Electronic Musician

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- **Nonviolent solutions to power struggles**

Bonus!

1998 Editors Choice Awards!

EM's editors pick the 26 coolest products of the year!

Electronic Musician
1998
EDITORS
CHOICE

Editors' Choice

By the EM staff

W e love them, we fear them, and we will never give them up. No, we're not referring to our parents, spouses, or children; we're talking about the annual EM Editors' Choice Awards. We love them because they're our big chance to spotlight dozens of outstanding new products for the personal studio. We fear them because for every product that wins an award, many deserving products don't win, and we don't wish to slight these other fine products. And we will never give them up because we believe they serve an important purpose in helping you make buying decisions.

This year's choices for the best new products were released between October 1, 1996 and October 1, 1997, when we began making our selections. We did not consider products that were available before this period, although we allowed a bit of slack for products that were released so close to the 1996 cutoff date that we could not test them in time for last year's awards. Upgraded software was considered only if it was a major upgrade.

We didn't attempt to pick products in every possible category. If we were un-enthusiastic about the candidates in a particular category or we felt we hadn't tested enough of them to make an informed choice, we simply passed. When the dust settled, we had 25 categories and 26 winners (with one tie).

Of course, each product has its own "personality" that makes it more suitable for some users than for others. In addition, some products that didn't win the award came extremely close to winning and are excellent choices in their own right. So even though we hope you will take these awards as seriously as we do, we don't want you to buy the winning products blindly. Consider your goals, your budget, how you like to work, and what tools you already have. To help you conduct this research, we have prepared a table listing EM reviews and features that provide in-depth analyses of our award-winning products.

Enough preamble; here are our picks for the best new products of the past year. And away we go!

EM'S EDITORS DOFF THEIR CAPS TO THE HOTTEST NEW PRODUCTS OF THE PAST YEAR.

Ancillary Hardware

Digital Audio Labs V8 (Win; $2,500)

Digital Audio Labs' much anticipated V8 was an easy winner in a broad category. This modular system for the PC offers a wealth of features: external converters, ADAT (and soon DA-88) interface, optional DSP expansion, and more. And the best part? You can purchase only the components you need now and add more modules later. Most features are supported by the major software developers, including Cakewalk, SEK'D, and Waves, and we expect additional support soon. The V8 is revving up to be one of the most powerful audio systems for Windows we've seen!

The V8's DSP takes the audio-processing load off your CPU, which means you'll get reliable and consistent performance regardless of what CPU you use. Nearly all basic configuration options can be controlled from software, meaning an end to jumper settings and, for the most part, device conflicts. You can send external audio into the system and mix it with your disk-based sounds and can apply effects in real time.

The V8 bus can support a maximum of sixteen simultaneous ins and outs if your hard drive can support it. Using the Big Block external rack-mountable interface, you'll have access to eight analog TRS ins and outs as well as simultaneous AES/EBU and coax and optical S/PDIF. If you can live with fewer ins and outs or your budget is a little tight, you'll appreciate the Deuce Coupe interface, which offers stereo analog and digital I/O. If you already own one of DAL's CardD Plus systems, you can use that, too.

And talk about expansion: the V8 has room for three add-on DSP modules that can give you over 300 total MIPS of processing power! That's enough power to mix your tracks in real time as well as manage the custom plug-ins that the system supports. Just add DAL's "DSP Supercharger" boards to this little engine, and you're really going to hit the pavement running.

We're looking forward to even more options for the DAL V8 card, but there's enough available now to get your studio into high gear. You won't find this much horsepower under the hood of too many systems!

Ancillary Software

Liquid Audio Liquifier Pro 1.0
(Mac/Win; $1,500)

Everyone knows the Web will continue to become more important for direct delivery of music, so the question of who will have the best delivery format the soonest is a major issue. We awarded this year's ancillary software award to Liquid Audio for its *Liquifier Pro* 1.0 mastering software, which allows you to create Web-ready, high-quality audio for distribution to the masses. By including DSP functions, such as 4-band EQ, dynamics processing, sample-rate conversion, and a secure copy-protection scheme, *Liquifier Pro* has everything you need to get your music onto the Web.

Liquifier Pro is not intended for delivering live music or cybercasts to your desktop in real time. Instead, this software lets you put high-quality sound onto the Web. By using an enhanced version of Dolby Digital's AC-3 compression scheme, *Liquifier Pro* produces music that can be quickly downloaded yet is nearly indistinguishable from the original.

Using the free *Liquid Music-Player* software, listeners can grab short previews of your Liquified music from the Web and sample your wares. When they find a track they like, they simply purchase it from any of the numerous Web retailers now offering music in Liquid format and then download the uncompressed version, save it, and play it back or even transfer it to CD-R.

Now that CD recorders are priced well under $500, we expect to see Liquid-built CD compilations appearing. After all, with high-quality sound, secure copy protection, and support for album graphics, lyrics, and liner notes, Liquifier provides all you need to deliver your music to the world. So what are you waiting for? Get Liquified!

Audio Card (audio only)

Korg SoundLink 1212 I/O (Mac/Win; $999)

As the movement toward digital studios continues, computer audio cards with digital I/O are becoming increasingly important. Most cards with digital I/O offer S/PDIF, which is great, but for the legions of recordists who use ADAT Lightpipe-equipped gear, a similarly equipped card seems heaven-sent. Although several such cards were announced in 1997 and a few actually shipped, most will not make their marks until 1998.

Korg took the lead of this small, cutting-edge pack, gaining almost immediate software support for its SoundLink 1212 I/O card. This high-quality PCI card for Mac and Windows is equipped with two channels of analog I/O, two channels of S/PDIF coax I/O, and 8-channel ADAT optical I/O. These are simultaneously available with software that fully supports the card, giving you a wonderfully flexible 12-in, 12-out interface. The combination of Lightpipe and S/PDIF provides many possibilities besides the obvious. For instance, with ADAT and S/PDIF, you can loop a pair of computer-based tracks through an external S/PDIF-equipped processor and record the processor's digital output to another pair of tracks, all in the digital domain.
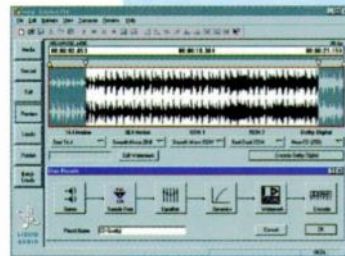
The 1212 I/O has several other endearing features. Its onboard DSP enables it to operate as a PCI bus master, taking care of all audio transfers to and from the computer without stressing the CPU. Not all cards have this feature. The card attaches to a breakout cable with BNC connectors for word clock in and out and a 9-pin connector for ADAT sync. And the 1212 I/O sounds great: the analog output is smooth and quiet. If you use an ADAT or other Lightpipe-equipped gear, Korg's PCI audio card is an excellent choice.

Digital Audio Sequencer

Steinberg Cubase VST 3.5
(Mac/Win; $399)

Several professional digital audio sequencers received major upgrades in the past year, making this an extremely competitive category. But Steinberg shook the entire digital audio world when it combined the *Cubase* line's everything-but-the-kitchen-sink approach to MIDI production and sophisticated multichannel audio capabilities with a real-time plug-in architecture that does not require expensive, specialized hardware. All you need to run *Cubase VST* plug-ins is a Power Mac with no additional hardware or a Windows computer with any standard sound card.

Other companies have since followed suit. For instance, Cakewalk supports the real-time DirectX format on its digital audio sequencer for Windows, and MOTU incorporated its own architecture in its Mac program. By the time you read this, Emagic will have joined the party, too. But Steinberg got the ball rolling, and its cross-platform VST format immediately drew considerable support from third-party plug-in vendors.

The software supports a wide range of audio cards and supplies a virtual mixer where you can assign audio channels to the card's physical I/Os. (When running on the Power Mac without an I/O card, of course, you just have two I/O channels.) The result is a "virtual studio" environment that is fun to work in and powerful enough for any desktop musician. You get up to 32 channels of digital audio with four bands of real-time parametric EQ per channel, separate master and channel effects "racks," a nice selection of bundled plug-ins, and automated mixing.

You get powerful tools for quantizing and aligning audio with MIDI and the usual MIDI editing screens but always with a unique spin. The piano-roll display, for example, lets you colorize notes by pitch or MIDI channel; the event list includes a bar graph for Velocity or controller data. A Drum Edit window lets you quickly assemble rhythm patterns in real time. You can match an audio recording to a MIDI track or vice versa and can even substitute a better drum sound in an audio rhythm track.

Other programs can accomplish many of these things, but *Cubase VST* does them all well and in real time—including real-time plug-ins without TDM—and it does them cross-platform. As of the end of our eligibility period, none of its competitors could do real-time plug-ins on both Mac and Windows. Another important plus is that *Cubase VST*'s price is very reasonable for a program of its magnitude. *Cubase Audio* 1.1 won this award in 1994, and it's great to see that Steinberg hasn't sat on its laurels. We love to see a company make everyone else play catch-up.

DSP Plug-In

BIAS SFX Machine (Mac; $299)

Plug-in development is one of the biggest growth markets in the audio industry, and there were many great candidates for this year's award. But BIAS took the road less traveled with its *SFX Machine*, and that made all of the difference. There is nothing quite like this sophisticated Premiere plug-in.

At first, things appear straightforward enough: you create sounds using modules whose signal path consists of one signal source (a simple audio waveform, noise, an audio input, or an LFO), one DSP process (e.g., amplitude mod, ring mod, mix, panning, filter frequency, and delay), up to two modulators, and an output.

But the program's signal path is something else again, allowing you to create complex feedback loops where one module's modulation output can be routed to another module. Any parameter within a preset can affect almost any other parameter or group of parameters, and all of them can interact simultaneously.

The *SFX Machine* allows you to create an incredible variety of sounds, from basic chorus, delay, and pitch effects to wild, out-of-this-world mind blowers. You can get filter effects that have, until now, been the purview of high-end outboard processors. To give you a handle on all this power, the developer has supplied tons of presets, so rookie sound designers need not cower in fear.

This combination of a tremendously powerful architecture and user-friendly presets makes BIAS's unique sound-design tool our plug-in of choice for 1997.

Dynamics Processor (hardware, over $1,000)

TC Electronic Finalizer ($2,495)

Not only is the TC Electronic Finalizer jam-packed with sophisticated and useful processors, it addresses a stage of audio production that, until now, most personal studios could not afford to dabble in: mastering.

The Finalizer delivers eight critical mastering stages (enough to fill a sizable rack if they were packaged as

separate units) all under the hood of a single rackspace box. You say you're new to the mysteries of mastering? Don't sweat it. Despite the unit's sophistication, it is relatively simple to operate and even offers a Help key that calls up guidelines for each of its eight processing blocks. The Finalizer's "Wizard" function will calculate appropriate settings for your mixes after prompting you to answer a few basic questions.

Best of all, the unit sounds great. One of the Finalizer's most impressive features is its 20-bit analog-to-digital converters, which are the same as those

used in TC Electronic's flagship M5000 effects processor (the one with the updated converter cards). In fact, many studios are buying the Finalizer for its A/D converters alone. But the fun doesn't stop there. The Finalizer also provides 5-band, 24-bit, stereo digital equalization; spectral enhancing; normalizing; expansion; compression; limiting; dithering; and manual or auto fade. Special features include a proprietary Digital Radiance Generator for simulating second-harmonic distortion or "warmth" that arises from the use of analog tape. And if it's automation you crave, the Finalizer provides it with all parameters hard-patched to MIDI controllers.

