Native Instruments Kontakt Player, which offers fewer user parameters than some sample players but allows Garritan to provide more-complex MIDI-control programming. In a departure from typical Native Instruments–driven plug-ins, J&BB lets you access updates on Garritan's Web site, and a major update was already available when I installed the program.

The plug-in accommodates a

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variety of hosts: AU, VST, and RTAS in Mac OS X, and DirectX, RTAS, and VST in Windows XP. You can also use ASIO in Windows and Core Audio on the Mac to run J&BB as a standalone instrument. Because most notation programs do not support any of the aforementioned hosts, Garritan has devised GPO Studio (Mac/Win, free), a clever plug-in host program that can load multiple instantiations of J&BB and Garritan Personal Orchestra.

I tested J&BB on my dual-processor 1.42 GHz Power Mac with OS X 10.3.9 and 2 GB of RAM. I auditioned the software as a standalone program and as a plug-in with Apple Logic Pro 7.1, MOTU Digital Performer 4.61, Steinberg Cubase SX 2.2, and Ableton Live 5.0.2. Additionally, I used the instrument as a target for PG Music Band-in-a-Box 12.

Band of Druthers

You choose your patches by clicking on the Load button above the user interface's pitch-bend and mod wheels (see **Fig. 2**). A drop-down menu lets you navigate to your folder of choice, or you can click on the button's upper or lower edges to load the next program in the folder. Folders are organized by general instrument type: Saxes and Woodwinds, Trumpets, Trombones, Tuba, Guitars, Keyboards and Vibes, Basses, and Drums and Percussion. Folders within the general instrument categories contain patches with customized controller mappings compatible with notation programs, such as Finale and Overture; a folder of Lite instruments; a mysterious Place Holder folder with no contents; and a folder of Multis for various ensemble types.

For the most part, J&BB encourages the user to build horn sections from individual instruments; you will find no composite brass ensemble patches. In fact, the majority of the brass and woodwind patches are steadfastly monophonic. The reasoning behind that apparent limitation is practical: channel-based MIDI data wouldn't let multiple sax voices, for example, behave independently. Instead of furnishing ready-made ensembles, J&BB gives you plenty of leeway to carve a dynamic timbral and rhythmic identity for each virtual player.

Apart from a variety of modulation tools to reinforce each instrument's individuality, you get multiple models of the same instrument. For example, the saxophones consist of Buescher, Conn, Selmer, and Yamaha instruments. For users who require polyphonic wind-instrument patches, the version 1.15 update gives you a folder of Lite instruments for each component of the horn section, with programmable polyphony.

You will need to use the Lite folder if you're using Band-in-a-Box, because that program often generates brass-section parts on a single MIDI channel. Also, using Band-in-a-Box requires that you set up your patches in advance. Kontakt Player can play a maximum of eight different parts, which means that more-ambitious orchestrations will require additional instantiations of the plug-in.

Control Your Expression

To maximize J&BB's potential, you will want to use the single-voice-per-channel approach for brass and woodwinds. The control options are copious and go a long way toward authentic emulation. Unlike other sample players with the Native Instruments imprint, J&BB offers no built-in delay, reverb, chorus, or other signal-processing amenities. Instead, Kontakt Player devotes the bulk of its DSP resources to clever manipulation of sample-playback techniques using MIDI-control conventions, most concentrating on the brass and woodwind instrument patches. For example, Control Change (CC) 64 lets monophonic instruments play legato lines without retriggering the attack—a crucial element in producing realistic

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wind-instrument lines. Keyswitch instruments use MIDI Note Numbers below the playable range to alternate between various muted and wide-open sounds.

Other CC messages invoke idiomatic techniques, such as breath noises, falls, and *doits* (rapid upward pitch changes). CC 18 introduces the rapid flutter-tonguing effect known as *growl;* used sparingly, that added lots of expression to some trombone noodling I recorded (see **Web Clip 1**). You can even dial in key click and valve-noise release loops, although the effect is easily lost in ensembles (see **Web Clip 2**). You can control the most salient characteristics of a real-world performance with the most commonplace hardware controllers, such as mod wheel, key pressure, and sustain pedal. However, because some performance artifacts occur on a note-by-note basis in the real world, you are better off inserting individual events into a sequence rather than playing them in using a controller.

