

VOL. 9 NO. 6

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**SEPTEMBER 1986**

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## CD at What Crossroads?

I'm able to admit that CD is at a crossroads, but not at the ones that just about everybody seem to be pointing at. In terms of public acceptance, CD is way past such a point—after all, by the time you read about a technology in your local newspaper and *Time* magazine, it *has* to be in. CD plants are still unable to keep up with demand for discs, and, since demand is increasing somewhat faster than the plants are being built, the shortage is likely to continue for some time yet. Nor are players for the masses a problem: locally you can buy a CD player (albeit of dubious ancestry) for \$88. I think the public has seen CD, and decided it's OK. In most cases, how it sounds is not an issue.

If public acceptance of CD has passed the crossroads, such a junction is just hovering in sight for audiophiles—we're definitely not yet there. I'll grant that opinion is divided: JGH actively likes the medium; AHC gives it more-than-grudging applause; JA can find it in his heart to overlook CD's trespasses in favor of its advantages; and Martin Colloms has always found CD a useful evaluative tool. But I am not alone—see the interview with James Boyk—in my dissatisfaction, in many numbers of systems and using dozens of different discs, with the new medium, in spite of initial favorable impressions. George Graves' comment (starting p.25) says it all: "A friend asked me how come I wasn't listening to my CD player." The best test of any piece of equipment is whether you go back to listening to it over and over—or whether you consistently avoid it. The advent of the CAL tube CD player is one hopeful step, but I suspect that the future of digital, and the only real crossroads, lies in the hands of the recording studios and the Japanese manufacturers who have been so effective at promoting the new medium.

The recording studios are where real advances, in the form of better recording electronics and digital oversampling while recording (*a la* the Philips players), can be made. Just as each new generation of CD

Continued on p. 141.



the  
question  
of

BITS

J. Gordon Holt

According to a recent newsletter to its regular contributors, our "competition"—*The Absolute Sound*—sees "controversy and confrontation" as the core of its editorial policy. By contrast, *Stereophile* sees as its *modus schtickus* an unflinching devotion to, and pursuit of, truth, reason, all of the eternal verities (including some you never heard of), and the intelligent exchange of informed ideas. In honor of all of the above-mentioned precepts (as well as some I didn't mention), this issue of *Stereophile* is largely devoted to the confrontation between knowledgeable writers for whom the widely proclaimed perfection of the Compact Disc remains a controversial issue.

Every technological advance in sound reproduction has been hailed as "unmusical," "unnatural," and "contrary to God's law." The first electrical recordings were condemned (by those who cared about

sound at all) as "shrill," "steely"<sup>1</sup> and "unmusical." The first stereo discs were castigated by most sonically-aware critics on precisely the same grounds, except that two new cavil criteria had been added: inner-groove distortion and mistracking. Could we really have expected CD to be greeted with any less skepticism.

Several of digital's critics point out that PCM has unleashed new and unfamiliar forms of distortion on reproduced sound. They then proceed to explain these in terms of PCM's sampling rate (too low) and 16-bit encoding (not enough bits). JA explains elsewhere in this issue why the CD's 44.1kHz sampling rate is not (in theory) the disaster that CD's critics claim it to be. To that I will now add the reasons why I do not

<sup>1</sup> The first use of this term that I know of dates back to 1914! Much of the language of "subjective" audio assessment predates the era of "perfectionist audio."

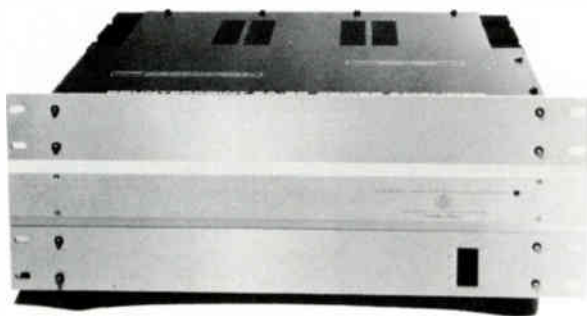
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feel 16-bit encoding to be a liability either.

The number of bits (Binary DigITS) comprising each parcel of sampled information (Word) determines how many different numerical quantities can be expressed. One bit has only two states: 0=Zero (Off), 1=One (On), so it can express only two amplitude levels. Two bits can be used to express 4 values: 00=Zero, 01=One, 10=Two, and 11=Three. 16 bits, as used in most of today's PCM systems, including CD, allow us to encode 2 to the 16th power (65,536) amplitude levels. The question is, is that enough for music reproduction?

Only a madman would care to listen to an audio system at a level of more than 115dB, which is only 5dB below the level required to produce actual physical pain in the ears. Most audiophiles, even when not constrained by considerations of neighborliness, rarely listen at levels higher than 105dB (even a loud soundtrack explosion in a well-equipped movie theater with Dolby sound rarely exceeds 105.) No sound at all is, of course, considered to be 0dB, and it is almost impossible to find such a quiet environment. Even the best sound-isolated anechoic chamber may have a noise floor of 5dB, and a concert hall's ambient noise is rarely less than 25dB. But let's assume, just as a worst-possible case, that the recording venue had an ambient noise floor of 20dB, that we can hear sounds whose level is 15dB below that noise floor to a level of 5dB (which we can), and that we're going to say to Hell with the neighbors and listen at peak levels of 115dB. The dynamic range we will need then is 110dB, and we will usually need much less than that.

With so-called linear encoding, those 65,536 recordable volume increments are all of equal size, and if the encoding system were capable of recording a dynamic range of 110dB, each level step will have a magnitude of less than 0.01dB. Since not even the most golden-eared perfectionists claim to be able to hear a change of much less than 0.1dB, it is clear that 16 bits are more than we need to provide what sounds like a continuous (analog-type) change of signal level.

But the quantization is not that precise. Only when the signal level falls precisely at

a quantizing step point will it be perfectly accurately encoded. If it lies about midway between two adjacent step points, the A/D converter can encode it either way: at the upper level or at the level below. Either way, the quantization will be inaccurate, by a factor of up to half the difference between those two quantizing levels.

The sum of such errors is called quantization noise or distortion and, if gross, can be heard as a hiss that fluctuates in accordance with the signal level.<sup>2</sup> In a perfect 16-bit system, it occurs at 1/131,070 the level of the highest recordable signal. If you care to look that up in a decibel table (for power ratios), you'll see that it represents 98dB, which is also precisely the dynamic range which can be encoded by the CD system.

That's quite a bit shy of the 110dB that we figured we'll need for perfect music reproduction, but CD's promoters undoubtedly assumed that it was more than would be necessary for the mass-market system that CD was intended to be. Even if a recording actually had 98dB of dynamic range on it (which very few have), it was reasonably assumed that most people would never listen louder than 90dB, so they would never hear the quantization noise at the system's cutoff point. It would be 8dB below the 0dB threshold of normal hearing.

But to an audiophile, 90dB is almost considered to be a high background-music level. And at 105dB on peaks, CD's modulation floor is 7dB above the hearing threshold, where it may or may not be masked by ambient noise in the listening room. At best, we may hear a rough quality to the weakest musical overtones; at worst, we'll hear an irritating hiss riding on the softest sounds. And we might also find that the hall reverb cuts off abruptly just above the point where it should fade to silence. In other words, it appears that the CD system *can't* meet the needs of the perfectionist. And we all know that the format standards for CD are so rigid they can't be modified to improve its performance, right?

<sup>2</sup> The live Lorin Maazel Beethoven 5 recording, on CBS/Sony, has some of the most beautiful examples of audible quantizing distortion that one could wish to hear. You hear it as a granular fuzz that rides on the envelope of the instrumental sound: Buy this CD, if only to educate your ears to the new sound of digital. —JA

No, wrong!

In analog recording on tape, the magnetic properties of the oxide particles behave in a very erratic fashion in response to a weak magnetic field. Some will change polarity, others won't, and the result is very poor tracking of low-level signal amplitude changes, resulting in gross distortion of moderate-level signals and a total loss of the quietest ones. This problem was solved by mixing an ultrasonic "bias" (70-200 kHz) signal in with the audio signal, which keeps the magnetism on the tape alternating continuously in polarity at a high enough level that the particles' residual magnetism is held above the nonlinear region. Being ultrasonic, the bias is inaudible. The audio signal is simply superimposed on the bias, allowing low-distortion encoding of low-level material.

The cure for CD's modulation-floor limitation is something analogous to tape bias. Instead of an ultrasonic signal, a PCM system uses white noise, at a level of just a dB or so above the modulation floor. White noise, which sounds like a sibilant hiss, is a complex signal consisting of random frequencies at random amplitudes,<sup>3</sup> and spanning the entire audio range or beyond. Covering the modulation floor, its random energy spikes add to the intensities of the lowest-level signals to permit them to be encoded in a linear fashion, although at intervals which are far enough apart so as not to make them, in playback, any louder than they were originally.

The subjective effect of this noise "biasing," more correctly termed "dithering," is dramatic. Not only does it eliminate quantizing-error noise at very low signal levels, it also extends the effective modulation floor by a full 15dB or so below what an undithered system can record! This bestows upon our "rigidly standardized" CD system a usable dynamic range of 113dB, which is 3dB more than the 110 we figured as the most extreme requirement.

Finally, it must be acknowledged that,


although dithering is now generally recognized as an important element in PCM recording, it is still not universally designed into recording systems. Few mastering recorders have dither "built-in"; although nearly all of them have it inadvertently, as a result of residual background noise in their audio input signal or circuitry. Practically all CDs, therefore, are dithered, by design or otherwise.

So, if neither sampling rate nor number of bits are sabotaging the CD, why do so many people dislike its sound? I think it's due to a number of things.

First, the whole idea of digital—the chopping up of music into little pieces, and reconstituting it like powdered orange juice—is offensive to some people. Others are offended by the idea of measuring time—which is the measure of music—as quanta rather than as a continuum. (Yet their "non-digital" wristwatch has an escapement which goes tick, tick, tick, in a most discontinuous fashion.)

Many of the complaints about CD sound [are] justified, however. We now know that a CD player's audio electronics and D/A conversion accuracy have a great effect on the sound. And as long as the sound of CD players continues to improve, we cannot truthfully say that we know, yet, what a CD really sounds like, or how bad or good "CD" is. And CD player refinement is obviously just the start of a long evolution of the kind that the system's detractors feared was impossible because of CD's rigid standardization.

Certainly, the audio input and A/D conversion circuitry of PCM recorders is long past due the kind of attention being lavished now on playback machines. What about DC-coupled audio circuits, isolated and regulated power supplies, and oversampled A/D converters in the machines on which CDs are mastered? What about the development of lower-distortion mixing consoles, and getting rid of all those signal processors, and using lower-distortion, smoother-response mikes in the recording studio and concert hall, as mentioned by James Boyk later in this issue?

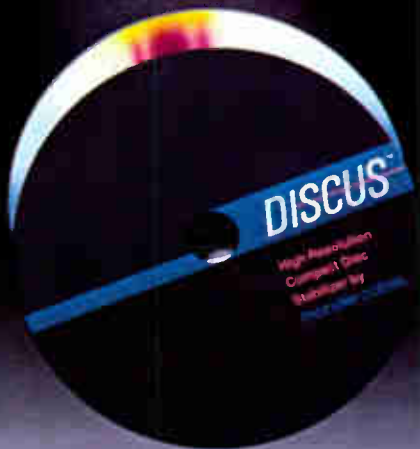
What about giving CD the 28-year chance to prove itself that we gave the LP? 

<sup>3</sup> Strictly speaking, so is "pink noise," but their spectral energy distributions are different. Pink noise has equal energy through each octave, white noise has equal energy at each frequency. And there are a lot more frequencies between 1000 and 10,000 Hz than between 100 and 1000.





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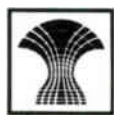
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# LETTERS

We regret that time does not permit us to reply individually to letters, particularly those requesting advice about particular equipment purchases. Were we to do this, a significant service charge would have to be assessed—and we don't have time to do it anyway! Although all are read and noted, only those of general interest are selected for publication.

## The biggest pile of trash?

Editor:

It is with great disappointment that I write this letter. I subscribed because your promotional literature led me to expect an opinionated but *technical* journal.