TC Electronic deserves nothing but praise for the Finalizer. It's a powerful, very versatile tool that in a single sweep puts personal-studio mastering on the map.

Dynamics Processor (hardware, under $1,000)

A.R.T. Pro VLA ($599)

This product literally stunned our reviewer. In fact, we had to call him to verify the high meter-rating he had given it: a 4.5 for audio quality and ease of use and a 5 for value. Considering the stringency of our rating system (we rarely give fives for any category), this was impressive news, indeed.

The fact is A.R.T.'s Pro VLA is one of the best-sounding new compressors we've heard in a long time—even among higher-end units. The sound is warm, musical, and transparent. We found it fat yet natural sounding and so smooth that only the highest, over-the-top settings yielded unwanted artifacts, such as pumping or breathing (and even then, they were minimal). Moreover, the Pro VLA is quiet, and the unit works well on a surprising range of instruments, including vocals, drums, percussion, acoustic and electric guitars, bass, and stereo-program material.

True, the Pro VLA doesn't offer gobs of features—
there's no input control, for example, and attack and release settings are

limited to fast and slow—but what it does provide is great-sounding dynamics control at a very reasonable price. Oh, and did I mention the two lovely VU meters, which can be switched to monitor input or output levels? Classy touches like that make an already killer deal simply irresistible!

Effects Processor (hardware, over $1,000)

Lexicon MPX-1 ($1,299)

With the MPX-1, Lexicon brings a sizable helping of its high-end effects processing within reach of the personal-studio owner. Less than half the price of the PCM 80, this deceptively ordinary-looking box offers truly superb sounds, a staggering depth of programmability, both balanced analog and digital I/O, and a number of features that PCM 80 owners are already pining for.

Two separate processing chips—one for reverb and a second for other effects—enable the MPX-1 to provide two independent stereo signal paths at all times with no compromises. The unit's six independent effects blocks (each with its own mix, level, and bypass controls) can be ordered in virtually any configuration, and the inputs and outputs of any block can be merged and/or split between the stereo paths.

Signal routing and modulation capabilities are likewise extensive, if not mind-boggling. Internal controllers include two LFOs, two ADR envelope generators, a sample-and-hold circuit, and rear-panel foot controllers. MIDI implementation, too, is vast and includes Lexicon's Dynamic MIDI scheme (which lets virtually any MIDI message be used as a modulation source), ten internal Program Chains with ten programs in each, and a full-featured arpeggiator. Whew!

Considering that the MPX-1 is so

crammed with features, you might think it's a bear to program—but you'd be wrong. The unit's interface is as user-friendly as they come and provides a multilevel help system that guides the user through any operation. Programs can easily be created from scratch or assembled by copying individual effects from other programs. And need we mention how glorious those Lexicon programs sound? None are duds, and most are simply stellar. This is one serious box, folks. Believe it.

Effects Processor (hardware, under $1,000)

Alesis Wedge ($499)

Alesis is no stranger to desktop processors. Indeed, the company's debut product was the compact Midiverb, released twelve years ago and still occasionally seen in personal studios. Now Alesis has returned to the desktop format with the

Wedge Desktop Master Reverb with Impulse Audition, a first-rate reverb processor that is about the same size as the Midiverb. But whereas the original Midiverb was, to be honest, a cheap reverb, the Wedge is pro quality all the way.

The Wedge is praiseworthy as much for its ease of use as for its excellent reverbs and other effects. The control surface is a study in simplicity and logic. Four faders and a value wheel permit intuitive, real-time control of programs, and an extra-large, backlit LCD screen makes it easy to view and keep track of your work. You can readily hear the results, too, by hitting the Tap/Audition button, a unique feature that emits a full-spectrum audio "impulse." And thanks to the unit's small footprint and light weight, it can be positioned on top of a mixing console for convenient, "sweet spot" operation.

Reverbs are the main focus of the Wedge, and we found them rich, smooth, and uniformly outstanding. Along with a wide variety of hall, room, plate, and gated reverbs, the Wedge provides some unique "virtual stereo" reverbs (we found them wonderfully effective on drums and electric guitars), as well as delay, chorus, flange, tremolo, rotary-speaker simulation, autopanning, pitch shifting, and numerous multi-effects. We were especially impressed with the unit's plate reverbs—some of the richest and most pleasing plate-reverb simulations we've heard anywhere. Besides, who can argue with a unit that offers up to 229 seconds—nearly four minutes!—of decay time? Once again, Alesis proves that big things can come in small packages.

EQ/Filter

Nightpro EQ3-D ($995)

Personal studios don't often get a whiff of premium broad-band analog equalizers, but that changed with the introduction of the Nightpro EQ3-D. Featuring essentially the same circuitry as the company's high-end EQ3 equalizer (used on dozens of gold and platinum records) but costing only a third the price, the dual-channel EQ3-D is a supremely smooth and natural-sounding EQ. It can perform enhancements on a finished mix that typical console EQ cannot. It does a killer job of filtering individual instruments, too, either while tracking or during mixdown. This was one box we had a hard time letting go of!

The EQ3-D has five boost/cut bands (which include a Sub band centered at 10 Hz) that span 2.5 octaves apiece and overlap to provide extensive tone-shaping control. For example, by boosting two adjacent bands, you can create a broader curve with a greater, summed boost. Or you could dial up a steeply sloping curve by boosting one band and cutting an adjacent one. But the unit's sixth band is the real prize. Dubbed the AirBand, it's a boost-only shelving filter that provides 20 dB boost at one of five different frequencies—2.5, 5, 10, 20, and 40 kHz. The 20 and 40 kHz bands are particularly effective for adding "air" and opening up the top end of a mix.

One of the more astonishing things about the EQ3-D is its lack of phase shift—a rarity among equalizers. No matter how wacky you get with the controls, this box will not introduce troublesome phase distortion. We even used it at multiple recording stages—tracking, mixdown, and mastering—and heard nothing "shifty" going on. If your personal studio is making the transition to personal mastering suite, the Nightpro EQ3-D is one piece of gear you can't afford to overlook.

Microphone

Røde NT-1 ($499)

In the not-so-distant past, microphones were among the weakest links in personal studios. In those days, it wasn't unusual to do extensive recording projects using nothing more than a handful of inexpensive dynamics. Why? Because at the time, any of the best mics cost more than a good used car.

Thankfully, that woeful condition is changing—and dramatically. On the front lines of this bang-for-the-buck shift is the Røde NT-1, a no-frills large-diaphragm condenser mic that hails from Australia. It gets our award for two simple reasons: it sounds great, and it's as inexpensive as they come. You need adjectives? How about fat, warm, and present? Heck, how about rich, sexy, and downright delectable? We won't hide our surprise in learning that the NT-1 held its own, at least tonally, against mics costing four and five times the money. In fact, to one editor's dismay, it sounded better on many applications than his faithful AKG C 414.

Of course, that's not to say that the NT-1 is a superversatile, all-around kind of mic. It's not. Housed in a light-gauge steel body, it offers only one polar pattern (cardioid) and no extras: no pad, no filter, no adjustments of any sort. Even the stand-mounting assembly, though sturdy, is Spartan: a simple nut that tightens around a plastic clip. But in critical audio matters, the NT-1 cuts no corners. The design is transformerless throughout, the diaphragm is a full inch in diameter, and the XLR connectors are gold plated. Most importantly, the sound is stellar. Thanks to Røde, even the humblest personal studios can now afford to own a great-sounding large-diaphragm condenser mic.

Microphone Preamp

Sytek MPX4A ($1,480)

Dedicated mic preamps were among the hottest items to trickle down into the personal-studio market in 1997, and there were several excellent units from which to choose. But most of those units cost upward of $1,200 for two channels. That's one of the reasons we were so impressed with the Sytek MPX4A Quad Microphone Preamplifier: the 4-channel unit is about half the price of comparable "name

brand" preamps. That makes it an attractive buy for the personal-studio owner seeking the subtle but real improvements that quality outboard mic preamps can provide.

Of course, if the solid-state MPX4A hadn't sounded as remarkable as those more expensive preamps, we wouldn't have picked it no matter how low the price. It passed our tests with flying colors, earning our highest rating for audio quality. And we'll let you in on some information not made explicit in the review: the "well-known and much more expensive" mic pre we used for comparison testing was none other than the Millennia Media HV-3, a solid-state preamp many pros regard as the last word in clean, accurate, transparent audio. The MPX4A held its own to the HV-3 and even outperformed it in terms of "high-frequency clarity and definition and overall noise level." Considering the relatively low price of the MPX4A, that's a significant claim.

The frequency response is rated an impressive 10 Hz to 85 kHz and the THD + Noise and Equivalent Input noise specs are equally impressive. Unless you have an argument with excellent sound for a great price, we think you'll agree that the Sytek MPX4A is all you could ask for in a solid-state mic preamp for your personal-studio setup.

MIDI Controller

Blue Chip Axon NGC77 ($995)

Guitarists have long suffered a bumpy ride down the MIDI highway. The side of the road is littered with discontinued products, and most of the survivors suffer from a common malady: latency problems. Conventional MIDI guitar systems use a form of pitch-to-MIDI conversion that often causes a noticeable performance delay.

The Blue Chip Axon NGC77 is a second-generation product that incorporates neural-net technology to generate MIDI notes so quickly that response appears to be instantaneous. Yet the system uses a conventional Roland GK-2A pickup and any steel-string guitar. It has a mic/line input that lets you use it as a pitch-to-MIDI converter for external, mono audio signals—and the feature works, which you can't say for all such products.

In addition, the unit has features you simply can't get on other MIDI guitar controllers. One of the most remarkable of these is the ability to create three different types of zone splits. For example, if you set a split point between strings 4 and 5, strings 1 to 4 will be in one zone and strings 5 and 6 in another. Similarly, you can divide the neck into two fret zones, and three more zones can be defined by picking position. All zones are available simultaneously.

This is by far the hippest MIDI guitar system we've ever seen. You need to spend some time getting the initial settings adjusted to taste—and admittedly the documentation we had was not too helpful here—but once you get things set up, you're in for a real treat.

Monitor Speaker

Mackie HR824 ($1,498)

In the ongoing evolution of the personal studio, some of the biggest recent news is the arrival of affordable active monitor systems. Why active monitors? Because typically they offer higher volume with lower distortion, a broader frequency range, and better stereo imaging than passive reference monitors. The amps and speakers are designed to match. Simply put, that translates to a potential for better mixes from personal studios.

Of the half dozen or so powered monitor systems to hit the market in 1997, we were most impressed by the Mackie HR824. We directly compared the HR824s to three other active monitors and found them the most accurate of the bunch. (The TEF analysis revealed an overall frequency response so flat that it was hard to believe. The most egregious bump was a 4 dB peak at approximately 48 Hz.) Frequency-range extension was impressive, too, going down to 37 Hz on the low end and all the way out to 22 kHz on the high end. And most everyone found the monitors' stereo imaging and high-frequency dispersion to be exceptional, describing them with adjectives such as "natural," "brilliant," and "fabulous."

The Mackie HR824s scored high in design and flexibility, too. Each monitor features an input-sensitivity control as well as an 80 Hz rolloff (3 dB) and a switch that allows a 2 dB boost or cut at 10 kHz. Further "environment tuning" is available via an acoustic-space switch with settings for Quarter Space (speakers placed in corners), Half Space (speakers placed against a wall), and Whole Space (speakers placed near the middle of a room).