FIG. 2: Although Jazz and Big Band lacks the EQ and effects you'll typically find in Kontakt Player–based software, it more than compensates by offering a wealth of expressive capabilities using MIDI controller data.

The way that J&BB handles volume and timbre for brass and woodwind instruments takes some getting used to; their default volume is zero, with Modulation (CC 1) controlling volume and brightness. Velocity controls attack time only. That's a very sensible combination, as sustained notes on wind instruments usually exhibit a proportional, continuous increase in brightness and volume that Velocity can provide only at a note's onset. MIDI Volume (CC 7) sets the instrument's volume ceiling. Although conventionally the modulation wheel invokes vibrato, J&BB relegates that task to Aftertouch.

Most of the programming is musical and convenient, but a few settings were not to my liking. I was surprised by the default vibrato rate for brass and woodwind instruments, for example, which was fast and reminiscent of the Sidney Bechet era rather than that of more recent playing techniques. Nonetheless, CC 17 alters vibrato rate, with lower values producing a slower vibrato. The vibrato's depth sounds quite musical, with none of the exaggerated warbling that's so characteristic of abused LFO modulation. Basses and guitars had very long releases, but fortunately, you can adjust release time to taste. I am far more comfortable regulating note releases and sustain using Note Off messages. The ability to adjust those parameters, however, makes long releases an extremely minor issue.

Strokes of Genius

Wind instruments are not the only instruments that benefit from expressive Control Change assignments; the electric piano and vibraphone patches, for instance, feature tremolo controls. Most of the instruments have two Variation controls: the first randomly regulates slight to exaggerated variations in pitch, and the other produces timbral differences between one note and the next. Most drum kits are already programmed to avoid the machine-gun effect, but slight pitch variations can also aid realism.

For drum sounds, brush stirs use Aftertouch as a switch to simulate figure-eight brushstroke patterns in different directions. Getting comfortable with this technique took a little bit of time (mostly due to the stiff response of my controller's key bed) and generated large amounts of Aftertouch data, but provided a nice tactile, expressive component to the part. More remarkably, the tempo of the brush stirs accommodates your host's tempo.

Too often, sampled-instrument libraries are guilty of indifferent and sketchy documentation, supplying only a list of CC assignments, with little in the way of explanation behind their musical applications. By contrast, J&BB's manual is hands down the finest I have seen in a long time. It explains not only controller-message assignments, but also the real-world instrumental techniques they allow you to emulate and how to pull them off convincingly. The manual provides extensive notes that indicate control assignments for every instrument. There's much more, including essays on the history of jazz.

I'd be remiss if I didn't mention that the Garritan Web site hosts a very active support community, along with terrific audio examples and tutorials. Gary Garritan and his cohorts are frequent participants.

PRODUCT SUMMARY

GARRITAN Jazz and Big Band 1 15

soft sample player/sound library
$259

PROS: Extensive library of great-sounding instruments. Plentiful and thoughtful array of expressive tools. Terrific user manual and online support. Versatile sound set and programming suitable for any jazz style.

CONS: None worth mentioning.

FEATURES	
EASE OF USE	
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www.garritan.com

Gratuitous Sax

J&BB's sound quality and the variety of instruments are uniformly excellent. The assortment of brass and woodwinds is large enough to create realistic ensembles. The selection of saxophone types is startling—in addition to baritone, tenor, and alto saxophones, you also get subcontrabass, contrabass, bass (two choices), C-melody, mezzo-soprano, soprano (again, two choices), and sopranino saxes. Brass instruments come with a variety of mutes, including Harmon, plunger, and cup, and you can modulate between plunger and open notes on one trombone and one trumpet patch (see **Web Clip 3**).

Sampled guitars are one of my personal red-flag instruments, and I found J&BB's to be quite good when played with a MIDI guitar (convincing keyboard-generated guitar parts are a tough nut to crack). Like the bass instruments, though, the guitar patches usually required shortening the envelope's release stage.

With its subtle ambience and sparkling brilliance (CC 20 adjusts brightness), the acoustic grand piano sounds terrific even in exposed situations. You also get a very expressive electric piano, hard- and soft-mallet vibraphones, and even an accordion (Milton DeLugg or Art Van Damme, anyone?).