*Stereophile*, however, is the biggest pile of trash I've had the misfortune to read since Eric von Daniken's idiotic opus *Chariots of the Gods*. The one reference to testing in Vol.9 No.2 ("Pure Gold") reveals that either the editor isn't paying attention or both he and Alvin Gold are cretins. Spectral analysis is a *frequency* domain technique—it doesn't show waveforms, that's time domain! Alvin Gold writes that amplifiers affect intonation—*incredible tripe!* The entire crew of contributors should move to Haiti where their mystical, magical views will find a receptive audience. Please refund my subscription price.

**Gary Allan**

Arlington, VA

*Is Haiti a nice place for a vacation? I think we'd all prefer Hawaii.*

## The less-than-perfect magazine

Editor:

After receiving Vol.9 No.4, I couldn't believe that you went to the so-called "Perfect-Bound" format. Then I opened the cover to see LA bragging about the great binding. Well, I'll tell you right now that it's far from perfect! After only two weeks, my new magazine is almost in three pieces—and this is from normal reading by several people. Go back to the old binding format and I'll go back to thoroughly enjoying you again.

**Douglas Rauer**

Tacoma, WA

*All of us here at Stereophile humbly beg forgiveness for what was a truly unpardonable step backwards in the art of magazine binding. The printers, in whose shadow we are not fit to sit, and who have invested heavily in glue—a type chosen, after weeks of research by JGH himself—have promised us that "perfect" will mean "perfect" in the future. And if it's good enough for The Absolute Sound and Hi-fi News & Record Review . . .*

## Digital vs. Analog

Editor:

Congratulations on your new binding, perfect or not. Vol.9 No.4 was a landmark in quantity and—with one glaring exception—quality. "Analog vs. Digital—Home Brew Science at the Edge of the Art" was so bad I really thought at first it was a put-on. The premise of this amazing piece was that we can assess the relative merits of analog records and CDs by comparing both to the original master tapes. So far, so good. But the authors compared the CDs and LPs to *cassette* copies of the master tapes. Kind of a problem there, given that nobody in the history of the art has ever contended that cassette players are in the running as state-of-the-art reproduction technology—if they were, then maybe the CD would never have been invented.

But wait, Messrs Clawson and Zeilig aren't through yet. Whose records did they choose for this test? Sheffield Lab. Good stuff, the Sheffields, no doubt about it. But there's just one slight problem—they're direct-to-disc. They've never seen a master tape! Clawson and Zeilig (and Holt and Archibald) waste seven pages describing how Sheffield Lab CDs sound more like tapes of tapes than do Sheffield Lab LPs. I certainly

hope so. If not, Doug Sax has wasted a big chunk of his life.

Perhaps the "body, sheen, glow, and bloom" heard only from the LP should be seen, not as euphonic colorations magically introduced by the turntable, but as euphonic characteristics of real music eradicated by the process of making and playing back both cassettes and CDs. Since Clawson and Zeilig make no mention of live music, and probably haven't heard the artists live, Occam's razor slices the cassette to shreds and the CD to bits.

**David W. Woods**  
Newark, OH

## CD & cassette vs. LP

Editor:

Jay Clawson and Chuck Zeilig's analog vs. digital comparison in Vol.9 No.4 was interesting, but, as you noted, we came to the opposite conclusion in a paper for the MIT press (published in the Spring '86 *Computer Music Journal* and reprinted in the Spring '86 *The Absolute Sound*). The differences between CD and LP on our reference system<sup>1</sup> are not subtle, the LPs having far greater spatial information—especially depth—and sounding more

<sup>1</sup> Our reference system: Oracle Premiere, Custom hand-made tonearm, Monster Alpha 2, Audio Research SP-11 & Klyne SK-5 preamps, Luxman M-05 solid-state power amplifier, Sound Labs A-1 electrostatic speakers, Audio Research interconnect cable, and FMS speaker cable.

dynamic, alive and natural. The CD performances of the same works sounded dull in comparison. Many listeners have heard these comparisons using our reference system, and all emphatically preferred the LPs over CDs from the same master tapes, even those listeners who used their favorite CD players (including the Musical Concepts).

After returning from a concert, we can be satisfied listening to our reference system playing an analog record. We cannot say as much for any CD player we have heard. In trying to reconcile these disparate results, we have considered the following issues:

Firstly, the Meridian player used by Clawson and Zeilig may be better than the Mission unit, which was the best player tested for our article. We played only classical music, partly because of its demanding nature, and partly because we were highly familiar with the music we chose. Digital audio systems exhibit increased noise and distortion as the signal level is lowered (see Greenspun's follow-up article in the Winter '86 *Computer Music Journal*) thus do more violence to soft passages in classical music than to soft passages in popular music, which has a more limited dynamic range.

Secondly, our reference systems are very different. Clawson and Zeilig's first system contained Mark Levinson electronics and Apogee ribbon loudspeakers. We have

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never been happy with the sound of any Levinson/Apogee system that we have heard, either with digital or with analog sources. In using one such system for phase distortion tests, in many ways we preferred the sound of PCM-F1 digital tapes to that of a Goldmund/Koetsu/Mark Levinson ML-6A front end. (The comparison, however, was not scientifically valid since different recordings were used for the two formats.) When using our reference system, however, everyone polled greatly preferred the sound of an Oracle Premiere/Monster Alpha 2 to the sound of CDs from the same master tapes.

Doug Sax, the progenitor of the software used in the *Stereophile* tests, believes his direct-to-disc records most faithfully represent the sound of the original performance. We would like to hear his comments on the test.

We find the article's comparison between a CD player and a "comparably-priced turntable and cartridge" a bit confusing. Anyone who purchases more than a few recordings must consider the fact that a CD costs \$6 more than the equivalent LP. A modest collection of 500 recordings would therefore cost an additional \$3000 on CD. When one considers the total cost of software and player, it is irrelevant whether or not a \$150 CD player outperforms a \$150 turntable.

**Philip Greenspun &  
Charles F. Stromeyer III**  
Cambridge, MA

## **LP vs. CD & cassette**

Editor:

Please thank the gentlemen who wrote the "Analog vs. Digital" piece in Vol.9 No.4 for so vividly letting all us unenlightened brutes know that CDs sound more like cassettes than LPs (or live music). Such stunningly flawed technique and irrelevant reference—how many Panasonic strain-gauge cartridges are for sale these days?—do a *great deal* of damage to the reputation of *Stereophile*. Let's not pile up the \$#%\* just to "fill" a magazine with a square-backed spine.

**Karl Schuster**  
High C Stereo, Leesburg, VA

*According to James Boyk, who co-engineered the two most recent Sheffield Lab releases (see interview in this issue), comparing a Sheffield CD (made from the digital master tape) with the Nakamichi cassette (made from the analog master tape) is the true comparison of completely digital and completely analog media. However, Mr. Boyk feels that the nearest thing to the real thing—live music as heard by the microphones—is the direct-to-disc LP.*

## **Grunts, Groans & CD**

Editor:

The orchestra conducted by Sinopoli in the Mahler Symphony 5 recording referred to in Vol.9 No.4 was England's Philharmonia, not "Philharmonic."

However, the CD was everything your reviewer (TG?) said, and more—a great deal more. All kinds of grunts and groans and other vocal exhortations from Signor Sinopoli, unfortunately not always on pitch with the music, are audible.

The CD medium is magic—a miracle. But it will be another miracle if the sound men can filter out some of the enthusiastic rantings of the stick men!

**William W. Weaver**  
Louisville, KY

## **Caps, CD, & Sound Quality**

Editor:

The main disadvantage of George Graves' CD player modification (Vol.9 No.4) was the outboard box for the output coupling capacitors, with its associated cables and plugs. Simpler is generally better, so I thought you would be interested in the approach I took.

Comparative listening showed me the sonic value of the cheaper Philips-designed CD players, so I bought (for \$180 at discount) a Magnavox CD-2040 player with the idea of tweaking it. One reason I selected this model was its large metal enclosure, which has plenty of space for mounting components; it's also much heavier than other models, which must count for something. The 2040 should still be available in discount stores for the same or a lower price.

I ordered a service manual for \$18; strictly





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In addition, the 207 provides an auxiliary high level input and a full tape loop, making this product essentially a CD player plus preamplifier. The 207's innovative design can simultaneously improve your sound quality and simplify your home entertainment by performing as the control center for your system.

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speaking, this is not essential, but was nevertheless helpful. First inspection of the unit suggested three potential areas for improvement: the 20uF aluminum electrolytic coupling capacitors (on everyone's replacement list); the poor internal cable with plug from the audio printed circuit board to the output jacks; and a muting relay in the output line placed after the output capacitors. This relay closes three seconds after the unit is switched on; checking with an oscilloscope showed that it is needed to block a hefty 7V turn-on transient. Since I didn't trust myself—not to mention the wife and kids—to remember to turn on the CD player before the power amplifier every time, I decided to live with the relay.

Even without a schematic, the output caps are easily traced back from the output leads. The electrolytics cannot be shorted, since they block a 3.4V DC offset from the output op-amp (this is deliberate, to ensure that the electrolytics operate with a sufficient bias voltage). They must be replaced, therefore, and I selected a single 10uF SiderealKap for each channel. This lower value still gives a satisfactory bass cutoff of 3Hz with the low

10k input impedance of my Krell PAM-5 preamp. The good news is that there is space between the player's two circuit boards to mount the large—1" diameter x 2.25" long—SiderealKaps directly to the boards in the same general locations as the original caps. I secured them to the board mechanically with plastic ties slipped through a couple of resistor leads.

To upgrade the player's output lines, I removed the cheap internal leads and RCA plugs and substituted hard-wired interconnects soldered directly to the pc board. I used 3ft. of Monster Cable Interlink Reference A cable, which is highly rated. I listened to some first; it's neutral without being aggressively detailed, and thus complements CD sound. This very flexible cable can be bought by the foot off the roll at dealers. The plugs are also very good. Preparation of the cable is a real pain, however: the inner strands of each wire must be laboriously scraped free of lacquer insulation before tinning. The black or white foam insulation around each wire is *extremely* sensitive to heat, so tinning and final soldering must be carried out quickly,

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using the optimum soldering iron temperature. The outer shield of the interconnect should only be connected at the plug (preamp) end of the cable. The interconnects were fed in through the old RCA plug holes, and mechanically fastened to the chassis with heavy plastic ties.

A final change was to unplug the wires from the audio board leading to the headphone board. This eliminated about a foot of wire which wandered around the inside of the unit, and gave a noticeable gain in detail and imaging even before the other mods were completed.

For reference, the rest of my system includes the PAM-5, a Threshold 400A power amplifier, and JBL 250Ti speakers. Improvements in the sound of the 2040 were obvious from the beginning, but it took a couple of hours' playing time for the capacitors and cables to break in. Real improvements, described by Mr. Graves, occurred in the upper frequencies. The high end is smoother, with about three-quarters of the objectionable CD harshness removed. This results in much better imaging depth and resolution of low-level detail. With the reduced harshness, I could use a more detailed interconnect—Randall—between the preamp and power amp, which further helped the overall transparency. (Before the upgrades, the player was unlistenable through the Randalls.) If anything, the bass response is better, despite the smaller value capacitors, becoming tighter and more controlled.

The total cost of these modifications, using top-quality parts, was \$115 (including the service manual), a cheap price to pay for the benefits noted.

**Jim Van Den Avyle**  
Corrales, NM

## More Caps & CD

Editor:

I read with interest George Graves' article on improving the sound of CD players (Vol.9 No.4). While Mr. Graves presented many good points, there are some issues which I feel need further explanation. The first concerns his instruction to turn down the volume control when powering up or down—always a good idea in any case—

since the modified Magnavox made more "thumps" than the stock machine. I believe this is because the output end of the coupling capacitor has no DC path to ground unless it is selected by the preamplifier's function selector. The uncommitted end of the capacitor therefore "floats" towards the potential on the other end. When the CD player is selected with the function switch, the system "pops" as the floating end of the capacitor is pulled to ground. To rectify this, all that is necessary is to tie the output side of the capacitor to ground through a large-value resistor, between 100k and 1M. Since the capacitors used are high-quality, low-leakage devices, a 1M metal-film resistor would serve nicely, with no ill effects.