If that weren't enough, the HR824s also provide a unique Auto Power mode that automatically turns on the monitors when it senses an input signal and puts them into standby if no signal is present after several minutes. They're not the lowest-priced active monitors around, but if it's precise resolution you're after, the Mackie HR824s are quite a bargain.

Roland V-Drums ($4,995/set)

To innovate means to introduce a new way of doing things, and in this category the Roland Corporation has been a perennial force. One of the company's newfangled offerings in 1997 was the V-Drums, an electronic drum kit that's new pretty much from the ground up.

Structurally, the V-Drums are distinguished from other electronic drums by virtue of having mesh drum heads in place of the usual rubber or plastic pads. Mounted on shallow drum shells with standard lugs, these can be tensioned like ordinary acoustic drum heads, and they provide surprisingly realistic playing surfaces. The heads—along with the drums' unique, rubber-coated rims—permit whisper-quiet performances. This makes the V-Drums ideal for overhead miking when using acoustic cymbals (not to mention for practicing in your apartment). If that weren't enough, the mesh heads even allow for brush playing—definitely a first for electronic drums.

The innovations don't stop there: Roland gave the kit a new brain, as well. Incorporating the same Composite Object Sound Modeling (COSM) technology found in Roland's VG-8 V-Guitar system, the TD-10 sound module uses icon-based programming to let the player model each drum's type, dimensions, shell material, drum-head type, tuning, and muffling. It also permits choices among various mics and mic positions, room sizes and types (including different wall materials), and environments (e.g., a cave, bathroom, and beach).

The 56-voice polyphonic module, which detects both stick Velocity and continuous stick-position changes, is more than just a drum brain. Loaded with drum and percussion sounds, the TD-10 also provides 50 melody instruments, a sequencer with 4-part backing band, and extensive onboard effects processing. The unit's metronome, which syncs to MIDI Clock, offers human-voice counting to assist playing in odd-time signatures. And best of all, not only are the V-Drums supersensitive and great sounding, but the TD-10 is fun and easy to use.

Multitrack Recording Software

Digidesign Pro Tools 4.0 (Mac; S795)

From its inception, Digidesign's Pro Tools system has been the standard by which all digital audio workstations are judged. It is still the DAW of choice for a large portion of Macintosh-based professional recording studios. But until software version 4.0, you could not use the software without the entire, relatively expensive hardware system, including a Disk I/O interface card, DSP Farm card, and I/O box.
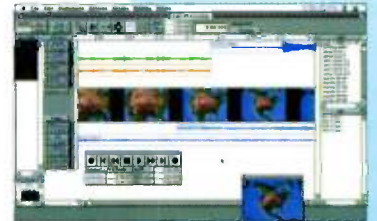
All that changed with *Pro Tools* 4.0, which supports Apple's Sound Manager audio, thus converting any Power Macintosh into a serious multitrack recording and editing tool. Of course, the software still works with all of Digidesign's current crop of hardware systems, including Audiomedia III and the whole gamut of Pro Tools hardware. The software-only version, *Pro Tools PowerMix* 4.0, allows you to record two tracks at a time and play back up to sixteen (mixed to the computer's two outputs), depending on your CPU speed.

Pro Tools 4.0 is extremely stable and incorporates numerous improvements, such as independent, custom fade-in and fade-out curves; a far more flexible Strip Silence feature; and the ability to do many of the destructive, file-based edits that formerly required exporting your file to *Sound Designer II*. It even lets you view QuickTime movies and edit the soundtracks while locked to picture.

The program includes Digidesign's new Audio-Suite DSP plug-in architecture, which admittedly does not permit plug-in operations in real time—you'll have to upgrade to a TDM system or look elsewhere for that—but it offers several refinements over most other plug-in architectures, such as allowing batch processing of multiple tracks and regions. A solid selection of plug-ins is bundled with the program.

Version 4.0 is more powerful, faster, and in all ways better than any previous version of the world's leading multitrack recording software. What more can we say?

Notation Software

Sion QuickScore Elite Level II 6.0
(Win; $179.95)

The dividing line often gets blurry between sequencers with strong notation capabilities and notation programs with lots of sequencing tools. Sion's *QuickScore Elite Level II* keeps you guessing for a while, but ultimately the program proves itself to be first and foremost a notation program. Nonetheless, this "integrated scoring and sequencing program" includes a respectable midlevel sequencer with piano-roll editing, an automated mixer, and graphic display and editing of continuous controller data. You can even attach WAV files to your sequences. An Event List window shows the usual MIDI data but also includes the appearance of non-MIDI events such as clefs, text, and symbols—each color-coded for easy identification.

QuickScore Elite Level II can handle up to 48 tracks with a resolution of up to 960 ppqn, which is a
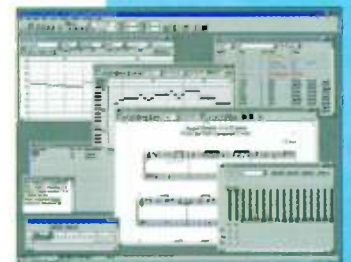
higher resolution than many "professional" sequencers can boast. It supports real-time, step-time, and tap-tempo recording as well as looping. In addition, you can sync the program to SMPTE/MIDI Time Code or MIDI Clock, which is not bad for a program that sells for less than $200. And there's much more.

Several other features set *QuickScore Elite Level II* apart from similar programs in its price range. For example, *QuickScore* automatically inserts "reminder" clefs in a score and shows "canceled" key signatures where appropriate. The program supports figured bass notation (a rare feature) and lets you create your own guitar chord grids. In fact, the program can analyze groups of notes on a staff and generate the proper chord symbols. Guitar players will especially appreciate *QuickScore*'s support for guitar tablature. The program can even transcribe standard notation into guitar tablature—pretty cool stuff!

Finally, *QuickScore* lets you adjust the shapes and positions of slurs, crescendo wedges, and several other symbols by dragging little grab handles with the mouse. And when your score is finished, you can export the result as a BMP or TIFF file for use in graphics applications. In spite of its modest price, this little program caught our attention with its surprising list of features.

Sure, you could pay a lot more money and get additional features, but this direct descendant of our 1995 award winner (Dr. T's *QuickScore Professional*) is all the scoring software many Windows-based musicians will ever need.

Recording Mixer

Yamaha 03D ($3,699)

If you are recording digital audio and using a conventional mixer, you are probably painfully aware that you are not getting every last bit of audio quality of which your recorder is capable. The missing ingredient is digital mixing with onboard signal processing. But until Yamaha released the 03D, you had to pay $9,000 or more for a professional-quality digital mixer. Even then, you really just had one reasonable choice: Yamaha's 02R, which won this award last year. (The Yamaha ProMix 01 won our 1995 award but lacked key features that many pros need.) Now, you can get a large part of a professional all-digital studio for a price that was unimaginable even a year ago.

The 03D sounds fantastic, offers extensive dynamic and scene automation with moving faders, and includes high-quality multi-effects. The EQ is clean, transparent, and of excellent quality, and you get it on every channel and return. The dynamics processing is equally ubiquitous and sounds very good (though I wouldn't push the compressors too

hard). The mixer has both analog and S/PDIF digital I/O and accepts one 02R-compatible expansion card that adds ADAT, TDIF, or AES/EBU I/O. You even get surround-sound mixing features.

If you add up what you would have to pay for a quality analog board with comparable mixing and automation features (to the extent that's possible) and equivalent outboard processing, you begin to see that the 03D is a real bargain. The only thing "wrong" with it is that once you have seen the 02R, you realize that something even better than the 03D is available—but for a lot more money than many of us can afford. Combine this board with your favorite digital recorder, and you will have made a giant leap toward an all-digital studio.

Sample-Editing Software

Sonic Foundry Sound Forge 4.0a (Win; $495)

Major upgrades from several sample editors appeared on the market this year, but one program continues to amaze us. Sonic Foundry's *Sound Forge* 3.0 won this award two years ago, and the company has done it again with version 4.0a, which offers the largest and best collection of audio processing tools we've ever seen.

Among the first programs to support Microsoft's DirectX plug-in architecture, *Sound Forge* can employ the plug-ins of any compatible program, and many of its own essential tools have been ported to the DirectX format. And if your PC is fast enough, you can preview any of the effects in real time.

DirectX is not the only standard that *Sound Forge* supports. You'll also find support for just about every Web format there is, including Progressive Networks' *RealAudio* and Microsoft's own *Net Show*. But music for the Internet is only a small part of the *Sound Forge* story, because no matter where your music ends up, the program has features that allows you to tweak, twist, and tune it until the cows come home.

We love the new and improved editing tools in this version: you'll find a "direct" editing mode that speeds up your work dramatically by letting you manipulate your original audio data without first making a backup copy. New drag-and-drop editing options make it even easier to build large projects from small chunks of music, and the new Paragraphic EQ combines four bands of EQ with both high- and lowpass filters for crafting sounds with exacting control. *Sound Forge*'s Playlist has always been one its most useful tools, and you can now build a Cutlist by marking regions that you wish the program to skip as it plays back. If you're doing audio and video on your system, you can play back AVI files to either your internal or an external display, which is a feature required by many professional-quality video playback cards.

We could go on and on about the features in *Sound Forge*—did we mention it has the best sampler support of any wave editor we've seen?—but you'll have to check out the demo on Sonic Foundry's Web site to see what all the fuss is about. Once you get hold of the program, you're going to be in for an awfully good time.

Sampler

E-mu e6400 ($2,795)

Okay, it's time to 'fess up: this is the only award-winning product we did not actually test. But the e6400 is essentially a 64-voice, file-compatible version of the Emulator 4X, and we have thoroughly tested the E4 series. (In fact, the original E4 won this award two years ago.) So we feel completely comfortable giving this sampler our seal of approval and are confident that you are going to be extremely pleased with it.

The e6400 is a truly professional instrument. A major plus is its expandability: thanks to three external and one internal expansion slots, you can double its polyphony from 64 to 128 voices (the same as an E4X), double its eight balanced analog outputs to sixteen, double its MIDI multitimbral capability to 32 parts, add AES/EBU I/O, and add an effects card. You also can expand its RAM from 4 MB to 128 MB. True, all this comes at a price, but in our opinion, it's well worth the money.

The e6400's sound quality is outstanding, and so is its voice architecture, which includes E-mu's Z-Plane morphing filters and extensive matrix modulation. Once you learn its user interface and hierarchical file structure, you can work fast, fast, fast. The OS resides in flash ROM, which makes upgrades simple. And all the trimmings you need are there, too, including two CD-ROMs jammed with sounds to get you started and the ability to read Akai samples. And lest we forget, you get Load While Play (which few samplers can do), stereo phase-locked time compression, digital resampling, Undo, and—well, you get the idea. It's one heck of a sampler.

Sound Cards

Creative Labs Sound Blaster AWE 64 Gold
(PC; $199)

Sound cards—computer cards with both audio recording/playback and synthesis capabilities—have improved dramatically over the past few years, and Creative Labs' Sound Blaster AWE 64 Gold is a great example of this progress. With markedly improved audio specs, digital output, and a wavetable set that is equal to any we've heard, Creative has finally put together a card that can compete in the big leagues. And if you add the card's 8 MB or 24 MB RAM expansion module, you can build huge sound

banks using your own samples or download any of the numerous sound banks you'll find on the Internet.