Band Leader

Jazz and Big Band is a great companion for any composer or arranger who wants to hear his or her charts realized using sampled instruments that can respond to idiomatic performances. Creating instruments that are perfect stand-ins for the real thing is at best a quixotic task, especially for brass and woodwind instruments. Even on a single held note, many acoustic instruments go through radical timbral evolution—more than the most extensive instrument library can provide. Garritan's software does not aim to replace the real thing, but it still goes to extraordinary lengths to endow its instruments with as realistic a performance as current sampling technology will allow.

Jazz and Big Band works best as a whole, providing realistic ensemble parts and solo instruments with a wealth of expressive capabilities. Whether you're arranging for a small fusion band or plotting the next incarnation of the Duke Ellington Orchestra in your bedroom, J&BB is a terrific tool that should find its way into every jazz education program in the country. I recommend it highly.

EM WEB CLIPS

EM contributing editor Marty Cutler lives in northern New Jersey with his wife and five cats.

ROLAND

CD-2

By Marty Cutler

Not every musician needs a computer-based DAW with a ton of tracks, instruments, and plug-ins. You might be content to build tracks one at a time with a hardware system you can plug in almost anywhere. Perhaps you just want to patch into your band's P.A. system and record gigs with a minimum of setup. The simple design of Roland's CD-2 ($799) easily accommodates those tasks with no-fuss, high-quality recording. The unit also offers several other useful features. Although Roland markets it primarily as an education tool and location recorder, the instrument's versatile capabilities make it a good tool for building tracks anywhere.

The CD-2 is not a field-recording unit; it can't run on batteries. It can, however, read files from CompactFlash (CF) cards formatted for Edirol's R-1, an eminently compact field recorder. The CD-2 records 24-bit, 44.1 kHz audio to CF cards with capacities of up to 2 GB. It can also record 16-bit, 44.1 kHz audio directly to its built-in CD-RW drive. You can conserve recording time with several levels of compression or record audio in WAV format. Recording WAV files to a 2 GB card yields roughly 196 minutes of recording time. Because of the two types of recording media, the CD-2 affords interesting creative possibilities for the solo musician; for example, you can overdub to the CF card while the CD plays back tracks.

Roland's CD-2 recorder offers a novel overdub recording capability, using either CompactFlash or CD-RW media.

In and Out

The CD-2's I/O options are flexible. Two built-in condenser mics are located at the top front of the unit. The front panel hosts a pair of balanced ¼-inch line jacks and an unbalanced ¼-inch high-impedance instrument input. On the left-hand side of the unit are a pair of balanced XLR jacks and a switch for 48V phantom power. The rear of the unit sports stereo RCA line-in jacks next to RCA aux outputs. A ¼-inch stereo headphone jack is provided in front, and stereo speakers are built in at the top rear of the unit.

A single MIDI Out port lets you play back Type 0 Standard MIDI Files (all MIDI channels on a single track) from CD and trigger external synths. MIDI, however, seems like a design afterthought, because the CD-2 cannot record audio and play back MIDI files simultaneously. Despite the number of inputs, recording to the CD-2 is always stereo, and you can use only a single input pair at a time. However, you can switch the leftmost front-panel ¼-inch input between the low- and high-impedance jacks, letting you record, for example, vocal and electric guitar tracks simultaneously.

The redundancy of recording controls makes the process simple. On the left-hand side of the device are record and playback controls for CF. CD-RW recording buttons are on the right-hand side. Dedicated buttons control many of the other recording functions. Other tasks are relegated to the CD-2's menu system, viewed on a small but clear 16-character LCD. You scroll the data knob to the location in the menu you want, and hit the Enter button. The Exit button backs you out to the top level.

The CD-2 provides several amenities, including a programmable metronome, CD-track looping, the ability to adjust pitch and speed independently, and a nice-sounding collection of built-in, preset effects for recording and mastering. Recording effects are applied on input and fall into three main categories: Dynamics, Vocal, and Guitar. As always, Roland's guitar effects are very good and include delays, amp modeling, pitch-shifting, and multi-effects patches. You can apply some effects to a single channel, letting you use, for example, an amp simulation on one input and a reverb on another, a handy aid for recording guitar and vocals simultaneously.

Mastering effects run the gamut from compressors and limiters to delays and modulation-type effects. Neither the recording nor mastering patches are editable, but Roland thoughtfully covered a lot of ground, from meat-and-potatoes effects to imaginative, over-the-top algorithms.