The second point I would like to discuss is the choice of the value. Mr. Graves simply says to use 20uF Wondercaps, but I feel this is a very large value, and would be an unnecessary expense in most cases. With a transistor preamplifier, the lowest input impedance—and thus the highest cutoff frequency—typically found will be around 10k. In combination with a 20uF coupling capacitor, this will give a -3dB frequency of 0.8Hz. I realize that the audible effects of a high-pass filter can be noticed well above the -3dB point, but the cutoff with 20uF is over five octaves below 20Hz! If you are using a tube preamp with a 100k input impedance, the cutoff drops to 0.08Hz, a truly earth-moving one cycle every 12 seconds! Does a value this conservative give any audible improvement? And if it did, would it be audible with, say, a pair of LS3/5As? This is an important issue when purchasing an expensive pair of Wondercaps.

**Thomas Mosteller**  
Lansdale, PA

## Even More Caps

Editor:

George Graves' article on modifying a CD player (Vol.9 No.4) is misleading to people who would wish for more from CD players than they are getting. Simply inserting Wondercaps (which are euphonicly colored when compared with other unsung brands that have been tried) in the signal path might not give the kind of

result that might be expected.

Because of such ills as ultrasonic noise being passed through the CD player's circuits, the result might not be as good as Mr. Graves experienced. The low self-inductance of the film capacitors will allow more of this ultrasonic noise to be passed to the preamp than did the original electrolytics, and this and subsequent equipment may not be adept at ignoring such out-of-band noise without stress.

Research and experimentation by myself and my circle of friends has shown that D/A converter performance can be improved; output amplifiers and filters can be improved, especially in areas of input dynamic range, slew rate and bandwidth; power supplies can be improved; servo and decoding circuits can be better isolated from each other; components such as resistors and capacitors better suited to audio signal handling can be used; better internal wiring; and, last but not least, a more stable mechanical environment can be created for the workings of the player, to minimize error correction and servo action.

To add insult to injury, we estimated that all of these improvements would add no more than \$50 to the production cost of a player, which translates to \$100 at the retail level. The hobbyist/enthusiast has to resort to his own devices to get better sound from CD players because the last—and the least expensive—5% of the circuitry is responsible for most of the sonic problems.

**Walter M. D'Ascenzo**  
Baltimore, MD

*Would that it were so easy for manufacturers to make their machines better. Even if we accept that Mr. D'Ascenzo's 2:1 ratio for production costs:retail pricing (in JA's experience, 5:1 is nearer the mark), the CD player market is so competitive that any mainstream manufacturer—and the players that most need modification are all mainstream models—who increased the price of his machine by \$100 would be committing commercial suicide in a market where non hi-fi enthusiasts buy most of the machines on price alone. This is particularly true when CD player prices seem to be falling almost faster than we can keep track of—one store in Florida was offering an*

*anonymous brand of player in July for just \$86! And, as Alvin Gold points out later, the Japanese have yet to make a profit at all on player sales.*

## **Understanding Tube Electronics**

Editor:

Since so many people seem to be concerned about whether Harvey Rosenberg's book *Understanding Tube Electronics* should be sent to unsuspecting "victims" ("Letters", Vol.9 No.3), I feel compelled to relate my own experience.

Because of my own careless reading of the NYAL ad for excerpts from *Understanding Tube Electronics*, I was not at all surprised when the book arrived instead. Neither was there any letter asking for \$6.95. It looked like a great freebie!

The book was a revelation! Where else can you read philosophy and tube distortion characteristics in the same volume? I read it cover-to-cover; I got my wife to read it; and I quoted from it at my office. People thought I was nuts.

It wasn't until I saw the ad again that I realized that there had been a mistake. I wrote to Harvey Rosenberg, thanking him for writing the book (although I did not offer him \$6.95). Because I had received the book in December, I told him that it must have been "Yuletide Karma." Harvey wrote me a very nice letter in return. He did not ask me for \$6.95. He did not ask me for the book. How anybody could read *Understanding Tube Electronics* and think Harvey Rosenberg less than a rare specimen of humanity is beyond me.

**Patrick Gifford**  
Astoria, NY

## **The Violin & the 8b**

Editor:

Yes, yes, from time to time I get bitten by the "Component of the Week" bug. Eventually sanity prevails. I pick up my violin, play along with the recording, and say, "Damn, that doesn't sound like a violin!" And so I read Robert Evans' letter, "Asset and Marantz" (Vol.9 No.4) with interest, for I, too, am fond of the "old iron and bottles that glow in the dark." I agree with him that

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the Marantz 9 is not particularly a good deal these days.

I use KEF 105.2 loudspeakers; to call them insensitive is an understatement! I recently replaced a well-known 200W/channel MOSFET amplifier with a stereo Marantz 8b, built around 1962. The sound level does not seem to be any lower, and the overall effect is much more musical and, for prolonged listening, not in any way fatiguing.

Unlike Mr. Evans', my amplifier was up graded—perhaps refurbished would be a better description. As suggested by its inventor, Sidney S. Smith, the eight Mylar coupling capacitors were replaced by the same value polypropylenes, and the sub-


sonic rolloff components were gotten "the hell out of there!" and *that was all*.

Despite that fact that the 8b sold in 1962 for \$300, a used one in good condition can be found for less than \$400. The updating costs around \$25, as well as a couple of hours' careful work, if you want to match the quality of the original construction. Think of it. What can you buy these days that will deliver such beauty?

Ask any Marantz 8b (or Radford) owner with a serious listening ear if they would willingly give up their amplifiers—Wow, talk about over-reaction.

**Arnold L. Weisenberg**  
Spring Valley, NY

*...remarkable!*



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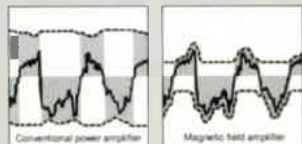
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# MOBILE MUSICALITY.

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**ESSENTIAL POWER.** Even before the exciting advent of car Compact Disc players, an abundance of power has been necessary to reproduce, without distortion, the frequency and dynamic range produced by modern decks.

Unfortunately, conventional amplifier technology is particularly unsuited to delivering this needed power to the specialized car interior environment. Like their home stereo counterparts, traditional car designs produce a constant high voltage level of all times, irrespective of the demands of the ever-changing audio signal—even those times when there is no audio signal at all! Because automotive amplifiers must, obviously, derive their power from the host vehicle, such an approach results in substantial drain to delicately balanced automotive electrical systems.



The Carver Magnetic Field Car Amplifier is signal responsive. Highly efficient, it produces only the exact amount of power needed to deliver each musical impulse with complete accuracy and fidelity. Thus the Carver Car Amplifier not only reduces overall long-term power demands, but produces the large amount of power necessary for reproduction of music at realistic listening levels without the need for oversized power supply components. Important considerations in the minuscule spaces which quality car design allocates to add-on electronics.

**INTELLIGENT POWER.** A hallmark of all Carver amplifiers is the careful integration of sophisticated speaker and amplifier protection circuitry. The Carver Car Amplifier is no exception.

Speakers are protected with a DC offset internal fault protection design which turns off the power supply at first hint of overload. An overcurrent detector mutes audio within microseconds of a short circuit, as does an output short circuit monitoring circuit. Together, these three circuits eliminate the potential need to replace fuses, revisit your autostereo installer, or worse yet, replace expensive speakers due to a moment's indiscretion with your deck's volume control.

**ASSIGNABLE POWER.** Integrated bi-amplification and bridging circuits, along with The Carver Car Amplifier's compact configuration make it ideal for multiple-amplifier installations.

The built-in 18dB/octave electronic crossover allows use of two amplifiers in a pure bi-amplification mode without addition of extra electronics. Or, at the touch of a button, one Carver Car Amplifier can become a mono amplifier for subwoofers while the other Carver Amplifier handles full range. Or, for astonishing dynamic and frequency response, two Carver Car Amplifiers may be operated in mono mode into 8 ohms for a 240 watt per channel car system which will truly do justice to digital without taxing your car's electrical generation system.

**INNOVATIVE POWER.** Can 1/10th of a cubic foot of space hold yet more innovations? Yes.

Carver has addressed the ongoing problem of head-end/power amplifier level matching: Output of current car decks varies widely from brand to brand and model to model. The result can be a less than perfect match. The Carver Car Amplifier incorporates circuitry which compensates for variations in head-end output, reducing noise and optimizing signal-to-noise ratio. In addition, Carver has added a subsonic

filter which removes inaudible power-robbing infrasonics before they can tax the amplifier and speakers. Finally, a delayed turn-on circuit activates the Carver Car Amplifier after your head-end unit has powered up, to eliminate starting pops and thumps.

**ACCURATE POWER.** It goes almost without saying that a product Bob Carver designs for the road carries the same superb electronic specifications that his home audio products are known for.

The Carver Car Amplifier is flat from 20Hz to 20kHz, down -3dB at 16kHz and 30kHz. Not coincidentally, the usual specifications given for Compact Discs. A signal-to-noise ratio of over 100dB means that, in even the most quiet luxury sedan, you will never be annoyed by hiss. The other specifications are equally as impeccable. You may peruse them in our literature or in independent reviews soon to appear.

**ACQUIRABLE POWER.** The remarkable Carver Car Amplifier is currently available for audition at Carver dealers across the country.

It is worth the journey. Whether you have a car system in need of the sonic excitement possible with abundant power, or are in search of the perfect complement to a new high-performance automobile, you owe it to yourself to experience the logical extension of Carver technology—The Carver Car Amplifier M-240.

Power Output Stereo Mode: (continuous RMS power output per channel, both channels driven, at 13.8 VDC input) 120 W into 4 ohms, 20 Hz to 20 kHz with no more than 0.1% THD.

Power Output Bridged Mono Mode: (referenced to 13.8 VDC input) 240 W into 8 ohms, 20 Hz to 20 kHz with no more than 0.1% THD.

Input Sensitivity: Variable 250mV to 4V

Signal to Noise Ratio: (referenced to 120 W A weighted into 4 ohms) Greater than 100 dB

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Weight: 4.7 lb.

The Carver Car Amplifier



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## A Question of Imbalance

Editor:

I recently purchased a Conrad-Johnson PV5 preamplifier and MV-75 power amp, a Kinergetics amplifier, and—the budget killer—a pair of Infinity RS1b loudspeakers. The rest of my system comprises a Thorens TD-126 turntable, with a Grado Signature IBB cartridge, and a Denon DCD-1100 CD player.

Considering I was formerly listening to Klipschorns through a Kenwood preamp and Yamaha power amplifier, you might think I would be thrilled to death with my new gear. Basically, I am, except for two things: one, the speakers don't sound as good as they did at the dealers (they lack bass definition and transparency); and two, I am completely frustrated when I read about modifications to the RS1bs, such as the soldering mods mentioned in Vol.9 No.4. How am I, your basic new RS1b owner, already somewhat intimidated by the set-up and control options, supposed to get these modifications done and make the speakers live up to their reputation?

By my dealer? Despite the fact that he knew how to set up the speakers, I'm not convinced he's an "expert" when it comes to the peculiarities of the '1bs. I live only five miles from the Infinity factory, but I can't convince one of their tech people to come and listen, despite the fact that I am willing to pay for his time.

Basically, what I am asking is, how does one find someone expert enough on these esoteric components to help the new owner?

**Mark J. Wolfson**  
Woodland Hills, CA

*Putting aside the question of actually getting modifications to equipment carried out, the conventional answer to Mr. Wolfson's second question is "the dealer." But if the customer has no confidence in the dealer, then a magazine must be the last resort. Last, because it doesn't have the one-to-one contact enjoyed by the dealer. From what Mr. Wolfson describes, I don't think the problem with his sound lies with the lack of modifications to the Infinity RS1bs. Rather,*

*his system typifies the kind of imbalance and lack of system matching that can waste much of the money spent on it.*

*The Infinities are superb loudspeakers, but, as discussed in the turntable designer interview in Vol.9 No.5, a loudspeaker can only sound as good as the signal fed to it. Worse, when the speaker is as transparent as the RS1b, it will only too clearly reveal the inadequacies of the equipment upstream of it. To recommend \$5000 speakers for use with an inexpensive CD player and an obsolescent turntable with what can best be described as a barely adequate tonearm is a folly that a dealer—supposedly concerned with his customer's best interests—should have advised against.*

*If Mr. Wolfson is to get the performance from the RS1bs for which he has paid, I advise him to audition LP players from SOTA, Linn, VPI, or Oracle, fitted with tonearms such as the Linn Ittok, WTA, Sumiko FT3, Eminent Technology 2, and the new SME Mk.V, and cartridges from Koetsu, Kiseki, vdH, Ortofon, Monster, etc. Then and only then should Mr. Wolfson worry about modifications.*

—JA

## McIntosh & Marantz

Editor:

I was pleased to see the letter from Robert C. Evans in Vol.9 No.4, praising the merits of the old circuitry in Marantz and McIntosh designs. Our shop has researched the refurbishing of McIntosh tube equipment to the utmost degree, and our findings agree with Mr. Evans' that these units provide "esoteric" sound at a nondepreciating price. The attention to detail in transformer design, with a simple approach to circuitry, and the upgrading of precision parts, make these units more than a worthwhile consideration for a high-end purchase.