The card's gold RCA audio connectors are far superior to the inexpensive, ⅛-inch minijacks we see on many cards in this price range, and you get S/PDIF outputs (though not inputs). We love the fact that the card is a breeze to install. The card installed under both Windows 95 and NT without a hitch; now that's progress!

Creative Labs provides extensive online support via their Web site, and new drivers for both Windows 95 and NT are likely to appear there often. (We spotted updated full-duplex drivers for the card on our last visit to the site.) That's the type of ongoing support we'd like to see from other card makers. And if you're a developer, a wide range of services are also available online to help solve any compatibility problems or issues you might have.

If you're just taking the plunge into the soundcard waters or upgrading from a less-than-ideal first card and you don't need digital inputs, you can't go wrong with the Sound Blaster AWE 64 Gold. It offers a great combination of MIDI and audio features, and the price can't be beat!

Sound-Design Workstation

Symbolic Sound Kyma 4.5
(Mac/Win; $4,400)

We admit it: we invented this category because Kyma didn't quite fit into our usual categories: it isn't exactly a DAW or sample editor, nor is it a synth, but it's a bit of all three. And it can certainly be described as a sound-design workstation. Indeed, when it comes to sound-design products, the Symbolic Sound Kyma system towers over all others. Whether you're doing music production; sound for games, the Internet, films, or TV; or working in a live or interactive setting, you'll find much to like in this amazing system.

Kyma combines a black box full of high-quality, programmable Motorola DSP chips with a highly intuitive, graphic interface to make sound design an efficient and entertaining endeavor. It's easy to create complex, time-varying sounds that can respond to MIDI commands or even write a script that specifies when and for how long notes should play. Just grab any number of modules from a library containing dozens of sound-producing or processing functions and then wire them together to create the sound you want. Tell Kyma to compile the sound and the system will immediately play back your design.

Any synthesis method you can imagine is available within the system, and it's easy to mix FM, additive, subtractive, and sample

Electronic Musician

playback, with a bit of live audio thrown in for good measure. The system knows all about MIDI; Kyma is the most versatile sound module on the market. Kyma can also process external audio in real time, and you can use that same audio to control the parameters of a sound. For example, you might use the pitch of your voice to change the playback rate of an audio file on your hard drive, or the amplitude of your voice could change the pan position of a sound. We can't think of another system that allows you so much freedom!

Among the many new features in version 4.5 are functions for modifying the spectrum of a sound, morphing two sounds, and creating alternate tunings. A sophisticated MIDI sequencer feature lets you nest any number of sequences, and a graphic envelope generator makes building complex, time-varying sounds easier than ever. Also new are a Tape Recorder for capturing audio directly to disk; an 88-channel, real-time vocoder; granular synthesis modules; and major improvements to the user interface. In short, Kyma 4.5 is one of the most powerful sound-design systems ever made. And to think that version 5.0 should be out sometime next year!

Synthesizer (hardware)

Roland JP-8000 and Yamaha AN1x
($2,295/$1,495)

Many fine new hardware synths were released this year, making the job of picking a winner especially tricky. In the end, we simply could not choose between the Yamaha AN1x and the Roland JP-8000, so we picked them both! Both synths use physical modeling synthesis to emulate the sound of analog synths. With 10-voice polyphony, the Yamaha has the polyphony edge over the 8-note Roland synth, but the instruments are in a virtual dead heat when you take all their features as a whole.

For starters, the Yamaha AN1x offers a 61-note keyboard to the Roland's 49 notes, but because neither is meant to replace your master controller, we don't view that as much of an issue. More important, both units ship with 128 presets, both are 2-part multitimbral, and both offer great sounding synth engines. We particularly like the Yamaha's ribbon controller, which allows you to assign separate parameters to the x (horizontal) and z (pressure) axes. But though both modules have highly sophisticated arpeggiators, a must for the techno/rave crowd, we give the edge to the JP-8000's arpeggiator, which can sync to MIDI Clock, internal LFO 1, and various other control sources.

If you like the feel of knobs and sliders, look no further. The Roland has dozens of real-time, programmable controls that allow you to change oscilla-

tor tunings, LFO depth, waveform shape, envelope attack and decay rates, plus much more. No more searching in a multilayered LED display for some obscure parameter setting! The AN1x also provides an array of knobs that have a tactile feel analog lovers will appreciate.

Building patterns is particularly easy with the Roland. Just use the Realtime Phrase Sequence mode in the arpeggiator to assign short sequences to different keys, and then trigger the sequence by hitting a key. You'll be off to the dance floor in no time. Or load up some of the techno sequences that come with the AN1x to sample its fat and funky sounds. You'll find strings, brass, bass, and sound effects aplenty to choose from.

We're delighted that Roland and Yamaha have introduced these two outstanding instruments, which bring back the great sounds of analog synths yet offer digital precision and control.

Synthesizer (software)

Seer Systems Reality 1.0 (Win; $495)

We've been watching software-based synths develop for some time, but they all suffered from one major flaw: an unacceptable amount of latency. Reality, from Seer Systems, has solved this problem and responds with the same timing and feel of an external, hardware-based sound module. Yet the entire program runs in software on your PC! (Sorry Mac users, there are no plans for a port to your platform.) Also, you can only use Reality with a true Sound Blaster–brand sound card. (The Editors' Choice award–winning AWE 64 Gold card makes a great companion.)

Reality provides up to 64-voice polyphony on a fast Pentium 133 or better and offers endless tools for sound design. There are a number of functions for creating analog emulations, including variable waveform oscillators, filters, envelopes, and LFOs, and FM fans will also find much to like. You can use your own samples to build patches, giving you a disk-based sampler, and you can explore its physical modeling, the hottest new synthesis method on the market.

One of the things we like best about Reality is how quickly we can create new patches. Features such as the Auto-zoning option really put us on the fast track, and the ability to automatically create new patches from WAV files is also a time saver. Seer Systems has even included over 100 MB of royalty-free samples and hundreds of presets spanning a wide range of sounds.

Focusrite Green 3 Voicebox ($1,349)

Although astronomers occasionally witness the birth of new stars, supernovas, and other celestial phenomena, we editors keep vigil for more terrestrial geneses. This year, we've witnessed the birth of a new hardware category, the "voice processor." A voice processor—so far, anyway—is a stand-alone, rack-mount device designed to let you track vocals directly to the recording medium, bypassing your console mic preamp and channel strip on the premise that you'll end up with better-sounding tracks that way. It contains a microphone preamp followed by any number of other processors (e.g., compressor, spectral enhancer, and EQ).

A surprising array of these workhorse units has hit the market recently, but our favorite in 1997 was the Focusrite Green 3 Voicebox. The Green 3 provides a mic preamp, expander, compressor, de-esser, and EQ section, in that order. We already knew we liked the Focusrite Green mic preamps—they're remarkably clean, quiet, detailed, and open sounding—but we were in for a pleasant surprise with the other features. The expander, with only a single control, does a great job of pushing down unwanted noise yet never clips the leading edges of sounds. The compressor, too, is exceptional, controlling dynamics smoothly while remaining nearly transparent,

even at high compression ratios and low thresholds. Though the de-esser's effect on signals was less dramatic than the other processors, it effectively reduced sibilants and unwanted breathing noises, especially during mixdown.

Perhaps most impressive, though, was the extensive EQ section. All three bands provide detailed tonal control while sounding sweet and musical at most settings. We especially liked the semiparametric midband, which provides a center-frequency control and a Notch button that toggles between bell

and notch frequency curves. In notch mode, the EQ is able to isolate very narrow frequency bands, allowing for near-pinpoint boosts or cuts.

Of course, the problem with any category is that it may suggest limitations that don't exist. With the Green 3 Voicebox, for example, we found that it worked beautifully on source sounds other than vocals. We used it on percussion and electric bass and obtained excellent results with each. But then, that seems to be a trait common to most any good audio tool: it ends up spawning applications its creators never intended, often with superlative results. ◉

THE AWARD WINNERS IN REVIEW

EM's editors and authors have thoroughly tested our Editors' Choice Award–winning products. (The only exception, the E-mu e6400, is a very close relative of the E4, which we have tested repeatedly.) Most of our tests have been published as reviews and a few as feature stories. Three reviews are still in progress, but the basic testing has been completed.

Dates outside of parentheses indicate reviews of the award-winning version. Dates inside parenthesis indicate reviews of earlier, closely related products. Dates inside parentheses with article titles in quotes indicate the products were covered in feature stories. The text of many of these articles is available on the EM Web site (www.emusician.com). Back issues are available from Mix Bookshelf; tel. (800) 233-9604 or (908) 417-9575; fax (908) 225-1562.

Home
improvement

Thanks to a bountiful selection of affordable gear—and, of course, the comprehensive product reviews and "how to" features you've studied in EM—those dreams of transforming your bedroom into a full-fledged recording studio have finally materialized. Soon you'll be churning out work that rivals the sonic impact and production wizardry of major-label releases.

Any romantic notions quickly fade, however, as sonic reflections and other acoustic gremlins start affecting your ability to hear what you're recording and mixing. As a result, tracks that sound marvelous within the four walls of your home studio sound absolutely horrible when played anywhere else. And to make matters worse, the sound leaking *out* of your studio is causing once-friendly neighbors and housemates to place orders for your head.

Suddenly, you're faced with a harsh reality: your bedroom wasn't designed to accommodate a critical recording environment. Is this the end of your dream? Hardly.

There are several ways to improve the sound of your humble room without spending a fortune. In fact, many of the design concepts that big-budget studios employ to create fabulous listening and recording rooms can be "downsized" to enhance the average personal studio. And who better to help you refashion your space into a discriminating recording milieu than the very same professionals who have designed some of the premier studios in the world?