For the Record

Getting from your first simple track to finalizing a stereo master is a streamlined process: set input levels, apply effects, hit the record and play buttons, and you're off. Overdubbing creates a new stereo track for the new material. There is no multitrack editing, virtual tracks, or comping. This approach requires careful tweaking of levels to achieve a good balance between the overdubbed audio and the previously recorded track. (You can always use the Erase button and return to the previous recorded state.)

The CD-2's limited choices can make for a liberating experience, especially if you're eager to get your ideas down quickly and with a minimum of fuss. The recorder's sound quality is quite good, and although I wouldn't want to rely on the built-in condenser mics for anything other than a quick demo, they worked fine when I wanted to dash off a quick overdubbed banjo duet.

The CD-2 would appear to face tough competition from portable digital studios, including some made by Roland and Boss, but the simple sound-on-sound modus operandi of the CD-2 puts it in a no-frills recording class of its own. Check it out and see if it suits your recording style.

Value (1 through 5): 3
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FMR AUDIO

Really Nice Levelling Amplifier RNLA7239

By Orren Merton

EM ★★★★★ hot pick

FMR's Really Nice Compressor RNC1773 has a reputation for giving high fidelity and transparent compression for a low price ($199). FMR's latest dynamics-shaping offering is the Really Nice Levelling Amplifier RNLA7239 ($249), a compressor built around a Blackmer VCA-based gain element that imparts its own color to the sound, unlike its more transparent sibling. Because of the tonal color, FMR decided to call the RNLA a leveling amplifier, both to highlight its different circuitry and to differentiate it from the RNC.

Really Nice Design

The RNLA retains the aluminum casing, dimensions, knobs, and connections of the RNC, although the RNLA's knobs are bright red. The Threshold knob varies the threshold of compression from –40 dBu to +20 dBu. The threshold can be very effectively set thanks to the RNLA's excellent 8-LED gain reduction meter. I can't say enough good things about the gain reduction meter, which works better than the meters on any product more than five times the RNLA's price.

The Ratio knob offers a range of 1:1 to 25:1. As you would expect, increasing the input level both compresses the signal and adds more color. The Attack and Release knobs let you adjust how quickly the RNLA compressor will engage and how long it will hold on to the signal, respectively. I found the attack times to be fast enough for drums and guitar tracks with multiple transients.

A very nice feature of the RNLA is the tiny Log Rel button, located between the Attack and Release knobs. For signals with very fast transients (drums, for example), engaging the Log Rel attempts to restore some punch by accelerating the release time as a function of the gain reduction amount. I tested this by playing some drum loops through the RNLA with the Log Rel button engaged and was quite pleased with how it brought the loops' punch back. The output Gain knob varies from –15 dB to +15 dB with a detent at zero, and the RNLA features a true "hard bypass," so even without power, you can still get signal out of the RNLA.

The RNLA offers two inputs and two outputs, making it useful for either mono or stereo sources. Because it offers only one set of controls, the unit cannot operate in a dual-mono mode in which each channel is processed separately. The inputs are unbalanced, which I normally would complain about. However, in this case, I'll make an exception: the inputs double as TRS inserts, so you can connect them to the TRS insert jacks of mixers and interfaces simply with a TRS-to-TRS cable, eliminating the need for a Y-cable. I think FMR's input design is ingenious and definitely consider it an important feature, but nonetheless I wish an alternate version with balanced inputs were available for those

FMR Audio's Really Nice Levelling Amplifier uses a gain element that gives the unit a distinct sonic character.

of us with balanced-I/O project studios. I should mention, however, that the RNLA is a very electrically quiet device, and I didn't notice any noise or problems using its unbalanced inputs.

The RNLA does offer balanced outputs, as well as a sidechain insert. When the sidechain is in use, the RNLA will process its input signal only when sidechain signal is present, allowing you to use it as a program-responsive compressor. That is an unexpected feature on a device this affordable. The RNLA is powered via a standard 9 VAC wall-wart power supply.

Really Nice Sound

I ran audio of drum loops, guitars, bass, and entire songs through the RNLA, and it never let me down. It excelled at both very mild compression and full squashing of out-of-control material. When I was judicious with the Ratio and Release knobs, the RNLA sounded pretty transparent, and at higher levels of compression, it imparted a pleasant thickness and roundness to the sound.