Credit where credit is due. The work on Mr. Evans' McIntosh MC225 and A116 was researched exhaustively and performed entirely in our lab; I would like our engineers to get the credit for their long hours of work.

**Don Turnipseed**

Audio Resource, #1 Metairie Court, Metairie, LA 70001

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# COMPACT DISC *at the crossroads*

George M. Graves

I was visiting the Consumer Electronics Show in Las Vegas, Nevada—aptly nicknamed “Lost Wages” —in the winter of 1980 at the behest of the company for which I then worked. While wandering the main floor of the Convention Center, I came across a booth belonging to the European industrial giant, Philips, who were showing their LaserVision player, some loudspeakers, and, as I recall, some car stereos. Over in one corner of their exhibit was an unprepossessing little stand with a very small component sitting on it. The placard announced (without much fanfare) that this was a prototype of a Digital Audio Disc (DAD) player.

I was taken by both player and concept: perfect reproduction forever! Like many audiophiles, I followed the progress of the new technology like an expectant father anticipating his firstborn. I watched the standards committees being formed, and was delighted when the little silver disc was universally adopted by virtually all manufacturers. This meant that it was really going to happen! Audiophiles would soon have real digital audio in the home!

When the little Philips player finally hit the US market in the fall of 1983 as the Magnavox FD-1000, I dug deep in my

pockets and sprang for one! For a while I was pleased with what my new toy did. It played the little silver discs with no noise, no obvious distortion, no clicks and pops. I was delighted. But then I started to hear of audiophiles who did not like the little marvel. Some (underground) magazines suggested that perhaps the system parameters had been too hastily adopted and that perhaps the sampling rate and number of bits chosen for the system were not up to the task. Others said, No, that wasn't the problem, the quality of the recordings themselves was lousy. For the first time, consumers had access to a playback medium that allowed them to hear just how bad most recordings were. Another group maintained that the culprits were in reality the analog sections of the players themselves, which, with their op-amps and brick-wall filters, just weren't of audiophile quality.

As for me, I found myself returning to my analog record collection whenever I wished to really enjoy music. I never even thought about it until a friend asked me how come I wasn't listening to my CD player? It was then that I realized that I was not happy with CDs *either*. But I wanted the system to work—I still do—so I tried modifying my



player with better coupling capacitors (Vol.9 No.4). This made a big improvement, lending credence to those critics who said that the machines were not designed properly, but I was still not satisfied with either the treble quality or the imaging capabilities of CDs.

Several CD players (and several hundred CDs) later, I still find analog records more satisfying, but the gap is narrowing. It has turned out that those who thought that the CD medium left much to be desired were right. But it wasn't one of the above-mentioned faults which was (and is) the culprit; it was, and continues to be, *all* of them!

First of all, however, CDs have improved. Most record companies have heeded the criticisms of their customers and detractors, and have improved the sound of their products. We now know, over three years after the introduction of the new medium, that in spite of its inherent limitations, there is much that can be done to make the CD a more musically satisfying product. Much of this has to do with the production of the master recordings themselves. The screechy highs, the muddy sound, the lack of imaging—all, to a certain extent, are faults of the original recordings. Realization of this fact has led to the production of some very good-sounding CDs of late from London (British Decca), Telarc, and Nimbus, to name but a few.

The CD medium does seem to favor natural recordings made with purist microphone techniques and a minimum of signal processing. Many classical record companies have literally had to relearn their business, and to forget the multimiking and heavy signal processing that they have been using for almost 25 years. The results of this rethinking, from those companies which have already taken the necessary steps, can be stunning. A good example is the new Robert Shaw/Atlanta Symphony recording of Beethoven's 9th Symphony on Pro-Arte.

Digital recordings have improved dramatically in the last year or so, as the digital tape recording equipment itself has improved. A case in point: the Sony PCM-1610 digital processor was, until recently, the machine upon which most recordings destined for CD release were made. The reason for this machine's popu-

larity was that it was specified by Polygram and Sony, who initially manufactured nearly all the world's supply of CDs, as the mandatory machine for CD mastering. This meant that recordings made on this machine did *not* have to undergo a process known as "cross formatting" to make them compatible with CD. Many engineers believe that cross formatting from one digital standard to another can be a major cause of degradation, even if carried out with a digital standards converter. If this were indeed true, it would be advantageous for recordists to use the CD format when recording their master tapes.

Unfortunately, by all accounts, the PCM-1610 sounds *awful!* In an effort to address this problem, many recording engineers reworked both analog and digital sections of their '1610s. Finally, Sony themselves substantiated the overall impression that the '1610 didn't sound very good by superseding it with a new machine called the PCM-1630. Among other Sony claims for this new CD format processor, the new machine is said to take advantage of recent work in digital filtering techniques, and as a result sounds "significantly better than its predecessor."

One thing that I have noticed about CD is that those discs made from good analog masters sound much better than purely digital CDs. I have no idea as to why this should be so. Perhaps, as I read recently, the limited high frequency response of the analog recording process (most professional analog tape machines are maintained flat only to 15kHz or so) acts as a gentle-sloped low-pass filter for the signal before it is transferred to the digital domain. This could help alleviate some of the aliasing problems inherent in converting analog signals to digital. If so, digital audio design engineers have a lot more homework to do on aliasing and its effect on digitally recorded signals—the anti-aliasing filters in modern digital tape recorders ain't makin' it!

To get an idea what I'm talking about, give a listen to the recently released Polygram CD of the old Verve jazz classic *Jazz Samba Encore!*, with Stan Getz and Luis Bonfá (recorded in 1963). For the first time, the comparison with the LP is



# MUSICAL

## The **CARVER C-1 Sonic Holography Preamplifier:** **Appreciated for Musicality**

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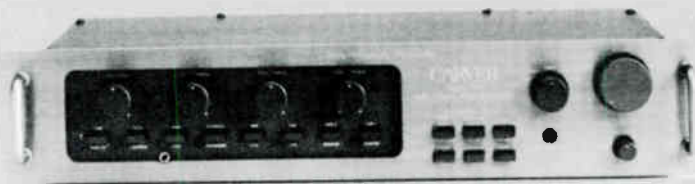
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favorable. Also, try the new RCA *Sunset Boulevard* CD, culled from various LPs of Franz Waxman's film scores conducted by Charles Gerhardt. The sound, though multimiked, is very clean, with none of the harshness of most digitally recorded orchestral recordings. I also have several Sony CDs of Beethoven Symphonies, made from old '50s vintage stereo tapes and performed by Bruno Walter and the Columbia Symphony orchestra. Compare Walter's "Pastoral" with the recent digital Denon featuring Otmar Suitner and the Berlin Staatskapelle. The old Walter analog recording sounds warm and clean, while the digital Suitner is cold and distorted by comparison.

Next, much of the criticism leveled at CD as a medium has nothing whatsoever to do with any inherent limitations of the technology itself. Many early CD detractors based their opinions on the quality (or lack of it) of the early players. To some extent, compact disc is an unsatisfying medium, not because it isn't hi-fi, but rather because almost all of the playback equipment made to date has been *mid-fi*.

Imagine, for a moment, that the only access you or I had to the phonograph record was by way of a Pioneer rack system, complete with cheap direct-drive turntable, a magnetic cartridge of uncertain parentage, and an op-amp phono preamplifier. Would you think any higher of such a system than you do of a Pioneer or Technics CD player? Of course not! Yet that is just what CD detractors—including Yours Truly, I'm sorry to say—have done with this new medium. The average CD player is just the same sort of beastie as that Pioneer rack system.

Where does that leave us? Well it leaves us with a great big question mark! We don't know what CD is capable of as a music storage medium because we've never heard a truly first-class player, one designed more like a Threshold preamp than a Pioneer receiver. All of that is about to change. We have already seen some warmed-over modifications of standard Philips players from the likes of Meridian and Mission, and these have been fairly successful to a greater or lesser extent; at least they have shown us the right direction.

What is needed is a no-holds-barred design which incorporates what is known about proper solid-state amplifier and filter design. With such a device, the true merit (or lack thereof) of the CD should become apparent. We are about to get such players. Companies here and in the UK have machines ready for the market which have been designed from the ground up to be real audiophile components. All that these machines borrow from their mid-fi cousins are the laser tracking components and some of the digital processing chips (mostly Philips). *Stereophile* will report on these machines over the next months, and we shall see . . .

My conclusions? CD *will* work. By the end of the decade, there will be players which will rival the very best phono equipment available today—and that, my friends, is sticking my journalistic neck out! Be prepared to pay for that performance, however! Such machines will undoubtedly come from small, specialist manufacturers. And just as a SOTA Vacuum Sapphire/Eminent Technology/Koetsu Signature Red LP player costs over three grand today, look for similar prices on like-quality CD players. As for now, my advice is: if you already have one of the latest third- or fourth-generation players, keep it. Things are moving much too quickly at this stage of the game for anyone without an unlimited supply of money to keep up. When that Great Machine appears, you'll hear about it. Save your pennies!

As far as the discs themselves go, they should continue to improve. But remember, more cassettes than LPs were sold in 1985. This tells the record company bean counters that the audience at large doesn't really give a damn about sound quality, so don't count on CBS, RCA, Warner-Elektra, or Capitol to give you better CDs (except by accident). Better to stick with such smaller companies as Nimbus, Chandos, BIS, Telarc (sometimes), and Pro-Arte for your CD fare. And, oh yes, don't be afraid to buy CDs made from older analog masters (especially from the middle to late '50s). Then, chances are, when that audiophile quality player does hit the market, you'll have something worth playing on it!



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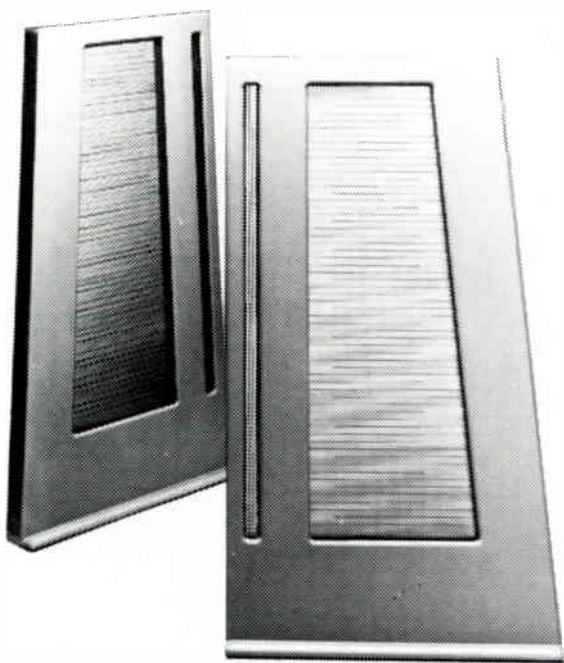
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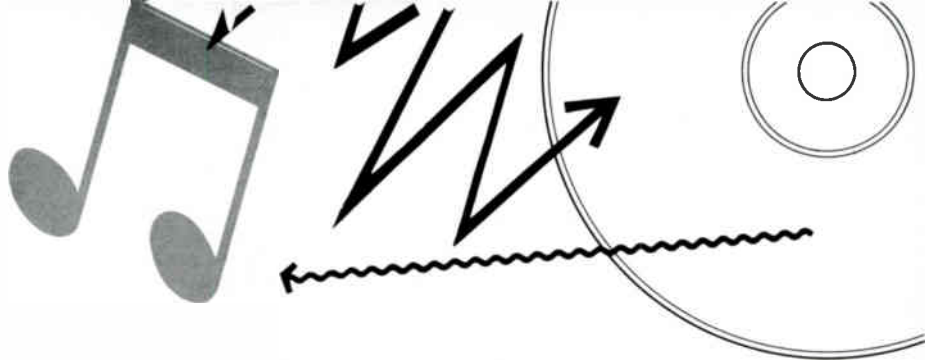
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# **SONY, R-DAT,** *and the* **Read/Write CD**

*Earlier in the year, Sony Corporation of America invited about 20 of the nation's leading audio journalists to a press conference, hosted by Promotion Manager Mark Finer, to introduce several new and upcoming products and design innovations.*

*J. Gordon Holt was there. Here's what he saw and heard:*

## **CD Players**

A number of refinements in CD player design have been implemented in recent Sony models. Since most of these have been reported to death elsewhere, I'll skip them here. Suffice it to say that, with the exception of 4x oversampling (Sony uses 2x) and a direct-coupled or all-tube analog section, Sony's current top-of-the-line CD players embody all of the latest thinking in CD player circuit design.