To this end, we assembled a brain trust of renowned studio designers and asked them a deceptively simple question: How would they optimize the sonic environment of the single-room personal studio? Surprisingly, even the most budget-constrained EM reader can take advantage of the audio solutions each designer submitted. You will not have to remodel your house, knock down walls, or purchase expensive building materials. However, rest assured that the time and money you *will* spend upgrading your home studio will pale in comparison to the thousands of dollars worth of design consultation that you just scored for the price of this magazine. Now, let's start building the home studio that will make your musical dreams come true!
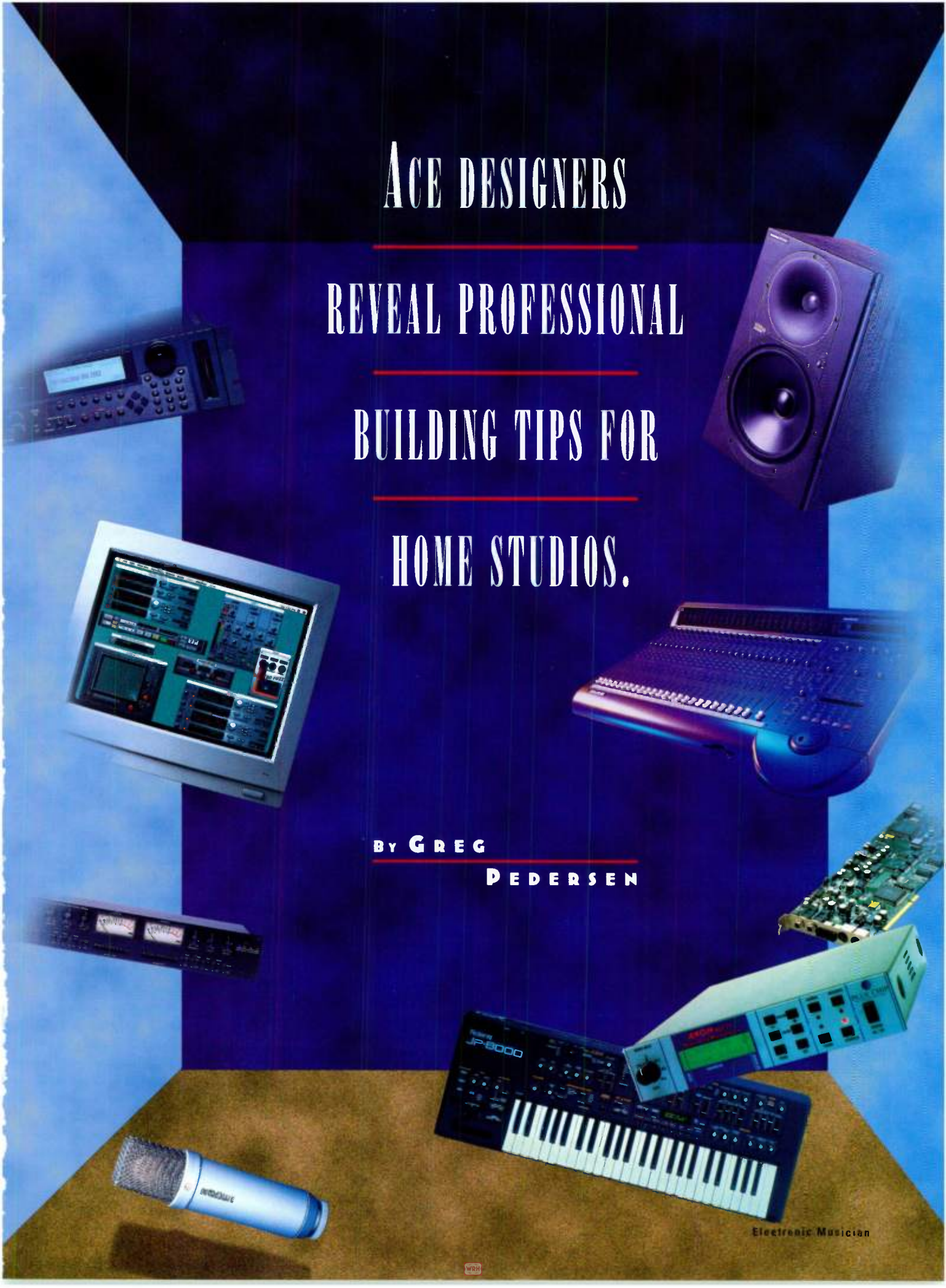
ACE DESIGNERS

REVEAL PROFESSIONAL

BUILDING TIPS FOR

HOME STUDIOS.

BY GREG
PEDERSEN

THE ACOUSTIC FACTOR

The pop stars, producers, and business people who hire designers to build dream studios often have the luxury of creating the structure from scratch—or at least they have the budget to gut an existing space and refashion it to their needs. The build-to-order process eliminates the need to deal with many acoustical nightmares because the problems are typically solved in the design.

Unfortunately, home recordists who seek to turn a bedroom or a garage into a studio seldom, if ever, have the option of knocking down a few walls. You're basically stuck with a room full of reflective surfaces and parallel walls that can twist and turn frequencies until the sound you perceive from your monitor speakers is pure fantasy. Obviously, this is not the place for critical recording and mixing.

"Ideally, you want a space with a frequency response as flat as possible," says George Newburn, a principal in the design firm Studio 440, who has designed studios for MCA Music Publishing and such artists as Danny Elfman and Peter Frampton. "You don't want a room with severe bumps or nulls at various frequencies because you'll never get an accurate representation of what you're hearing."

So how do you diminish your room's acoustic hellions without rebuilding the entire space? The solution is to minimize the room's effect on the listening position.

THE MIXING ZONE

Luckily, there are several ways to ensure that reflections and other audio anomalies will not dance around your ears. First, you must find the optimum spot to install your mixer because doing this will establish the all-critical listening position. Chips Davis, a world-renowned room designer whose current projects include the MGM Grand Hotel's EFX show in Las Vegas, recommends setting up the mixing area

approximately one-third the distance from the front of the room.

"The mix position is supremely important," he says. "You can invest a lot of time and money creating a perfect room, but if you set up your console and speakers incorrectly, you'll blow the whole ballgame. For example, if you set up the mixer too close to the rear of the room, you'll get a lot of reflections that can cause frequency coloration bouncing back at you. By setting up your reference monitors toward the front of the room, however, the reflections will take some time to bounce back from the rear of the room, which causes your brain to kick in with the Haas effect [see the sidebar "The Haas Effect"]. The Haas effect essentially cuts off the rest of the room, so you're able to focus on the source sound from your speakers."

"In a bedroom, it's best to have the majority of the acoustic space behind you," agrees Gary Hedden, designer of The Bakery in Hollywood and many artists' studios, including rooms for Adrian Belew and Chester Thompson. "If you have an 11 × 14 bedroom, the speakers should be placed where most of the 14-foot dimension is behind you. You want the sound reflections to disperse as far away from your mix position as possible. The worst thing you can do is put your back against a wall because the sound from the monitors will immediately reflect off the wall behind you."

SPEAKER PLACEMENT

The positioning of the reference monitors in relation to the listener, the console, and the rest of the room also plays a substantial role in the presence of reflections within the mix field. To avoid having reflections mess with your tonal decisions, you need to have symmetry between each speaker and between each speaker and you.

"You need to create an equilateral triangle," says Jack Jacobsen, a designer and studio builder for members of Night Ranger and Jefferson Starship and for Windham Hill's production facility. "The distance between the speakers and the distance from each speaker to your head must be the same. For example, if the speakers are six feet apart, your head should be six feet away from each speaker. Otherwise, you will not have an optimum perspective of the stereo field, and secondary reflections may compromise critical listening."

The face of your console may also fall prey to reflections from speakers placed right on the edge of the console bridge. The solution? Get 'em back, Jack!

"You can't really put the speakers in a position where you don't have console reflection, but you can minimize it," says Bob Hodas, an acclaimed acoustician who has tuned hundreds of rooms as owner-operator of Bob Hodas Acoustic Analysis. "Setting your speakers on top of the console bridge is about the worst

![At Murielle and Joel Hamilton's studio in Pacific Palisades, California](photo of recording studio)
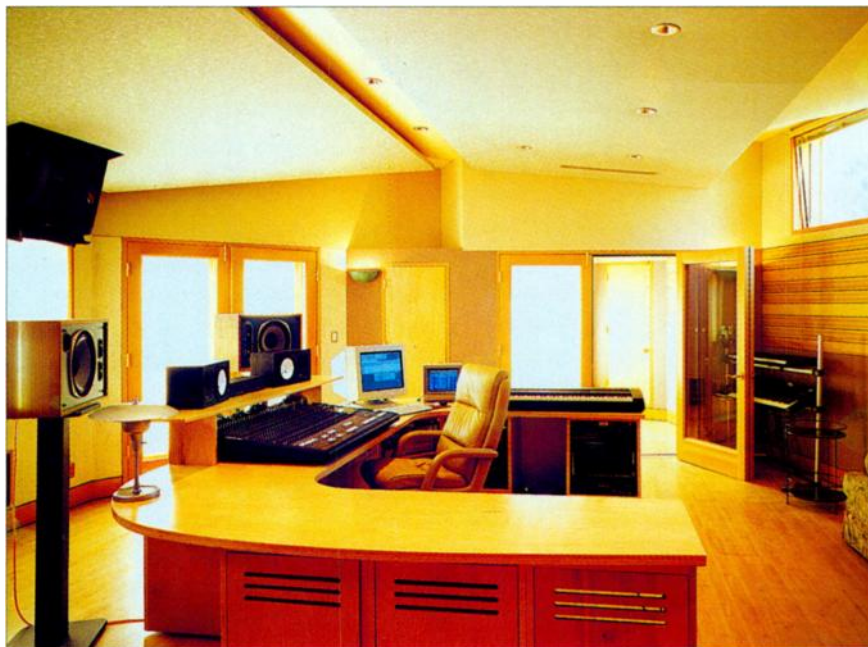
At Murielle and Joel Hamilton's studio in Pacific Palisades, California, studio bau:ton's designers moved the reference monitors back from the mix position to minimize console reflections.

thing you can do because the sound from the speakers bounces right off the console and into your face. If you place the monitors on stands and move them back eight inches from the console, you will change the angle at which the sound waves intersect with the console. Then most of the reflections will bounce underneath you and will not affect your frequency perception."

Davis also recommends attaching an absorptive cloth cover pad on top of the console meter bridge to minimize reflections from the edge of the bridge.

"The pad should be approximately one inch thick and can be mounted using Velcro," he says. "It should also hang over as much as possible without cutting off your view of the meters. The more the pad hangs over, the more it will prevent reflections off the face of the console. Posture counts when avoiding reflections, too. Make sure your seat is high enough so that your knees are almost up to the arm pad of the console. Sitting in this position will keep any reflections that bounce off the face of the console from hitting near your ears; they'll hit your stomach and chest instead."

STUDIO SYMMETRY

The glorious concept of harmony is critical in both life and relationships, and it's essential in the recording studio, as well. Changes in mass on either side of your listening environment can affect the balance of sound produced by your monitors.

"Symmetry is one of the most important aspects of building a studio," maintains Hodas. "If you don't have symmetry in the studio, there's a good chance you'll be plagued by bad stereo imaging from your monitors and the bass response will be screwed up, too. Let's say you have a bench on one side of the studio but not on the other. It will be more difficult for bass frequencies to move through the side of the room containing the bench because you have a greater amount of mass on that side. Obviously, the situation can interfere with an accurate assessment of bass levels while you're mixing.

"You also want any acoustical treatments to the space to be symmetrical," continues Hodas. "If you have an untreated window on one side of the room and you've mounted some foam on the other side to kill reflections, that imbalance will really mess up your imag-

In this room designed by George Neuberg of Studio 440, note how symmetrically the mix position has been laid out. Consistent elements on the right and left help maintain proper stereo imaging.

ing—especially if this setup is in the front part of the room, where you're also getting first-order reflections bouncing back to the mix position. What will happen is you will get this comb-filtering effect that will skew the frequency response of one side or the other."

Peter Grueneisen, ace designer at studio bau:ton, whose credits include Heart's famous Bad Animals studio in Seattle, agrees that it's critical to ensure equal, balanced frequency response from the left and right monitors. "When you're sitting at the board in the mix position and you look to each side, the conditions should be the same," he says. "For example, you don't want to have an enclosed wall on one side and a big opening that goes to another part of the house on the other."

Hedden elaborates further: "If you draw a line through your mix position to the middle of the stereo spectrum, everything on the left should be identical to everything on the right. This includes wall treatments and the shape, position, and amount of equipment. Any reflection, absorption, or resonance that happens near the speakers, or between the speakers and you, should be identical on the left and right. Otherwise, your perception of center as well as your perception of left-right balance will be funny. If it's not possible to maintain strict symmetry, you can reduce the sonic damage

by positioning asymmetrical elements below the level of your shoulders. Setting up the studio in this manner should ensure that any unbalanced reflections occur below the mix field."