It is difficult to find any fault with the

RNLA. It's designed amazingly well and sounds great. Even the documentation is well written and helpful. As with any "color" compressor, you wouldn't want to rely on the RNLA when you want a completely transparent compressor. And as I mentioned, I'd love to see another model with balanced inputs. But if you're looking for an affordable and great-sounding compressor, you owe it to yourself to give this one a serious look.

Value (1 through 5): 5
FMR Audio
www.fmraudio.com

APPLIED ACOUSTICS SYSTEMS

Lounge Lizard EP-3 (Mac/Win)

By Len Sasso

EM ★★★★★ hot pick

Applied Acoustics Systems has a hands-down winner with Lounge Lizard EP-3 ($249; upgrade, $49). Physical-modeled Lounge Lizard is arguably the best virtual electric piano on the market, and version EP-3 sports a variety of enhancements along with an expanded preset library.

Lounge Lizard runs standalone as well as in VST and DXi plug-in formats for Windows and VST, AU, and RTAS formats for Mac OS X. Challenge-and-response authorization is required within 15 days of installation and can be carried out online, by fax, or by phone.

FIG. 1: The Lounge Lizard EP-3 control panel B houses the physical-model controls, which have been slightly expanded and rearranged.

Lounging About

EP-3 has a somewhat expanded and logically reorganized control panel for the physical model of the electric piano. A completely revised and more flexible effects section with its own panel makes programming EP-3 much clearer.

As with previous versions, EP-3 has separate controls for the four elements of the electric-piano action: mallet, fork, pickup, and damper (see **Fig. 1**). Although some of the control names are the same as those of typical synth and sampler controls, their effect is not produced with standard synth modules such as filters and envelope generators. Rather, each control affects the workings of the physical model, and the results are more realistic and more varied than can be produced with a synth or sampler.

The Release section of the panel has been renamed Damper, its release-time control has been moved to the Fork section, and an attack-decay-balance control has been added. In the Pickup section, the pickup-type choices have been changed to R for a Rhodes-style electrodynamic pickup and W for a Wurlitzer-style electrostatic pickup.

The output of the physical model feeds a 3-band EQ consisting of two shelving filters and a peak filter. All three filters can boost or cut and have adjustable frequency. Having an EQ before the effects section is a welcome addition.

Effective Alternatives

The biggest changes in EP-3 are in the effects chain: there are now two multi-effects and a reverb, each of which can be disabled. The two multi-effects come before the reverb and can be arranged in series or parallel.

Lounge Lizard 2's stereo delay has been replaced by three delays: ping-pong, digital, and tape. The digital and tape delays are 1-tap feedback delay lines, but the tape delay adds a lowpass filter to the feedback circuit to emulate analog tape's attenuation of high frequencies. As expected, the ping-pong delay bounces between the left and right channels of the stereo output.

In addition to the original phaser, EP 3 now has stereo and mono chorus and flange as well as an LFO-controlled notch filter. The LFO-controlled wah-wah has been augmented with a new auto-wah, in which Velocity controls the amount of a single wah. Vibrato and overdrive distortion round out the new effects.

All of the time-based effects, including tremolo, offer tempo synchronization. Furthermore, EP-3 has a built-in clock for tempo synchronization in standalone mode. The built-in clock can also be used when EP-3 is running as a plug-in, and in a very nice touch, the tempo can be controlled remotely by MIDI. You can use that for Echoplex-style delay effects, for example.

A Matter of Convenience

EP-3 introduces several new conveniences. For starters, the presets browser can be resized, and output metering is now stereo. A built-in audio recorder allows you to capture your late-night muse without launching your DAW. Although clock and effects settings are saved with individual presets, lock buttons let you preserve the current settings when loading new presets.

The new keyboard section of the control panel presents a variety of options. The whole piano can be transposed in semitones and octaves. The tuning reference pitch can be changed. Scala micro-tuning files can be imported, and the amount of stretch for standard equal-tempered tuning can be adjusted.

The EP-3 preset library has been completely reworked, and the presets are both more varied and better categorized. You'll find plenty of classic Rhodes and Wurlie sounds waiting to be tweaked as well as loads of custom presets ranging from the eminently playable to the barely recognizable (see **Web Clip 1**).