The only development that may be completely new and unique to Sony is what they call Envelope Differential Detection. To prevent loss of lens servo power during brief periods of data loss due to disc surface dirt or blemishes, Sony players now utilize an extremely fast-acting servo "hold" circuit which immobilizes the lens carriage

during the period when the laser is unable to read the surface pits on the disc. When the laser's "vision" is restored—that is, when the obscuring surface blemish has passed—a logic circuit reads the "frame numbers" of the next digital "word," and positions the laser on the track whose first-word number is closest to that of the last "visible" frame. Sony gave us a very impressive demonstration of the efficacy of this system, by playing flawlessly a disc which had a 2mm-wide strip of tape stuck radially across the playing surface. With the servo hold circuit deactivated, the disc went into total mute.

There were also a few CD player "innovations" described whose merit I am obliged to question:

A copper-plated chassis, to prevent

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"magnetic distortion from electrical current passing through the adjacent PC boards and wires." (Copper has no ability to "shield" a magnetic field; only Mu-Metal has that property.)<sup>1</sup>

Oxygen-free copper heat sinks. (No one has ever claimed, to my knowledge, that OFC makes a better heat conductor than oxygenated copper.)

A linear-crystal oxygen-free copper AC cord. (Do we really need a wire that will better conduct the garbage that normally comes in through the AC line? And how much flexing will a linear crystal wire take before it breaks?)

Sony also showed more unconventional CD players. Their automotive player, launched at the Las Vegas WCES, installs in the trunk, holds ten discs in a removable magazine, and is controllable from a small wired

remote unit in the passenger compartment. The remote can be dash-mounted, or left free to be moved about from passenger to passenger via its umbilical. All the usual functions and displays are available on the remote. (Imagine the fun of traveling with this and several medium-sized kids! Gimme it, it's my turn to pick the next one! No it's not, you had your turn! It's my turn! It is not! Daaaddy!)

Trunk installation, like the in-dash CD player, raises once again the question of disc damage due to the buildup of heat in a closed auto in the sun. Failing to get a conclusive answer to this from either Sony or Philips, I tried my own experiment. Taking an unwanted CD and an oven thermometer, I put both in my oven and raised the temperature in 5°F steps, to ascertain at what point the CD would be reduced to a sticky puddle. At 170°, which is more than would ever be reached inside a car, the disc was still unaffected. Verdict: CDs are not likely to be damaged by temperature buildup in a car, either in the passenger compartment or the trunk. Case closed.

A new CD changer—the CDK-0065—

<sup>1</sup> Certainly there is evidence that use of conventional mild-steel chassis for hi-fi components can degrade sound quality. Conductors carrying high currents attempt to magnetize the steel; the hysteresis in the steel magnetization reflects back into the conductor, resulting in increased distortion. A 1980 AES paper from engineers at Kenwood quoted measured distortion rising from around -120dB to -105dB with a change to a mild-steel chassis for a power amplifier. I would imagine that this is what Sony is getting at, but the explanation suffered in the translation. —JA



### CD-Rom Drive Unit

made for Seeburg, holds 60 discs in a removable tray, and looks startlingly like a miniature 45-rpm jukebox.<sup>2</sup> It has connections for an external hard-wired remote control, and programming capability depends on what's designed into the remote controller. Maximum disc access time is claimed to be 16s. Availability status of this is unclear, but the literature about it (dated April 1986) was marked "Product Preview."

### CD-ROM

We were shown a prototype stand-alone CD-ROM (computer-data) player, as well as a smaller model sized to fit into the space normally occupied by a standard 5-1/4" computer floppy-disc drive. Both use the same Sony "Linear Motor" drive used in the latest CD players, and a driver card allows direct interfacing with most IBM and IBM-compatible microcomputers.

Until the recordable/erasable CD becomes available (probably a couple of

years hence),<sup>3</sup> CD-ROM is being touted as the ideal high-density storage and distribution medium for so-called archival data—material which does not require frequent updating, such as technical databases, reference material, and business and the historical records of some countries.

With a storage capability of 540 million printed characters—over half a gigabyte, roughly equivalent to 160,000 single-spaced typewritten pages!<sup>4</sup>—one CD-ROM disc could store the text of an entire encyclopedia, or everything that has ever been written about every branch of electronics to date, or several years of a large corporation's financial records, sales projections and realizations, and business correspondence. (The entire *Grolier Encyclopedia* is already out on CD-ROM, and occupies but a small fraction of the available space. Unfortunately, it includes no illustrations.)

Sony, incidentally, has signed an agreement with a firm called Knowledgeset

<sup>2</sup> Betcha didn't know a "juke" was originally an after-hours recreation shack where Negro field workers used to dance and booze it up. The name was later applied to sleazy drinkin'n'dancin' halls where the music source was records, first free of charge from conventional record changers, then from special automated, coin-fed players.

<sup>3</sup> According to the July '86 issue of *Computer Shopper*, an Austin, Texas-based firm called Portable Solutions has introduced a \$5000 system called BackPac BP-100+, which records data on a laser-optical disc. The \$200 disc, however, is not erasable or otherwise re-usable.

<sup>4</sup> Based on a per-sheet thickness of 0.0035 inches.

Corp. (of Monterey, CA) to collaborate in the production of CD-ROM software for anyone who wishes to use the service. If anyone reading this is interested in producing a CD-ROM disc of the entire printed record of audio material, we will happily promote it, free, in these pages.

During the Q&A period that followed Sony's CD-ROM presentation, someone asked whether it was true that the "pits" on a CD are not pits at all, but bumps. The answer, which seemed a bit short on elaboration, was that they *were* pits. It would appear that this is not correct.

Ken Pohlman, in his excellent book *Principles of Digital Audio*, confirms that the laser beam reads the underside of the pits, which would be seen by it as bumps. And one of Sony's own "white papers" says "Technically, they are referred to as 'bumps' but here we will use the general term 'pits.'" Which is roughly the same as saying "These are actually straight, but we prefer to call them curved." Ah, the inscrutable oriental mind! But I guess that settles the question once and for all. (This would mean that the disc is mastered from one side with clockwise rotation, and played from the other side with counterclockwise rotation.) The question is irrelevant anyway, because it is not the pits or bumps themselves which represent the digital Ones, it is the *transition* from a pit/bump to no-pit/bump which changes a One to a Zero and vice versa.

Sony's CD-ROM drives are claimed to be available now, but not at your corner store; only directly from Sony.

CD-I stands for CD-Interactive, and it is one of the newest applications of CD to appear on the horizon. A couple of firms have demoed, at recent CESs, "picture CDs", which display a series of still-frame computer graphics images while the disc plays. According to Sony, however, this is only a hint of the capabilities of this system. Sony foresees combining data with photos, diagrams, short animated sequences, and music and/or speech and sound effects. In short, CD-I will be CD-ROM with all the bells and whistles. The possibilities are, as Sony contends, limited only by the imagination.

Unlike CD-ROM, there are not as yet any

industry-wide standards for the CD-I format, but Sony plans, initially, to market their CD-I player as a stand-alone device with a keypad and microprocessor, making it unnecessary (although possible) to use a separate computer with it. Outputs would be provided for a video display and stereo audio system, as well as for data transfer to a separate computer. Delivery date? Sometime in the future.

### PCM processors (various)

A new PCM processor, the PCM-60IESD, offers 44.1kHz sampling—the same format as CDs—and has digital inputs and outputs.

Oh Wowee, now we can make digital copies of CDs! Right? Wrong! In theory, you never *could* make digital copies of CDs, even if you had a 16-bit 44.1kHz professional PCM-1630 to do it on. According to Sony, CDs are copy-protected—and have been from the very first releases.<sup>5</sup> (To a computer hacker, copy protection is just a more challenging version of the Rubik cube.) But the 601's digital input *does* allow you to use digital sourcing, such as an A/D microphone preamp which could, according to Sony, feed a 600-foot-long unshielded cable to the 60IESD, if you have the need. Or can *think* of any such need.

(Reporter's aside: Here we were, seeing and hearing some of the most advanced hi-tech home electronics equipment in the world, and whenever a projected slide needed to be changed, Mr. Finer had to leap from his seat and punch the Advance button on the projector. My God, I thought, couldn't this fabulously wealthy corporation afford a slide projector with a remote control at the end of a wire?!)

The SDP-505ES digital surround-sound processor is a multifunction device which combines a high-quality digital delay with a true Dolby Surround decoder, and throws in a pair of 16-watt rear-channel power amplifiers *gratis*. Using exactly the same PCM format as Compact Disc, the '505 is the first such device I have heard whose rear channel sound was as clean and noise-

<sup>5</sup> While it is true that the data encoding on a CD has a "flag" which can be set during mastering to prevent copying—the recorder detects that the flag is set and refuses to enter record mode—it appears that whether this flag is set or not is arbitrary. Some CDs will be able to be copied digitally; some not. —JA

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free as the front-channel signals. The rear delay is adjustable in 0.1ms increments (is that really necessary?) from 0 to 90ms, and there are separate adjustments for L and R rear, allowing one to compensate for circumstances requiring that one rear speaker be closer to the listening area than the other.

In Dolby Stereo (surround-encoded film) mode, the device decodes out the rear L-R signal, the rear delay adjustment is limited to the Dolby-recommended 10 to 30ms range, and the HF response of the rear channels is rolled off above 7kHz (again, to Dolby spec). (There is no directional enhancement, as in the Fosgate and Shure decoders reported here in recent issues.) The device also has five so-called "ambience" modes (whose functions were not explained to us, and nobody thought to ask), and three delay-setting memories, allowing instant recall of preferred settings for various kinds of material.

The SDP-505ES to my knowledge is unique among surround processors in that it includes a pink-noise generator which switches every half-second from in-phase to out-of-phase, causing the hiss to alternate between the front and rear channels. Not only does this greatly facilitate gain balancing, it is also ideal for trimming the frequency response of the rear speakers to match that of the front ones. (They should sound as similar as possible, for best results.)

This looks like an interesting device; we'll try to get one for a report in these pages.

## The Recordable CD

As soon as Finer mentioned this, a hush fell over the multitude. Tension charged the air in that suddenly small room with the sound of 20 breaths taken in and held. This was the breakthrough we had all been waiting for.

"Our work in this area has shown considerable promise," Mr. Finer announced. (20 breaths were held even deeper.) "But there is nothing we can report about it right now, so we decided not to touch on that issue today." (20 reporters audibly deflated.) "Instead, we'd like to tell you about our DAT." (Or was it R-DAT?)

The recordable/erasable or read/write CD was, in fact, covered in one of the white

papers in our press kit, in enough detail to suggest that Sony had a working prototype system. It uses two little-known principles: thermal coercivity enhancement and the Kerr magneto-optical effect.

The former refers to the fact that a magnetizable material becomes increasingly easy to magnetize as its temperature increases. The disc, which is "pre-grooved" via start addresses for each track, has a thin magnetizable film under a protective clear-plastic coating. In recording, the surface is subjected to a fixed magnetic field which is too weak to magnetize the unheated material. The laser beam, however, instantly raises the surface temperature to a point where the field can magnetize it, and the laser is turned on and off by the signal to lay down magnetic domains which correspond to the "pits" of a CD.