BASS BUGABOOS

Within the studio environment, bass frequencies can generate enough sonic gremlins to earn public-nuisance status. Parallel walls, for instance, can cause bass frequencies to bounce around the room, producing nasty peaks and dips in low-end response. However, this wily enemy has a weakness: bass frequencies tend to build up in the corners of a room, so an absorptive apparatus called a *bass trap* can be positioned in these areas to minimize low-end woes.

Unfortunately, bass traps can usurp space that's not readily available in a cramped home studio. The depth of a bass trap determines what frequencies it can absorb, so the longer the length of the bass wave, the more depth you'll need to counteract it.

"Bass traps often require quite a bit of space to be effective," says Hodas. "For example, at 100 Hz you have to deal with a 10-foot wavelength, so you're going to need two and a half feet of space to absorb it. Whatever length the bass wave is, it will take a bass trap that is one-quarter the size of the wave to adequately absorb it. So if you have a big bump at 40 Hz—which produces a

THE HAAS EFFECT

The Haas effect relates to the localization of a source sound when the signal reaches a listener's ears at slightly different times. "Basically, the brain perceives reflections that reach the ear from a source sound within nineteen milliseconds as part of the direct sound," says acoustician Bob Hodas. "Essentially, the brain can't identify those reflections as being separate from the direct sound. This helps the quality of sound within the home studio because some problematic reflections may be 'canceled out' by the brain before they compromise the listening environment."

The Haas effect can be classified as an example of sensory inhibition because the response to one stimulus (in this case, the direct sound) causes the response to another stimulus (the reflections) to be inhibited.

rather massive sound wave—you probably will not have the available space in your room to construct a trap large enough to tame the bass."

If lack of space is a serious problem in your studio, you may want to consider using a parametric equalizer to help your playback system reconcile the room's tonal idiosyncrasies. An outboard, dual-channel equalizer can be inserted into your console stereo bus to cut (or boost) problem frequencies until the sound produced by the monitors is relatively flat within your specific listening environment.

"A parametric EQ, such as Meyer's CP10S, is one way to control bass frequencies if you don't have the room to build proper bass traps," says Hodas. "Equalization will not solve the problem acoustically, but it can, at least, help you create a space you can mix in with some confidence."

If you're lucky enough to have a big room, preconstructed bass traps are available from many manufacturers (see the sidebar "Studio Helpers"). These can be rather expensive, so budget-conscious recordists may want to consider building their own bass traps (see the sidebar "DIY: Corner Bass Trap" on p. 72; also check out "DIY: Build a Better Bass Trap" in the June 1995 **EM**).

It's important to note that any home-brewed bass traps often require spin glass (the term *Fiberglas* is actually a trademark of Owens Corning), particles of which can float loose in the air and cause a health hazard. To keep the air in your studio as free of spin-glass particles as possible, be sure to wrap these materials in fabric.

"Make sure to use fabric that's acoustically transparent," says Newburn. "A quick test for this is seeing whether you can breathe easily through the fabric. If you can, then sound can move through it, too. Upholstery fabrics aren't a good idea because they're actually dense enough to become reflective."

For the construction-challenged studio owner, Hedden suggests an ex-tremely easy-to-build bass trap that could probably be assembled by a class of earnest sixth-graders. "The simplest form of bass trap is a fiberboard or plywood panel placed diagonally across the corner of the room," he says. "You just place Fiberglas behind the panel, and you're done. The depth of the panel will, of course, determine at which frequency the trap works. I would suggest a typical arrangement of making the panel one foot deep on one wall and two feet deep on the other to create a sort of triangular cavity."

According to Jacobsen, one of the cheapest bass traps may already be located in your room—a bed. "Futon beds make great bass traps," he says. "Futons are nonreflective and absorb low frequencies very well. Any soft furniture, in fact, that is placed in the corners of the studio can help control bass frequencies."

HIGH-FREQUENCY HORRORS
Now that we've dealt with some low-frequency reflection problems, let's explore some solutions to high-frequency reflections. For example, if you think a mirror does wonders reflecting that cute mug of yours, you'll be happy to know it can also expose mid- and high-frequency reflections that can compromise the listening environment.

"Above 400 Hz, sound waves act like light beams, so you can accurately predict the location of first-order reflections by using a mirror," says Hodas. "Sit at the mix position and have a friend take a mirror and move it around the studio's side walls and ceiling until you see the front of the monitor. If you see the speaker reflected in the mirror, you're also getting a sound reflection from that point."

You should also use the mirror trick to hunt for reflective surfaces on all your equipment racks. Most racks are constructed of metal alloys, and metal *loves* to reflect. The angles of your racks and other gear, in relation to the reference monitors and the mix position, are usually responsible for how much these surfaces reflect problematic sound waves back to the listening area.

"You can use two mirrors and a flashlight to test whether or not the surface angles are going to cause reflections in the mix position," says Newburn. "Put a mirror on a reference monitor and another mirror on a piece of equipment you believe may be reflecting sound into your mixing area. Then, from the mix position, point the flashlight at the speaker. If the light reflects off the speaker mirror, then off the other mirror, and back to the mix position, you have a problem."

If you discover a rack that is tossing "nasties" into your ear space, Davis suggests orienting the rack (or other piece of furniture) so that the sound waves are reflected straight to the back wall and away from the console. "I'd also try to absorb some of the reflections by putting 1-inch thick, cloth-covered Fiberglas on the side of the rack facing your speakers," he says. "Even if you've taken care to ensure that a rack reflection won't come back into the mix position, it'll still bounce someplace else."

Windows are also notoriously reflective surfaces, but it's often difficult to banish them from your studio space. After all, a nice view (and natural light) provides a soulful contrast to the lifeless aura of a room crammed with recording gear. Newburn has a solution for how you can enjoy a window to the world without risking rampant

reflections: "Put up a heavy-duty velour curtain that you can pull across when you want to do some critical listening. Velour is a dense fabric and will tend to absorb certain frequencies rather than allow them to pass through and reflect back from the glass."

THE ISOLATION FACTOR

Now that we've covered the concepts and materials inherent in improving your studio's acoustics, it is time to focus on the concept of sound isolation. Obviously, in most home-studio situations, housemates and neighbors are close enough to be driven mad by the noises (both good and bad) that you produce.

In a worst-case scenario, eviction can be the reward for your finely honed musical masterpieces. Good manners—

Well-designed studio furniture, such as this Pro Station by Omnirax, can help you work within your monitoring sweet spot, minimize system clutter, and prevent problematic tonal reflections and resonances.

such as turning down the volume during early morning and late-night hours—can help, but courtesy is usually a doomed "quick fix." Sooner or later, the noise factor is going to upset somebody. Hedden suggests wearing headphones and close-miking acoustic performances to keep sound levels on the soft side.

"In the studio, if you monitor through headphones and put microphones close to what you're trying to record, you'll achieve pretty good sound-level management," he says. "Try to keep the volume levels of the performances down so that the acoustic levels and the monitoring levels are relatively equal—which means equally *quiet*."

Of course, you can't always manage sound levels so precisely. A snare drum overdub, close-miked or not, is going to be loud enough to upset a sensitive neighbor. And most vocalists can sing you out into the street, too—especially if you're running the same section of a song over and over to get the part right. One way to avoid these problems is to add enough mass to your room so that bass waves and other frequencies can't simply stroll through your walls and disturb the peace.

"Doors and windows are the weakest link, in terms of construction isolation, because you can't insulate them like you can a solid wall," says Hedden. "However, there are workable solutions. A solid-core exterior door—that is, a wooden exterior door measuring 1¾ inches thick with a jam and sill—is a cost-effective way to have a door capable

of creating a relatively airtight seal. Thermal seals that are designed to keep warm air in and cold air out are also effective options for making a door as airtight as possible. In addition, retracting thresholds that come down against the carpet to seal the bottom of the door are available. Door handles can also be a problem because common, through-the-door assemblies invite sound leakage. It's better to have a door that can be pushed open from one side so that no handle is necessary. This way, there is no front-to-back opening in the door through which sound can escape."

Newburn suggests mounting weather stripping to cover the tops and sides of the door. (Of course, the stripping must be installed on the entry *opposite* the side where the door opens into the room.) "You should also put a seal on the bottom of the door, but this can be difficult in a carpeted room because a carpet doesn't provide a solid surface upon which to form a tight seal," he says. "However, you can work around this by stuffing towels under the door while you're working."

As mentioned earlier, windows can be an acoustic problem because they are a reflective surface. But they can also cause isolation problems because single-pane glass is far from soundproof.

"To try and keep sound from leaking out of windows, I make a foam block that can be inserted into the windowsill," says Jacobsen. "I use rigid installation foam, the kind that has an aluminum backing, and I put the aluminum side to the glass because it reflects light and

HOME improvement

heat back outside. You can just set the foam block in the window to achieve isolation while you're recording and mixing and then pull it out when you're finished working."

TUNING YOUR ROOM

Unfortunately, the mirror trick we discussed earlier isn't powerful enough to be the sole crusader in the witch-hunt for frequency anomalies.

To really get the nitty-gritty on your room's acoustical problems, you need to have the studio "tuned." This process—which is also referred to as "shooting the room"—involves testing the response of your monitors as they react to the room's natural modes.

"The height, length, and width ratio of any space has natural resonances, or *modes*," says Davis. "If you're singing in the shower and you hit a note that fills the whole space without your having to put any energy into singing it, you've discovered a natural resonance of that space. Or let's say that a room's natural resonance is at 39.7 Hz, a low E. If I play an open-string, low E note on an acoustic guitar, the natural resonance of the space will promote and sustain that note."

Obviously, if certain frequencies are accentuated by your room's natural modes, you may be "tricked" into cutting those frequencies when you mix because they'll sound more prominent than they really are. Thus fooled, you may make EQ tweaks that actually weaken the tonal spectrum of the mix. Once again, the acoustic personality of the room is inhibiting your ability to make critical, informed sound-sculpting decisions.

In addition to revealing problematic resonances, shooting your room is a good way to find out whether the phase relationships of your speakers and other recording equipment are correct. The process can also determine which surfaces of the room need to be treated with frequency-absorbing material (to make the space more acous-

tically "dead") or frequency-diffusing material (to scatter reflective waves without absorbing them).

"If you're serious about what you're doing in your studio, getting the room tuned is critical," says Hodas. "If you can achieve a fairly linear frequency response between your room and your recording system, you'll be able to trust your ears, work faster, and have more fun. For example, it's a lot of grief if you always take your mixes out of the studio and play them on three or four different systems—your car, your friend's home stereo, a boom box, and so on—to ensure that they translate to the outside world. You should be able to

produce good mixes on your speaker system and also be able to trust that the sounds you're hearing are relatively accurate. Of course, you can always get used to the idiosyncracies of your room and do whatever it takes to make it work for you, but what if you're working with other people? You'll be constantly explaining why nothing sounds quite right in your studio."

The decision as to whether you shoot the room yourself or hire a trained professional is largely dependent on how much bread you can spare and the breadth of your knowledge concerning the science of sound. If you endeavor to tune your own room, start

STUDIO HELPERS

If you're really ambitious enough to build a serious home studio, you'll need to hook up with some manufacturers that make (or distribute) the necessary materials. Please keep in mind that this is not designed to be a comprehensive list; it's just a quick reference guide to get you started on your buying spree.