Lounge Lizard EP-3 is equally at home in the studio and on the gig. It is CPU efficient and runs well on a reasonably fast laptop. It offers far greater programmability than sample-based electric pianos, and there are no streaming or RAM issues. If you're looking for a virtual electric piano, this is the one. EM

EM WEB CLIPS

Value (1 through 5): 5
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www.applied-acoustics.com

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Expand & Update Your MOTU Studio

Digital Performer 5 and the new UltraLite compact FireWire audio interface lead a wide range of new products to expand and update your MOTU desktop studio.

Quad processing

With two dual-core processors at speeds up to 2.5GHz per core, the Apple Power Mac G5 Quad doubles the punch of its dual-processor predecessor. Do the math: Quad-core processing means four Velocity Engines and eight double-precision floating-point units for blistering performance of up to 76.6 gigaflops. What does that mean for your MOTU Digital Performer 5 studio? Run MachFive, MX4, the Symphonic Instrument and dozens of other virtual instruments, processing plug-ins and disk tracks without even batting an eyelash. Blaze through your work, deliver ahead of schedule and astound your clients — because this baby really moves.

Compact FireWire Audio I/O

The new MOTU UltraLite compact bus-powered 10x14 FireWire audio interface is born from the innovative design, proven reliability and award-winning sound of the MOTU 828mkII and Traveler FireWire interfaces. You get 8 analog inputs, 10 analog outputs, S/PDIF digital I/O and 96kHz recording in a compact, bus-powered, fully portable half-rack I/O, complete with two mic/instrument inputs equipped with individual 48V phantom power and 60dB pad/trim preamp gain range, separate main outs and phones, front-panel LCD metering for all I/O, 8-bus CueMix DSP on-board mixing, front-panel programming, SMPTE sync and many other advanced features.

MIDI Control from KORG

Every MOTU studio needs capable and convenient MIDI control. The new KORG K-Series USB/MIDI controllers feature solid, full-sized keys and four velocity curves to perfectly match your playing style. Available in 25, 49 and 61-key versions, each provide easy access to the full range of notes thanks to dedicated octave shift buttons, plus a host of assignable controllers including KORG's innovative ClickPoint, which performs double duty as an X/Y joystick or a USB mouse. Plus they come with the M1 Le, a soft synth version of the legendary M1 to use within DP! Now add the sleek and portable padKONTROL, with 16 extremely responsive trigger pads that can be used to perform natural sounding drum parts, trigger audio loops or video clips, and send MIDI control change messages to take charge of your soft synths, samplers and effects. Its unique X/Y pad can be used to perform realistic rolls and flams with the touch of a finger.

Authentic SSL processing

Waves delivers the classic sound of the SSL 4000 Series to your Digital Performer mixes. To faithfully recreate the extraordinary SSL sound, Waves engineers spent more than a year analyzing and modeling the distinctive sonic characteristics of SL 4000 factory reference consoles and components provided by Solid State Logic. Extensive testing proves that the Waves SSL 4000 plug-ins sound virtually identical to their hardware counterparts. Developed under license from Solid State Logic, The Waves SSL 4000 Collection includes three meticulously modeled plug-ins based on the legendary SSL 4000 Series: the SSL E-Channel, the SSL G-Master Buss Compressor, and the SSL G-Equalizer.

Universal plug-in control

As a Universal Sound Platform, Native Instruments KORE operates not only as a plug-in within Digital Performer but also as an instrument host application. It allows you to integrate all your VST- and Audio Units-based software instruments and effects into a single, unified interface. KORE provides greatly increased control, overview and ease of use in all creative situations. Both Native Instrument's own range of instruments and effects as well as third-party products are supported. The seamless integration with KORE's advanced hardware controller gives hands-on control with unprecedented analog feel, finally turning today's software synthesizers and samplers from applications into true instruments.