The Kerr magneto-optical effect describes a peculiar property of some varieties of glass and clear plastic: They rotate the polarity of light passing through them when subjected to a magnetic field. The field, of course, is provided by the magnetic "domains" of the reflective disc surface, which cause polarized light to be reflected at an angle different from that with which it shines onto the surface. The polarity rotations are detected, and interpreted as changes from one digital state (0) to the other (1).

The magnetization is vertical rather than longitudinal; that is, the domains are lined up perpendicular to the disc's surface, rather than (as in the case of computer floppy discs) in line with the recorded track. This prevents adjacent opposing domains from demagnetizing each other, thus permitting a much greater information density than is possible with longitudinal recording.

Like conventional reflective laser-optical discs, the recordable/erasable disc can be used to record either digital information—computer data or PCM audio—or analog information, as on LaserVision video discs. In the former capacity, a 5-inch disc can hold 1 gigabyte (1,000,000,000 bytes) of data, while a 12-incher will accommodate an incredible 4 gigabytes. A 12-inch disc of analog (video) material would hold 30 minutes' worth of program per side.



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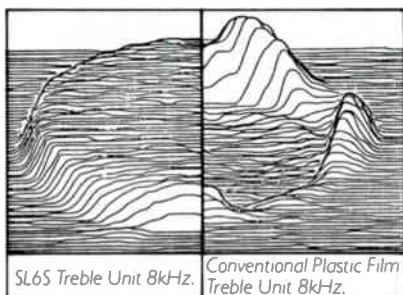
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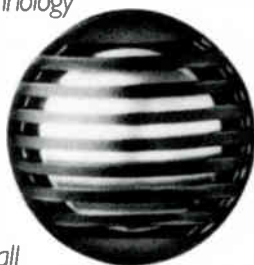
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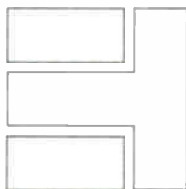
—Anthony H. Cordesman, *Stereophile*, Vol. 8, No. 7

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Sony DAT-7

### R-DAT and S-DAT

DAT is the new Digital Audio Tape system, R- standing for Rotary-head and S- for Stationary-head. (Peter Mitchell discussed the two systems in his "Shop Talk" column in Vol.8 No.5.) 81 companies worldwide have agreed to two DAT "standard" systems, but one system seems to be favored: the R-DAT, or Rotary (helical scan) DAT, mainly because of its longer (2 to 3 hours) playing time.

Sony showed (but did not demo) a prototype of their R-DAT machine. R-DAT will record and play 5 different formats (see Table 1), one of them—16-bit encoding at 44.1kHz sampling—identical to that of the Compact Disc. However, it cannot be used for digital copying of CDs, for the reason mentioned previously, and consumer units featuring this format are in fact intended to be used for playback-only.

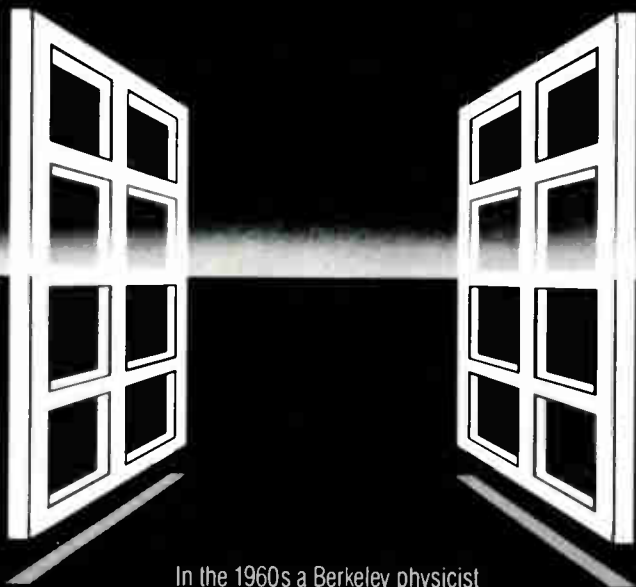
The details about R-DAT, the newest of all the audio formats, really stretch one's credibility, both for the remarkable things it is claimed to be able to do, and the exceedingly small dimensions within which it does them.

The deck itself is essentially a scaled-down version of that used in video cassette recorders. The head drum, with two tiny heads mounted at 180° intervals<sup>6</sup> around its perimeter, is only 1-3/16 inches in diameter, and spins at 2000rpm. The tape—1/8 inch wide, exactly the width of an audio cassette tape—is wrapped around only a quarter of the drum's perimeter, in a helical arrangement like that used in VCRs, so that the heads lay down a series of diagonal "stripes" across most of the width of the tape. The actual speed of the tape is 0.3ips, as compared with 1 7/8ips in a conventional audio cassette recorder, but the drum-mounted heads, spinning against the direction of the tape, produce a writing speed of an astonishing 123ips!

But what about that quarter-turn tape wrap? With only two heads, each switched on only when it's in contact with the tape, a quarter of each drum revolution will pro-

<sup>6</sup> With a second pair located halfway between the first, the system will allow you to listen to the playback from the tape immediately after it is recorded, as a check on the integrity of the recording. This will almost certainly be a feature of Sony's professional R-DAT machine.

# T R A N S P A R E N C Y



In the 1960s a Berkeley physicist named David Fletcher pioneered the concept of transparency as applied to audio reproduction equipment. Rejecting the popular trend of the era; musicality, Fletcher embraced a new standard for the design of his own equipment . . . perfect neutrality. His effect on the hi-fi industry has been most noted through the following achievements:

- 1973 – Rebirth of moving coil cartridges with the Supex SD-900 series.
- 1974 – First low-mass tonearm, the Grace 707, providing a level of transparency never before achieved.
- 1977 – Introduction of 'The Arm' which today is still acknowledged as the last word in neutrality.
- 1982 – The Talisman Cartridge line with focus-field magnetic structuring.
- 1985 – Evolution of the SME tonearm to the Series V. Totally aresonant, rigid, and state of the art.
- 1986 – Talisman Virtuoso series achieving astounding rigidity and voicelessness.

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duce no output. In fact, the digital signal itself is discontinuous, being interrupted during each scan by the subcode data at the beginning and end of each track. This, of course, would be disastrous for an analog recorder, but it's hardly a challenge for digital. For recording, the digital data stream is compressed in time by a factor of 3:1, effectively tripling the rate at which the digital bits are laid down on the track. In playback, each scanned track is fed into a holding buffer, which then "dribbles out" the data bits at one-third speed during the time it takes the drum to span one head-on/head-off period. The result is an uninterrupted data flow.

But why not use a 180° drum wrap, as in ½-inch VCRs? Because the 90° wrap minimizes tape wear and allows for fast shuttling of the fragile tape, without having to unwrap it from the drum. The heads are able to read enough data from the tracks during fast shuttle to identify each passing frame (track) by number, and in fact each frame *is* numbered. This would allow the machine to search out, precisely, any spot on the tape, with a precision of about 1/60 of a second! More about this remarkable capability later.

Each angled track stripe is an incredible 0.0005" wide—about one tenth the thickness of a human hair—and is 0.9" in length. And each track packs a mind-boggling 35,076 bits of digital information into that 0.9 linear inch. Only about two-thirds of that information is the signal itself; the rest consists of fragments of information from adjacent stripes (for error correction), and various and sundry control and numeric codes for track finding and head-scan synchronization. So complete is the isolation between data blocks on the stripe, that the system allows for post-recording—the addition of or changing of some of the recorded information after the fact, without affecting the already recorded material!

There are no unrecorded "guard bands" between stripes, to prevent signal crosstalk. Instead, the heads are rotated by 20° in opposite directions from perpendicular to the stripe, so that each recorded track's azimuth is substantially misaligned with respect to the adjacent tracks. Because of the very

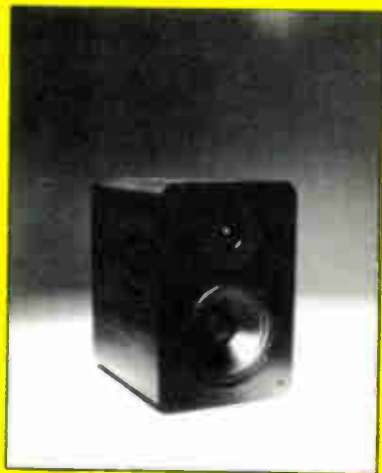
high signal frequencies—in the vicinity of 7.5MHz—and the precision of the head gaps, any misalignment causes severe attenuation of the signal. Since the recorded signals are digital, total isolation between bands is not necessary; it is only necessary that the unwanted signal be weak enough that it never approaches the Off/On transition level of the desired track.

Each head is about 50% wider than the tracks on the tape. But how can this be? Each pass of the head erases the adjacent edge of the preceding track, that's how. And this unusual approach makes possible another remarkable characteristic of DAT.

As owners of PCM-FI digital audio processors are well aware, different VCRs tend to move tape at slightly different speeds when recording. When playing back on the same machine, this causes no problems. Playback on others, however, may cause snow at the top or bottom of the screen when watching a video recording, or frequent uncorrectable errors (bursts of distortion or muting) when reproducing PCM tapes. For this reason, all half-inch VCRs have Tracking controls, which allow the playback tape speed to be set to match that of the deck on which the tape was made. On the R-DAT, as on the new 8mm videocassette machines, there is no tracking control; the adjustment is done automatically. Here's how.

The end of each track has a pilot signal recorded at identical signal levels, but staggered in position for alternating tracks so that the head always reads an odd- or even-numbered pair of pilot signals in sequence. The signal track for each head pass is always the one between these corresponding pilot-signal blocks. With each head scan, the system looks for equal-strength signals (analog, not digital) from both pilot blocks, and automatically adjusts tape speed until they are equal. This is the purpose of the 50%-wider head; it allows the player to read the pilot tracks on each side of the signal track, at the same time it reads the signal track. The lower-track pilot is always read first, the upper one second, and their levels are then compared. The sequencing tells the system which is which, and if one is stronger than the other, the tape speed is

# “...The Most Successful Design of All”



MAXIM III 2-WAY SPEAKER SYSTEM



MAGNUM III 3-WAY SPEAKER SYSTEM

## J. GORDON HOLT STEREOPHILE JULY, 1985

Mr. Holt elaborates: "of all the speakers in this price class that I have heard, I would say that Siefert's Maxim is probably the most successful design of all. The system is beautifully balanced and almost perfectly neutral. The low end from these is just amazing! gives a solidarity and foundation one does not expect to hear.

They have the most accurate middle range I have heard from any speaker. It has one of the best extreme-top ranges I have heard from a dynamic system. The imaging and soundstage presentation from these are excellent.

They do not sound small. It can make most audiophiles (and practically all music lovers) quite happy.

**RECOMMENDED."**

The Maxim III's, whose 40-Hz resonance is unmatched anywhere for a 2-way ported system only 13H x 11D x 9W, are optimized for lowest group delay and intermodulation distortion. Natural hardwood finishes are walnut, oak, or black lacquer.

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Coming soon for use with Maxim III. 12-inch long-throw driver. Complete with 100-Hz, 3rd-order unique phase-matched active crossover. Provides mono-summed bridged outputs. Equalized for 19 Hz (-3dB). \$499.00/set.

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The new 3-way MAGNUM III is the big brother to the Maxim III. Its similar design goals of extremely-low group-delay response, low intermodulation distortion, optimized imaging, and impressive low-end performance are achieved in a modestly-sized cabinet only 22H x 14D x 13W.

Featured are an 8-in. polypropylene-cone long-throw (16 mm) woofer. A tuned-reflex cabinet-wall port extends response to 36 Hz (-3 dB). A new 4-in. long-throw polypropylene midrange driver provides over 6 octaves of smooth, wide-dispersion response.

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of the entire *Stereophile* review along with complete specifications of the Maxim III and new Magnum III. Join hundreds of satisfied customers, buy the Maxim III's factory-direct for \$399 plus \$14 UPS or Magnum III for \$699 plus \$36 UPS, with 30-day, satisfaction-guaranteed return privilege.

# SIEFERT RESEARCH

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automatically adjusted until they match. Damnably clever!