Acoustic Sciences Corporation
Tube traps
tel. (800) 272-8823 or (541) 343-9727
fax (541) 343-9245
e-mail ttrap1@aol.com
Web www.continet.com/bdcrow

Acoustical Solutions
Acoustic foam
tel. (800) 782-5742 or (804) 346-8350
fax (804) 346-8808
e-mail acoustic@richmond.infi.net
Web www.acousticalsolutions.com

Argosy Consoles, Inc.
Housings for Mackie 8·Bus mixers
tel. (573) 348-3333; fax (573) 348-2769
Web www.argosyconsole.com

Auralex Acoustics
Acoustic foam
tel. (800) 95-WEDGE or (317) 842-2600; fax (317) 842-2760
e-mail auralex@auralex.com
Web www.auralex.com

Bryco Products
Racks and storage cabinets
tel. (310) 305-0317; fax (310) 305-9167
e-mail bryco@primenet.com

Folded Space Technologies
Acoustic panels
tel. (404) 633-2507; fax (404) 321-5094

e-mail fspace@mindspring.com
Web www.mindspring.com/~fspace
Illbruck, Inc.
Acoustic foam
tel. (800) 662-0032 or (612) 520-3620
fax (612) 521-5639
e-mail 73133.1205@compuserve.com
Web www.illbruck/sonex.com

Industrial Acoustics Company
Noise-control doors and windows
tel. (718) 931-8000; fax (718) 863-1138
Web www.industrialacoustics.com

Littlite/CAE, Inc.
Console work lights
tel. (810) 231-9373; fax (810) 231-1631

Omnirax
Racks and workstations
tel. (800) 332-3393 or (415) 332-3392
fax (415) 332-2607

RPG Diffusor Systems, Inc.
Acoustic foam
tel. (301) 249-0044; fax (301) 249-3912
e-mail info@rpginc.com
Web www.rpginc.com

Rack Craft
Desktop racks
tel. (913) 262-3949
e-mail rackcraft@aol.com

Silent Source
Acoustic foam
tel./fax (413) 584-7944
e-mail silent@crocker.com
Web www.crocker.com/~silent

Taytrix
Modular gobo systems
tel. (201) 222-2826; fax (201) 222-5457

Whisper Room
Portable isolation booths
tel. (423) 585-5827; fax (423) 585-5831

the process by listening to some favorite albums in the space. Ideally, these productions should represent the styles of music and instruments that are likely to pop up in your recording situations. As the music plays, try to determine any boosts or drop-offs in frequencies that you do not hear when listening to the piece on headphones or other playback systems.

Although this is a *very* basic way to test room response, a casual listening test should reveal potential tonal lapses in your recording space. You should also purchase a test-tone CD, such as the *Mix Reference Disc* (available from Mix Bookshelf; tel. 800/233-9604 or 908/417-9575; fax 908/225-1562) to check your room's reaction to tone bursts at specific frequencies.

"A test-tone disc gives you an idea of the modal stability of the space: whether certain notes are going to sustain or die," explains Davis. "Essentially, you're listening for the results of one tone burst frequency to another tone-burst frequency. Let's say the 40 Hz burst goes off and you hear this 'buuung' sound that really sustains. Then, the next tone burst at 50 Hz dies really quickly. Now you know that your room's modal resonance is supporting 40 Hz, which is why that frequency is ringing on you. Obviously, that shows 40 Hz is going to be more prevalent in the space when you're recording and mixing."

A less subjective method of measuring the response of your room is to rent a ⅓-octave-resolution real-time analyzer (RTA). This device is essential for do-it-yourself room shooting because it measures sound-pressure levels at 31 different frequencies. A good RTA can cost you $900, but you can rent units for approximately $100 per day.

Although an RTA will not tell you *all* the information needed to tune a room, it will uncover problem frequencies with more precision than the untrained ear.

"Even a cheap RTA has a variety of uses beyond tuning a room," says Jacobsen. "When I'm in the studio, for example, I leave the RTA's microphone turned on the entire time I'm working. If some frequency suddenly starts feeding back, all I have to do is look at my RTA and—bingo!—the unit pinpoints the offending frequency. You can also use an RTA as an ear-training device to help you locate specific frequencies within the sonic spectrum. Pretty soon,

DIY: PORTABLE ISOLATION BOOTH

Space is always limited in the typical bedroom studio, so it's usually impossible to build a vocal isolation booth into a personal studio. Fortunately, you can make a portable iso booth that can be set up when needed and broken down for easy storage when the session is over.

"First, get three unfinished sliding closet doors," says studio designer and musician Jack Jacobsen. "The doors are lightweight and hollow on the inside, so they're easy to work with. Then hinge the three doors together with hinge pins. To ensure the sound of the booth is conducive to cutting vocals, it's essential you attach absorptive foam on the inside of each door to help diminish sibilance and high-frequency reflections. If you

feel it would help the performer to have visual cues, you can easily cut an eye slot into the door.

"Now, position the three-sided booth in a corner of the room to form a five-sided area," Jacobsen continues. This configuration minimizes the possibility of reflections from parallel walls. You should also hang shipping mats on the back wall to help absorb the lower frequencies of the voice that occur at around 200 Hz or 300 Hz. Again, the use of absorptive materials is critical because you want this area to be as nonreflective, dead, and anechoic of an environment as possible. When you're done, you just pull the hinge pins, break the booth down into pieces, and store the unit away."

when you start to EQ a mix, you'll be able to determine whether your tweaks are actually doing something.

"However, it's important to note that an RTA is not an end-all solution," Jacobsen continues. "If you equalize your monitor system until it delivers flat frequency response when measured on an RTA, that doesn't necessarily mean you have improved the sound of your room because an RTA doesn't tell you anything about reverberation times or phase relationships."

Jacobsen's statement shows the danger of taking room-tuning into your own hands: what you don't know *can* hurt you. To enhance the room's sound, it's important to understand the science of acoustics so that you know why you're messing with a given frequency.

"It will do no good to try to EQ a playback system to fill every hole you find in a room's frequency response if the problem is a physical one," says Davis. "If you just try to EQ the holes, you will smear the audio spectrum immensely. For example, never take an RTA, set it on a mic stand at the mixing position, and then start EQing the low end. If you have an 8-foot ceiling, you are dealing with a natural floor-to-ceiling frequency cancellation. That's the laws of physics at work; you can't make that problem go away by using EQ."

Given the pitfalls of DIY room shooting, hiring a professional may be the best route for you and your room. You should be prepared, however, to spend anywhere from $500 to $1,000 to contract the services of a local acoustician. To get a better idea of what you're getting for that fee, we asked Hodas to chronicle some of the services he provides and the equipment he uses when tuning a room.

"I tune studio spaces with a Meyer Sound SIM System 2, and I had to pass a rigorous course by Meyer Sound Labs to be accredited on the system," he says. "Meyer understands that anyone could go out, buy a test system, and do bad work, so their course is very thorough. The SIM System makes it possible for me to do my analysis at an extremely precise ½₄-octave resolution. By comparison, the ⅓-octave resolution of many less-expensive systems affords a very cursory kind of analysis. If I used one of those systems, it would be like telling someone, 'I will tune your piano, but I'll only tune twelve of the keys!'

"When I tune a studio, I'm looking at 245 points in that room," continues Hodas. "For example, if you have two or more sets of reference monitors, I'll shoot them all to ensure the polarity is correct on each and every one. This is critical, because if your speakers have

an absolute polarity shift, elements such as vocals will move back and forth when you switch from one set of speakers to another. You want the left and right speakers properly in phase and all the tweeters moving in the same direction. With SIM, I can spot a horn out of phase quickly because I'm able to look at phase relationships constantly in real time."

Hodas also does a tone-impulse-response test to identify the reflection patterns in the room. He even checks the console stereo bus to determine whether there are any electronic malfunctions messing with your tonal perceptions.

"If you've got a left and right mismatch in your console that is more than two-tenths of a dB off, it's going to pull the stereo image to one side or the other," says Hodas. "The SIM system has resolution down to one-tenth of a dB in amplitude, so I can look at the phase of the console and see whether any of its capacitors are starting to go bad—a situation that can throw off phase and frequency response."

POWER STRUGGLES

Acoustic anomalies are not the only factors a studio designer must take into account when building a recording facility. These days, even a modest home studio is a neural net of wires, patch cables, and power cords, and every piece of electronic gear must plug into a wall socket. Electrical power is the lifeline for your recording gear, and the studio's power sources must be absolutely uncompromised. If not, you may be plagued by buzzes, hums, and other noises that can ruthlessly trash a session. In addition, power surges, brown outs, and blown circuit breakers can put expensive recording and music gear at risk of serious damage. (For a more comprehensive tutorial on power

and grounding, see "On Solid Ground," parts one and two, in the September and October 1992 issues of **EM**.)

To start the process of creating a safe, effective power source, Hedden suggests studying the branch circuits supplying electricity to your home. "It's important to know what else is plugged into the outlet that you're using for recording," he says.

Jacobsen has an easy method for identifying shared circuits that could cause power problems in your studio. "The first thing you want to do is go to your breaker box and find out which breaker goes to the room you're using as a studio," he says. "Turn on a small table lamp and plug it into all the sockets; if it goes off every time you throw the breaker, then all the sockets in that room are on the same breaker. There are usually only four sockets in a conventional bedroom, but because you can put eight sockets on a single breaker, two rooms may share that one breaker. It's critical to determine whether your studio is on the same breaker as another room. For example, if you share a breaker with your kitchen and someone turns on a blender while you're mixing, you'll probably have a horrible buzz and hum coming through your monitors. If you're tracking, that sound will get recorded along with the instrument or voice."

To prevent this frustrating scenario from messing with your patience and productivity, you should dedicate—and isolate—one breaker to your recording space. (Be sure to identify it with a label that says "studio.") You'll probably have to call in a professional electrician to make the adjustment for you, but the expense is worth its weight in studio hours. After all, you obviously can't work if dinner preparations, house cleaning, and other household activities are constantly throwing noise into your recording system.