Pro waveform editing & mastering

Your DP mastering and processing lab awaits you. BIAS Peak Pro 5 delivers award winning editing and sound design tools, plus the world's very best native mastering solution for Mac OS X. With advanced playlisting. Superb final-stage processing. Disc burning. Plus PQ subcodes, DDP export (optional add on), and other 100% Redbook-compliant features. Need even more power? Check out our Peak Pro XT 5 bundle with over $1,000 worth of additional tools, including our acclaimed SoundSoap Pro, SoundSoap 2 (noise reduction and restoration), Sqweez-3 & 5 (linear phase multiband compression/ limiter/upward expander), Reveal (precision analysis suite), PitchCraft (super natural pitch correction/ transformation), Repli-Q (linear phase EQ matching), SuperFreq (4,6,8, & 10 band parametric EQ, and GateEx(advanced noise gate with downward expander) — all at an amazing price. So, when you're ready to master, Peak Pro 5 has everything you need. It's the perfect complement — and finishing touch — to Digital Performer 5.

The gold standard for groove

Spectrasonics Stylus RMX v1.5, the award-winning "groove standard", gets better and better with new features like "Chaos Designer™ Buzz" for stuttering edits, 500 incredible new categorized Multi grooves and 250 slamming new Kits. It's even easier to learn RMX now with the new Reference Guide/Help System and hours of brand new tutorial videos – including one specifically for Digital Performer users!

Expand & Update Your MOTU Studio

On-demand plug-in processing

How do you conserve precious CPU cycles for the demands of your Digital Performer based studio, but also run all of today's latest plug-ins and virtual instruments? The Muse Research Receptor is a dedicated hardware-based plug-in player for your favorite VST software. With 16 channels to run virtual instruments or effects, a built-in MIDI interface and a versatile complement of digital and analog I/O, Receptor is the ideal way to run plug-ins while keeping your host computer running smoothly. Control everything from the front panel, or simply connect a monitor to the back. Visit museresearch.com to view demos by Dream Theater's Jordan Rudess and to learn about Receptor's new UniWire™ technology, which provides MIDI, audio, and remote control between Receptor and your computer via a single Ethernet cable. Receptor provides the ultimate in performance, stability, and sonic performance.

Control room monitoring

The PreSonus Central Station™ is the missing link between your MOTU recording interface, studio monitors, input sources and the artist. Featuring 5 sets of stereo inputs (3 analog and 2 digital with 192kHz D/A conversion), the Central Station allows you to switch between 3 different sets of studio monitor outputs while maintaining a purely passive signal path. The main audio path uses no amplifier stages including op amps, active IC's or chips. This eliminates coloration, noise and distortion, enabling you to hear your mixes more clearly and minimize ear fatigue. In addition, the Central Station features a complete studio communication solution with built-in condenser talkback microphone, MUTE, DIM, two separate headphone outputs plus a cue output to enhance the creative process. A fast-acting 30 segment LED is also supplied for flawless visual metering of levels both in dBu and dBfs mode. Communicate with the artist via talkback. Send a headphone mix to the artist while listening to the main mix in the control room and more. The Central Station brings all of your inputs and outputs together to work in harmony to enhance the creative process and ease mixing and music production.

Large capsule mic

The new RØDE NT2-A can be plugged directly into your 828mkII, Traveler or UltraLite interface. This professional large capsule (1") studio microphone incorporates three-position pick-up patterns, pad, and high pass filter switches conveniently located on the mic body. At the heart of the NT2-A is the Australian designed and manufactured HF1 dual diaphragm capsule. The frequency and transient response of this new transducer has been voiced to complement today's modern recording techniques, and yet still evoke the silky smooth character of the legendary microphones of the 50's and 60's. These features provide the flexibility and superlative audio characteristics that make the NT2-A one of the most versatile condenser mics available. The NT2-A's variable controls allow switching between Omni, Figure 8, and Cardioid polar patterns. The three position high-pass filter provides a flat response or an 80Hz and 40Hz high pass filter. The microphones Pad can be switched between 0 dB, -5dB and -10dB. The NT2-A comes in a soft pouch with an M2 stand mount.

Electronic Musician 2006 EDITORS CHOICE

Power conditioning

A large-scale MOTU-based multitrack studio is not only a finely-tuned instrument, it's an investment. Protect that investment — and get the best possible performance from it — with the Monster Pro 2500 and Pro 3500 PowerCenters. Many so-called "power conditioners" only protect against random power surges and/or voltage spikes. But AC power line noise and noise from other components is an equally harmful and constant threat to your gear's performance. To prevent this, Monster's patented Clean Power™ filter circuitry (U.S. Pat. No. 6,473,510 B1) provides separate noise isolation filtered outlets for digital, analog and high-current audio components. The result is high quality sound that's free from hums, buzzes and other power line artifacts, revealing all of the rich harmonics and tone in your recordings. Get All the Performance You Paid For™. Get Monster Pro Power.