Several error-correction systems are used simultaneously, resulting in the system's ability to completely correct for losses due to tape surface irregularities of up to 0.01" of an inch wide and 0.1" inch long, and to interpolate the effects of blemishes 0.04" of an inch wide and  $1\frac{1}{32}$  of an inch long.

Sony's R-DAT does not use dithering (which most perfectionists feel to be necessary). Responding to muted cries of outrage from those present when this was announced, the representative of Sony's design department then waffled, saying that no firm decision had yet been made about dithering, one way or the other. It was clear, though, that if their R-DAT emerged undithered, Sony would hear from an angry audio press! Someone (I don't know who) asked why dithering had been used in Sony's PCM-F1 if it wasn't going to be used in the R-DAT. That was when we all learned that *no* dithering had been designed into the F1. It was inadvertent, as a result of noise in the audio stages. Great!

Dithering, incidentally, refers to the effect of white noise mixed into the audio signal prior to A/D conversion. If the dither (noise) level is just above the dynamic-range floor of the digital system, it can dramatically increase (by about 20dB) the available dynamic range of the system, allowing it to reproduce signals far below what its lower limit would otherwise be.

Sony plans to produce both consumer

and professional versions of their R-DAT, and professional users should love it. Its ability to search by frame number will make it possible to do computer-controlled digital editing and sequencing (of sound effects, for instance), at far less cost than previously. And for a high-volume studio, the system's remarkable compactness—the cassette is a mere 2.75 by 2 by 0.4 inches—means that a lot less space will be required for master-tape storage.

This is one new product to watch! **S**

## CABLE QUICKIE

At the SCES, Mel Schilling (of Music and Sound Imports) complained that no one was interested in his audiophile cables. Although he offered dealers a 1-meter pair at a price that would permit a fine profit at \$25 retail, no one would buy them. They just weren't expensive enough!

Mel sent both Gordon and me triplet cables for audio/video use. I peeled one off to connect my LV player directly to the TV; the remaining pair went from my tonearm to the preamp. On video, the cable produced the cleanest and least fussy-looking picture of any of the cables I had lying around. On the tonearm, the sound was slightly more detailed, focused, and less "confused"-sounding than with the cable I had been using.

Dear readers, be sensible. Don't assume that something has to be expensive to be good. It ain't so, especially in audio. —BS

**TABLE 1: R-DAT Formats**

	I	II	III	IV	V
No. of Channels	2	2	2	4	2
Sampling Frequency (kHz)	48	44.1	32	32	32
Quantization (bits)	16	16	12	12	12
Tape Type	MP	Oxide	MP	MP	MP
Tape Speed (ips)	3/10	1/2	3/10		5/32
Recording Time (m)	120	80	120	240	240
Write Speed (ft/s)	10.3	10.3	5.2	5.2	5.2

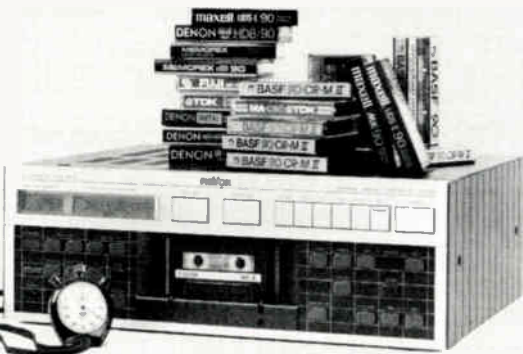
# Revox has a 20-second solution to your tape selection problems.

No matter how good your cassette deck and your tape, you cannot achieve peak performance unless your deck is calibrated for the tape you're using. Solution: the Revox B215.

*The Incomplete Calibration Compromise*—Most home recordists realize you should adjust the bias when changing from one tape formulation to another. And most better cassette decks have facilities for this one adjustment.

But, as any recording professional would tell you, simply adjusting the bias is—at best—an "iffy" compromise. For optimum performance in magnetic recording, three interdependent parameters must be precisely calibrated for each tape formulation: bias, record sensitivity, and equalization. In the studio, this is done by a maintenance engineer who records a series of test tones, "tweaks" the adjustment pots, and checks the results.

*The Microchip Engineer*—With its powerful microprocessor and proprietary software, the B215 performs this calibration automatically in a mere 20 seconds. You simply press the red "align" button. The B215 records test tones (400 Hz, 4 kHz, 17 kHz), makes required adjustments through digital attenuator networks, and checks again. All



three parameters—bias, record sensitivity, and equalization—are optimized for peak performance.

*20 Seconds Too Long?*—Once the procedure is complete, calibration data can be stored in non-volatile digital memory. Up to six different tape formulations can be stored for instant pushbutton recall.

#### Level Setting Option

—The B215 also offers a unique automatic level setting feature. Simply play a loud passage of the music to be recorded while holding down the "level set" button. The B215 samples the incoming signal and sets the record level for the best overall performance. For unusual recording situations, manual level setting is also available.

*The Best from the Best*—The Revox B215 also provides Dolby B/C™ noise reduction and Dolby HX Pro™ headroom extension. Put it

all together and you have everything you need for making the best possible recordings from today's best tape formulations—all of them, without compromise.



Philips microchip is programmed to test, analyze, and calibrate.

Naturally you will find that cassettes recorded on the B215 will sound best when played back on the B215. But a better-sounding cassette will also enhance your listening pleasure on just about any reproduction system. You will likely note a distinct improvement if you have a quality automotive system, and even better portable players can benefit from the superior quality of tapes produced by the Revox B215.

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**STUDER REVOX**

# Zen

## and the art of d/a conversion

JOHN ATKINSON PONDERES THE PROBLEMS

It has become accepted lore in audiophile circles that the 44.1kHz sampling rate adopted for Compact Disc is too low. Some writers have argued that, as a 20kHz sine-wave will only be sampled about twice per cycle, it will not be reconstructed accurately, if at all.

Now, it may be true that 44.1kHz is too low a sampling rate, but certainly not for this reason. H. Nyquist, a researcher at Bell Labs, many years ago proved mathematically that as long as the sampling frequency is at least twice the highest frequency of interest in the signal to be sampled, the waveform *will* be accurately preserved. This was verified by JGH in his original review of the Sony PCM-F1 (Vol.5 No.7), but is hard to grasp emotionally—I mean two samples don't sound anything like enough! Here, then, is an elegant explanation I heard a little while ago, courtesy of Stanley Lipshitz.

I'll start by assuming that we have something that doesn't exist: an audio signal with a spectrum that has no components above half the sampling frequency (fig.1). (Those who complain that picking a signal that

doesn't exist to prove the case have a point; I will merely say that true scientific method always involves leaving out messy facts that confuse things unnecessarily. And you're going to get a few more such examples in this piece.)

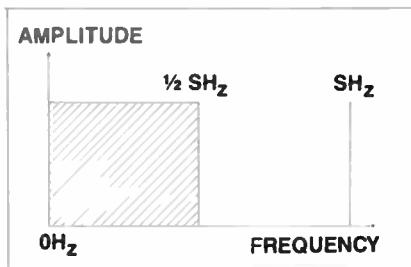


FIG. 1 SPECTRUM OF INPUT SIGNAL BAND-LIMITED TO HALF SAMPLING FREQUENCY (s)

Using a perfect A/D converter—I told you there'd be more convenient simplifications—the signal is duly sampled and encoded, producing a mass of data consisting of a regular string of numbers. Each number describes how big the signal is at a time interval  $1/s$  seconds after the last one

("s" is the sampling frequency). In order to reconstruct the signal, this stream of data is fed to a perfect D/A converter which, in its simplest form, spits out an infinitely narrow pulse every  $1/s$  seconds, the height of the pulses roughly mapping out the original shape of the signal (fig.2).

To reconstruct the waveform properly, we again need something that doesn't exist: a perfect low-pass filter with the impulse

swept to define that the zeros in the  $(\sin x)/x$  response—the points where the amplitude of the oscillations are zero—are spaced  $1/s$  seconds apart. If we feed our stream of pulses of varying heights, representing the signal, into this filter, then each pulse will produce a  $(\sin x)/x$  wave that will be zero every time another pulse comes along. It will not be zero between the pulses, as shown by fig.4, and if all these nonzero

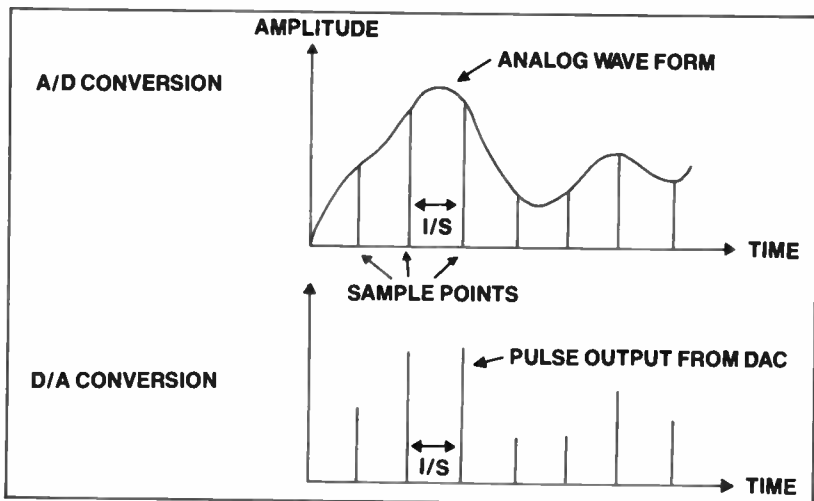


FIG. 2

response shown in fig.3. Note that whereas we could imagine that somebody, somewhere, will eventually design a perfect A/D converter, this perfect filter's impulse response has a feature that doesn't exist in nature—ever! It appears to know that a pulse is about to happen—as with the mythical chemical substance postulated by Isaac Asimov that dissolved just *before* the experimenter added water! The perfect filter starts to oscillate with increasing amplitude *before* the pulse occurs. When the pulse finally happens along, the filter's oscillation reaches a maximum, then dies away in a perfect mirror image of its precognitive behaviour.

The actual shape of the response is called a  $(\sin x)/x$  curve, and extends in time from minus infinity to plus infinity. As we are dealing with imaginary circuits, it is no

waves are added together, the sum of their amplitudes *exactly* reconstructs the shape of the original wave *between* the sampling points. I'll leave it to you to do the sums for a 20kHz sinewave sampled at 44.1kHz—give your PC a workout—but the important thing is that there is *no* missing information about the shape of the original waveform up to its bandlimit of 22.05kHz. Despite the fact that a 20kHz sinewave is only sampled twice per cycle. Elegance indeed—a marriage made in Heaven (or Bell Labs) between a perfect pulse stream and a perfect low-pass filter!

But wait! This elegance exists only on paper. Our original signal doesn't exist; we used a perfect A/D converter; we assumed that the string of numbers didn't become corrupted in storage; our D/A converter produced infinitely narrow pulses, spaced *exactly*  $1/s$  seconds apart; and our reconstruction filter featured a perfect impulse response extending to infinity in both time

<sup>1</sup> I can't remember the name of this substance. A free year's supply of *Stereophile* to the first reader who can jog my memory. Or send me an aqueous solution.

directions with zeros also spaced exactly  $1/s$  seconds apart. On paper, everyone's CD player produces a perfect sound forever. In reality—well, this issue of *Stereophile* already contains enough discussions of the subjective shortcomings of the medium.

Yes, I know—there are tens of thousands of happy CD player owners. But you should now start to see why there *are* subjective shortcomings. Take the first assumption, that the signal had no components above half the sampling frequency. Real music inconveniently has a spectrum that extends up and up, well above the traditional “20 to 20k” audio bandwidth. Before it can be sampled, the music signal has therefore to be viciously filtered to avoid the particularly audible nasties of “aliasing”—such a benign word to describe one of the more unpleasant-sounding distortions—and the design of such filters is no trivial task. They ring; they produce gross phase shift in the audio band; they go out of alignment; if they have major ripples in their passband's amplitude response, these inconveniently show up in the digital domain as pre- and post-echoes (a phenomenon described by its rediscoverers, Roger Lagadec and Thomas Stockham, as “dispersion”); and, most important, the only way around these problems costs money—lots of it.