"You also don't want to plug *anything* in that draws a lot of current, such as a portable heater or fan, on the same line," warns Jacobsen. "There may be only twenty amps going to that circuit, and your breaker will click off if you draw more than that twenty amps. And guess what? A 1200-volt heater alone draws ten amps. Luckily, you can have a massive quantity of stuff— say, a setup with three ADATs, a big mixing console, two racks full of outboard equipment, a pair of speakers, and a monitor amplifier—and probably draw only seven or eight amps of power. But if you start plugging in bass amps, subwoofer systems, and anything else that swings a lot of current, you'll be popping the circuit breaker and interrupting your session."
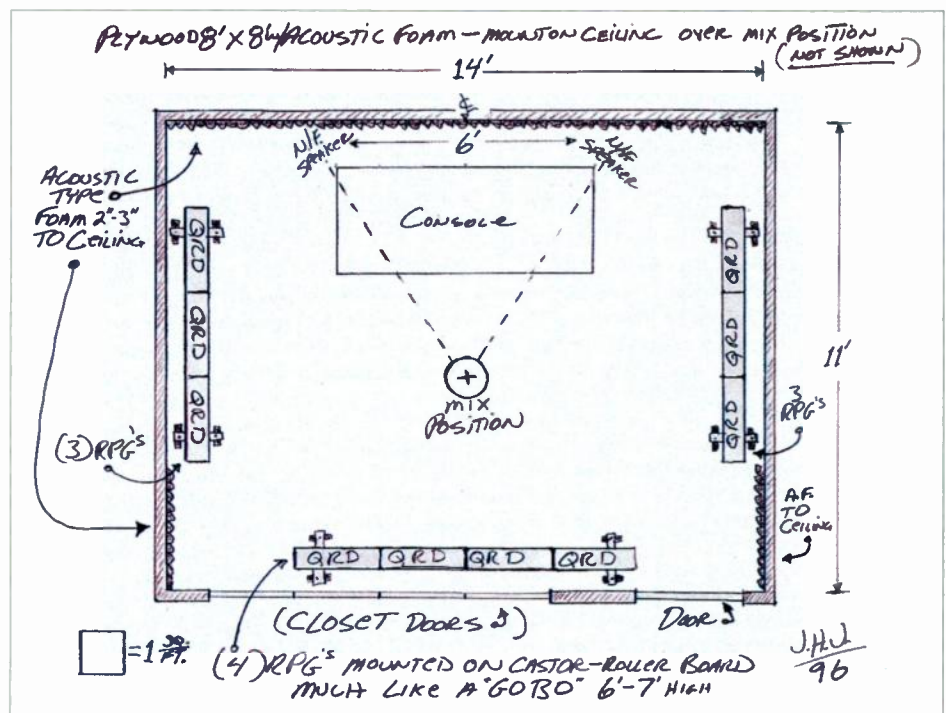
Jack Jacobsen drew up this basic design for a bedroom studio exclusively for EM readers. Thanks, Jack!

Some homes mix 15- and 20-amp circuits, and **EM** Senior Editor Steve Oppenheimer strongly suggests having the 20-amp circuits service your studio. Check your breaker box to confirm the power situation.

"Twenty-amp circuits give you more power," says Oppenheimer. "It's better to have some headroom so that you're not stressing your power with whatever you're doing in the studio. An electrician can switch you over very easily to twenty amps. It's really no big deal, and you should have it done."

The quality of power in your studio is another factor to seriously consider. "You certainly want to protect your thousands of dollars worth of equipment by plugging into good electricity," says Jacobsen. "*Bad* electricity is caused by certain situations such as a socket without a neutral wire, the ground and the neutral wires being tied together, or reversed neutral and hot wires. I recommend getting a phase-test plug so you can check the wiring yourself. These units only cost about five bucks, and they can save your gear. You just plug it into every socket in the room, and it will tell you whether any of the outlets are wired wrong. Of course, if you discover any problems, you should hire an electrician to correctly wire the system."

To further protect your recording gear, Hedden recommends buying an isolation transformer. "These units cost approximately two hundred bucks and will help improve your system's signal-to-noise ratio considerably," he says. "For your computers and related equipment, I would also recommend an uninterruptable power supply [UPS]. You can get one for about a hundred and fifty bucks, and they can really save you a lot of grief if your house power shuts down. If you're sequencing, for example, and there's a little glitch in the power, you won't lose your RAM. The UPS has a battery backup, so if there's a power failure, you'll have a few moments to save your work and turn everything off."

ILLUMINATION
In the rest of your house, light dimmers can provide a subtle hint of mood lighting. In your studio, however, the only moods these dimmers will produce are anger and frustration. Light dimmers typically create annoying buzzes that can toy with your concentration and even sneak into your recordings.

"That buzzing sound can get into everything, including mixing consoles and microphones," says Hedden. "If you do have dimmers in your studio—and I recommend that you don't—a good test to see whether you've got a problem is to grab a battery-operated AM radio and tune to a place where there isn't a station. If all you hear is hiss, you're okay, but if you hear a buzz, it's probably coming from the dimmer. You also want to avoid fluorescent lights because their transformers produce a horrible hum.

"In addition, be careful when using halogen lights because some models employ a switching power supply to make a lower voltage," he continues. "I plugged one of these low-voltage lamps into my desk and had a computer fail as a result. I wasn't able to use my mouse. I would stick to the standard 120-volt lamps rather than the low-voltage lights. All in all, incandescent lights are really the best choice."

THE COMFORT ZONE
Let's face it: the space in your bedroom studio is pretty darned cramped, and it's often difficult to place all of your equipment in convenient and easy-to-reach places. Every time you reach for a piece of outboard equipment, it's two feet away from your mix position, so your body contorts like William Hurt's half-man/half-ape character in *Altered States*. Not good! Fortunately, well-designed studio furniture can help you keep everything within easy reach.

"Musicians buy all this gear, but they don't think about where they're going to put it, so most of the stuff just sits on the floor," says Phillip Zittell, vice president of sales and marketing at Omnirax. "We offer an alternative where everything in your studio can be positioned so that it's ergonomically sensible. We even measure the overall height of our workstation units to ensure that reference monitors can be
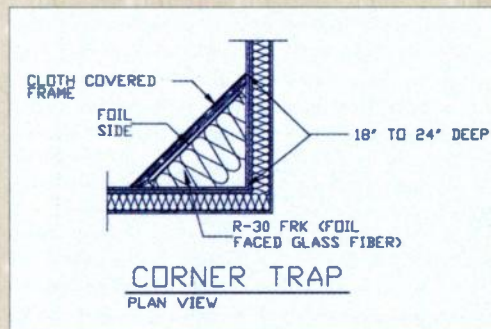
placed in the right position."

And speaking of position, we already know that the mix position in your studio is critical. However, many recordists will compromise ergonomics by plopping a console onto a cheap folding table or a makeshift bench. Such kludges invite problematic frequency reflections and may force you to move outside of your monitors' sweet spot to make sound adjustments. Specially designed studio furniture can alleviate mix position ills, but a new type of furniture—the console housing—can do that *and* make your Mackie 8•Bus or Yamaha 02R look as slick as an expensive Neve.

"Like a lot of people, I bought a Mackie 8•Bus," says David Atkins, founder and president of Argosy Consoles. "My wife had hoped I was getting something that wouldn't have all these wires hanging out the back, so I told her I'd try to find something nice to put the console in. But because I couldn't find anything that professional, we starting sketching out a housing for the mixer to emulate a large-format console.

DIY: CORNER BASS TRAP
Building a bass trap can be as easy as going down to your hardware supply store and buying a bundle of Owens Corning R30 Fiberglas. Then build a simple wooden frame, and mount it diagonally, approximately 24 inches out from the corner of a wall (see diagram below). The frame should be tall enough to cover the entire corner; you want the low-frequency focus taken out of the listening environment. Now stretch a cloth over the frame to hide the Fiberglas, but be sure to keep the foil side of the Fiberglas facing out into the room. Mounting the Fiberglas "foil out" is really important because tests show that this foil acts as a membrane absorber that knocks the heck out of bass waves.

—Chips Davis

CLOTH COVERED FRAME
FOIL SIDE
18" TO 24" DEEP
R-30 FRK (FOIL FACED GLASS FIBER)

CORNER TRAP
PLAN VIEW

"We discovered that by dropping the 8•Bus into the housing, everything could be on one control surface, which creates a much more organized work space," Atkins continues. "For example, you can integrate your peripheral equipment into the console work surface instead of having to put your outboard gear into a rack that's out of the speaker plane. Obviously, it's inconvenient to reach behind you or to the side every time you want to tweak a compressor. This way, you can just reach up on the console and adjust compression parameters without moving out of the monitoring sweet spot."

However, whether you use home-built or custom studio furniture, keep in mind that any furniture can resonate at frequencies that can cloud your perception of the audio spectrum. "The furniture in your studio should be acoustically transparent," says Hedden. "Stands that support the gear where you want it but don't have a lot of resident cavities are good choices. A simple test for resonance is to simply knock on the furniture. You shouldn't hear any ringing tones, hums, or rattling. Obviously, the overall construction should feel very solid, too."

Comfort involves more than just ergonomics, however. Spending hours (or days) in your now-soundproofed home studio—sometimes with other musicians or technicians present—will definitely increase the "funk" factor. And we're talking about sweat and stuffy air here, not rhythmic grooves.

"There will be more heat in your recording space than normal due to the gear, lights, and people," says Hedden. "You'll also have reduced air flow because you've sacrificed ventilation for soundproofing. To keep the studio from becoming an unbearable sweat box, you can install an independent cooling unit outside the room with vents that can blow in cool air. These systems contain all the noisy parts in the box that's mounted outside, so the noise levels inside your studio can be kept fairly low. You can also add some vents to your central air-conditioning system—if you have one—that service the studio space."

"A lot of the guys I know have separate, window-mounted air conditioners in their studios," offers Hodas. "These are single-room air conditioners, much like the type you find in some cheap motels, that you can run periodically to keep the temperature down. Obviously, you don't want to run the system while you're doing critical listening, but you can usually keep the room comfy by turning on the system while you're setting up or composing."

In a really tight-budget scenario, you can keep the air moving by having small desktop fans blowing across equipment racks and the mix position. Again, you don't want the fans chattering when you're mixing or recording, but keep them running every single second your ears are not on duty. It also helps to crack open the available windows and doors while the fans are going so that the hot air can escape.

Now taking frequent breaks to "fan out" the room on hot days may not seem like a productive use of studio time, but cranky musicians and engineers often work very, very slowly. (And falling asleep on the mixing console because you've gotten all warm and toasty isn't very productive either, is it?)

END OF SESSION

Hopefully, these tips, tricks, and applications will help you make those long and arduous hours spent in your home studio more enjoyable. When everything sounds great, you'll obviously be more confident about the quality of your music productions. In addition, your critical-listening chops should improve when your room isn't throwing aural impediments into your workspace. In short, a good room is a great thing.

And armed with all the know-how that these pro studio designers have encapsulated into the pages of this article, building your ultimate dream studio shouldn't be an *impossible* dream.

Freelance author, guitarist, and gonzo bedroom-studio recordist **Greg Pedersen** *(gregscrnr@aol.com) maintained his esprit while researching and writing this massive feature by inventing open tunings and jamming to old Joe Walsh records.*

FEAR OF FLUTTER ECHO

Do you remember the echoing "chu-chu-chu-chu" sound effect in those *Friday the 13th* horror movies? The eerie tone is an example of flutter echo—a distortion of a source sound that drives some studio engineers and producers to distraction. The easiest way to check your recording space for this acoustic imp is to walk around the room clapping your hands. If you come to a spot where you hear the "Jason effect," you're the proud parent of a flutter echo. However, according to designer Chips Davis, the presence of flutter echo doesn't mean you're working in an acoustically unfit studio.

"It cracks me up sometimes when I see people walk into a room, clap their hands, and pronounce, 'Oh no, there's flutter echo in here!'" he says. "If you clap your hands in a space and you hear flutter echo, you have to be directly in the line of the echo for it to be harmful. If it's bouncing at the other end of the room, you will not hear it when you're mixing or recording. I mean, have you ever heard flutter echo on a speaker? If you think so, just take your drum machine, call up a snare sound, and run it through your speaker system. Now, if you don't hear the flutter echo bounce around where you're sitting to mix, don't worry about it. You should only be concerned with the listening environment you're in.

"If you *do* hear that echo, simply change the angle of the speaker, and it should disappear," Davis continues. "Even if you have the worst case of flutter echo imaginable, all you have to do to cure the problem is to treat a front or back wall and one side wall with absorptive foam and angle your speakers correctly. Do that, and people will be able to come in and clap their hands all they want!"