Automated mixing and control

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MOTU system expert advice

When it comes to putting together MOTU recording systems, nobody does it better than Sweetwater. Whether you're building a simple portable recording rig with an UltraLite and a new MacBook Pro or a 128-track powerhouse Digital Performer studio centered around the latest Quad Core G5, Sweetwater can help you select the perfect components for your MOTU system, from the specific MOTU audio interface model, to control surfaces and hard drives, to plug-ins and studio monitors. Even better, we can install, configure, test and ship a turnkey system straight to your door — all you'll need to do is plug in the system and start making music. Why shop anywhere else? Call the experts at Sweetwater today!

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Are You Being Served?

By Larry the O

I recently called the customer service desk of a major airline (considered the world's largest until a few years ago) to complain bitterly about the fact that, although I could purchase a ticket six weeks in advance, I couldn't get a seat assignment until everyone else had boarded the plane. The customer service representative told me my ticket "was not a guarantee of a seat; it was a guarantee of transportation." In response to this monumentally moronic statement, I asked the obvious question: How *was* I to be transported, if not in a seat? Hanging off of the wing? I later emailed a complaint and received a reply explaining that seats were held back because the airline overbooked flights, as if that was supposed to be a good reason. I wish such mindless repetition of a senseless party line was limited exclusively to the airline industry.

Alas, it does not take an Einstein to observe that only two things are infinite: the universe and human stupidity—and I'm not sure about the former. Although it was indeed Einstein who said that, and he was probably thinking of poor customer support when he did.

Let's be fair. Good customer service is hard to provide. Offering phone support is very expensive. Beyond the cost of maintaining numerous phone lines and paying people to staff them, far too many calls come in that should never have been made. For example, many people find it abhorrent to read user manuals in an effort to solve computer problems themselves. Instead, they find it easier to dial the phone and have someone else solve the problem. And some people are just plain clueless, providing fodder for the legion of apocryphal customer support jokes. Why should manufacturers put expensive, trained staff on their phones for that? As a result, we get customer-service reps who can do little more than read cue card responses.

> Poor customer service damages brand loyalty.

It takes financial investment, good management, a lot of work, and infinite patience to provide good customer service, but it can be done. For example, sometimes those same people who won't crack open a manual will avail themselves of online resources.

Having said all that, let us tackle my favorite "dumb support" trick. You finally manage to reach a customer service rep on the phone. You describe your problem and are told, "We've never had anyone complain of that problem before," implying that it must be something you're doing wrong. At that point, the conversation is effectively over, when it should have been just beginning.

Worst of all is when there seems to be nowhere one can get an answer. Recently, violinist Cat Taylor's band Avalon Rising received an invitation to play a massive festival in China on short notice. Being the consummate professional, she immediately tackled the issue of what equipment she needed to take and how to deal with China's electricity, which is 220V, 50 Hz. She determined that she needed to buy a new piece of equipment and proceeded to try to find out how to power it properly in China.

The large mail-order house she was going to buy from couldn't tell her anything; in fact, she ended up educating them about a number of things. A huge music-store chain was entirely useless, although at least they didn't give her bad information. She finally turned to customer service at the manufacturer—a sizable, established company. The regulations they cited that apparently forbade them from shipping an adapter for China within the United States were certainly not their fault; they did, however, put Taylor in a difficult position, given that using a third-party external power converter would void the warranty on her new gear. But it was scary when the service rep consulted technicians who told him that 2,000 milliamps, the current draw of the device, was 0.002 amperes, when it is, in fact, 2 amperes. Fortunately, she was able to reach the customer service manager, who helped her out.

It comes down to two facts: first, it is very tough to provide good customer service, and second, poor customer service frustrates customers and damages brand loyalty. Both sides have responsibilities in this situation. Manufacturers have to apply the same intelligence and level of resources that go into their product designs to providing good customer service. Users, if they want to use sophisticated tools, must use the available resources and good troubleshooting techniques before throwing their problems onto a manufacturer's plate. EM

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