If only the CD sampling rate were higher than 44.1kHz, the digital recorder's input anti-aliasing filter problems could at least be moved farther away from the music, which is the real reason why the sampling frequency is too low.

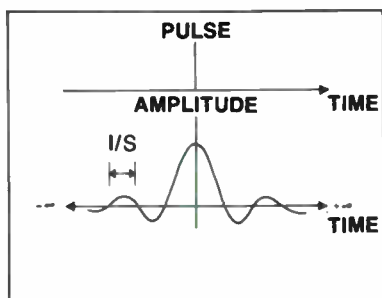


FIG. 3 PERFECT LOW-PASS FILTER IMPULSE RESPONSE

I'll draw a discreet veil over the “perfect” A/D converter and data storage required—I live in hope.

The rest of the process you get for free when you buy a CD player. The perfect D/A converter—see my comment on its A/D equivalent. Of one thing I am sure: you can't buy one for the kind of money available to a manufacturer marketing a CD player for \$349, let alone \$149.

How about some of the minor impossibilities? The fact that the pulses coming from the DAC should be infinitely narrow turns out not to present a major problem. Even if the pulse is so broad that it lasts until the next one, producing a “staircase” waveform, the only effect is to droop the treble somewhat, about 4dB at 20kHz, the kind of problem that circuit designers are good at solving. The fact that the pulses should be spaced exactly  $1/s$  seconds apart turns out to be much more serious. As pointed out by Philip Greenspun in the Winter 1986 issue of *The Computer Music*

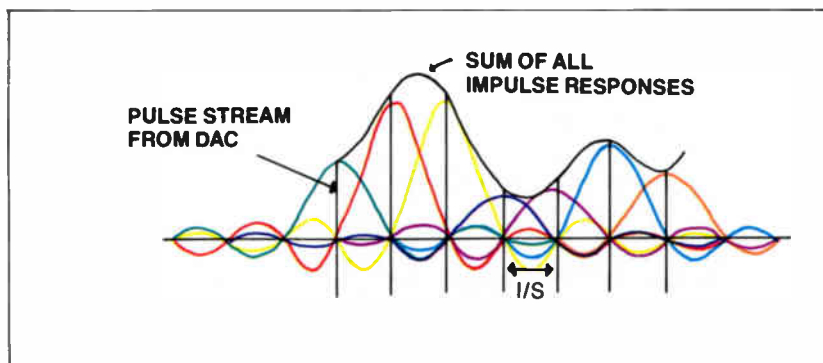


FIG. 4 WAVEFORM RECONSTRUCTED BY PERFECT LOW-PASS FILTER

"The MG-III is a remarkable speaker at any price; at \$2,200\* it will be a runaway best seller."

INTERNATIONAL AUDIO REVIEW (U.S.A.)  
HOTLINE #31, 1984

"With me, it's now a question of trying to live without them, rather than with them. In other words, I'm 'hooked'."

HI-FI ANSWERS (U.K.)  
JULY, 1985

"Here we have a remarkable, true audiophile speaker."

HI-FI NEWS AND RECORD REVIEW (U.K.)  
JUNE, 1984

"One of the best sounds at the Riviera (Consumer Electronics Show)."

AUDIO MAGAZINE  
MAY, 1985

"Especially with full orchestral music, the MG-III really shows its full potential."

STEREOPLAY (GERMANY)  
AUGUST, 1984

"This speaker will be a classic."

HIGH FIDELITY (DENMARK)  
JULY-AUGUST, 1984

The Absolute Sound Magazine.

SEE REVIEW IN VOL. 9, NO. 35  
AUTUMN, 1984

# Critic's Choice

**||| MAGNEPAN**

1645 9th Street  
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\* PLUS FREIGHT

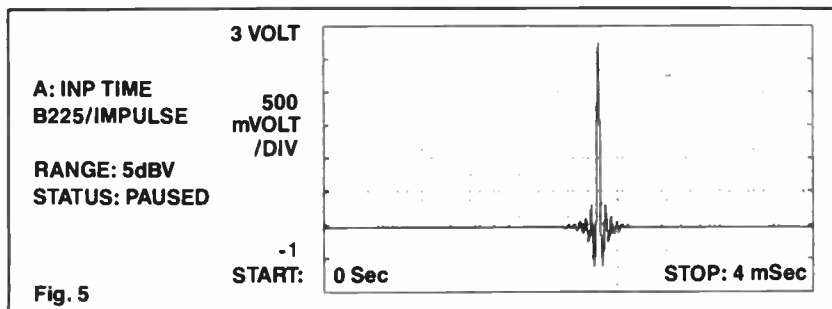
## Magneplanar® MG-III



*Journal*, and discussed by Bob Stuart in *Stereophile* (Vol.9 No.2), any minor inconsistency in timing—due, say, to jitter in the player's crystal-controlled clock from heavy current demands on an inadequate power supply—means losing precision in the reconstruction of the fine detail of the analog signal. Engineers call this "distortion."

Now that you've accepted the fact that the existence of a precognitive reconstruction filter is an impossibility, look at the measured impulse response of a Philips-system CD player (fig.5). Familiar, huh? It turns out that one of the beauties of a signal

length—provided you have enough RAM to hold that data—is the ability to be able to manipulate time; precognitive circuitry becomes a possibility. A filter operating in the digital domain can be made to approximate perfect behaviour because it can look both back and forward in time and operate on the current sample according to what it finds. In fact, this *is* the practical basis of digital filtration. The cost of RAM chips will never fall so low that the filter will be able to operate from minus infinity to plus infinity, but it can, in practice, ignore the contributions to the wave shape of samples far away



once it is in the digital domain is that the direction of time flow no longer is an invariable constant. There is no reason at all why the music data on a CD can't be played from end to beginning, decreasing entropy and causing the musicians to grow younger. Some musical works—Barry Manilow's entire output, for example—might even sound better! Similarly, consider the steady flow of data through a CD player's circuits. Animal fanciers could consider the numbers as goats passing through a door; unless the doorkeeper had X-ray vision, he would not know anything about a particular goat until it passed through the door. However, there is no reason at all why the doorkeeper couldn't place a second door before the first and take some action at the main door based on what he found out at the second: stop all brown goats from going through, for example. To an outsider not aware of the existence of the upstream door, it would appear that the doorkeeper possessed prescience of the color of approaching but unseen goats.

The effect of being able to examine a stream of digital data anywhere along its

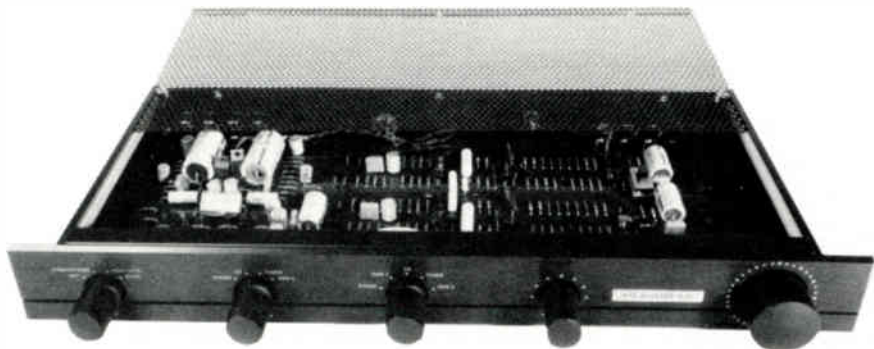
length—provided you have enough RAM to hold that data—is the ability to be able to manipulate time; precognitive circuitry becomes a possibility. A filter operating in the digital domain can be made to approximate perfect behaviour because it can look both back and forward in time and operate on the current sample according to what it finds. In fact, this *is* the practical basis of digital filtration. The cost of RAM chips will never fall so low that the filter will be able to operate from minus infinity to plus infinity, but it can, in practice, ignore the contributions to the wave shape of samples far away

in time from the current sample, as the resultant error in amplitude will be less than the random changes due to noise. The digital filter used by the first generation of Philips players used 96 coefficients—it could examine 96 samples before and after the sample of interest simultaneously, in order to act as an ideal low-pass filter—while the new filter in the true 16-bit players has more, reaching further toward a better approximation to that perfect impulse response. This attempt to approach the theoretical elegance is one reason why audiophile-quality CD players, or at least CD players with pretensions to audiophile sound, feature the Philips D/A chip set, which includes the precognitive digital filter. (A perhaps more important reason is that Philips will actually sell their technology to small hi-fi companies.) Digital filters are now also appearing in players from Sony and Technics, some four years after the Dutch engineers at Philips formulated their system.

Now, are 16 bits sufficient? And what about oversampling? And the quality of the analog circuitry?



# THERE ARE LOTS OF REASONS WHY THIS IS THE WORLD'S BEST PREAMPLIFIER FOR LESS THAN \$2000.



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It is the first of the new generation of preamplifiers from PS Audio, a company that has been dedicated to music and high fidelity for the last 12 years.

It is a preamplifier that can actually reproduce a musical performance with such clarity, beauty and realism as to be nothing short of startling.

Not only will you rediscover all the depth, information and just sheer pleasure hidden on your records all this time, but the 4.5 can offer your CD player and tape recorder something that no other preamplifier in the world can ... straightwire performance.

Only the PS Audio 4.5 allows you to totally eliminate your electronics from the path of the music. No dynamic range constriction, no altering of the signal whatsoever. In fact, without a PS preamplifier, we doubt you have ever really heard your CD player, tape deck or phono preamp.

This is a preamplifier that is completely moving coil ready, has full cartridge load facilities, 100% class A discrete high voltage circuitry, 1% metal film parts, passive RIAA curve, remote power supply....

And, oh yes ... we forgot the best part ... *it's only \$499.00 complete.*

Write us, or see your dealer for information about the 4.5, the upcoming 5.0, our CD player, and 200C power amp.

**PS AUDIO**

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# PURE GOLD

## Alvin Gold

Not since the wonderful day when Philips did a series of radio commercials with a "Fir-rips" slogan have I seen Japanese manufacturers so heated around the collar area. But this time Philips were also taken by surprise by an article that appeared a few weeks ago in one of the UK's weekend heavies—the *Sunday Times*—to the effect that CD was about to disappear in favor of digital tape.

I don't want to spend time here explaining the argument—it was as convoluted and obscure as it was uninformed and full of holes—but it does neatly illustrate what we might describe as the catastrophe theory of digital audio. It also hints at some of the background manipulation of the press that has been taking place.

Both consumers and the press tend to measure the success of a medium—compact disc or any other—by market penetration, percentage growth, and that kind of thing. But put yourself in the position of one of the Japanese manufacturers of compact disc. True, everything's humming at shop-floor level, but the fact is that CD was largely invented and developed thousands of miles away in Europe by Philips. Philips also managed to enlist the EEC's help in erecting a 19% tariff wall around the vital and lucrative European market, and are now milking it to the tune of a near-50% market share, leaving you with crumbs. Yet not only must you fight Philips' aggressive pricing and generally superior technology: about 20 of your compatriot companies have exactly the same ideas and want to share those crumbs. Worse, sensing the growth of the market, all manner of "audio" companies are crawling out of the woodwork, sincerely aiming to get rich quick.

OK, CD is pretty popular with the buying public, but it's a public weaned on cheap, miracle hi-fi that washes whiter, which believes that a simple five-band graphic can cure all of life's ills, and that a loudness control really can provide thundering lows and shimmering highs. You've been telling your

public all these things over the years, so you're not entitled to surprise when it becomes difficult to disenchant people of the early, overenthusiastic claims that CD—by implication, *all* CD—sounds perfect, and it doesn't matter if they pay \$900 or £90.

Do you see where this is heading? CD is a success, yes, but not to Far Eastern player manufacturers who can't maintain prices—the software industry has, and this has made the hardware producers absolutely furious—and therefore are making little or no profit.

DAT offers a neat way out of this impasse. It was invented, developed, and will be brought to market by the Japanese, who manufacture and control the supply of every last component that goes into the players. The prices will be high, but so what? This will be a premium product, and the majors will be able to keep the market clean—and the margins high—for a few years to come. Just like the early days of video, in fact.

So you carefully feed a few "facts" to the press in selected crucial Western markets (the UK has always been influential). Maybe you gently suggest that DAT will sound spectacularly improved compared with CD, that it will be as cheap as CD (both suggestions that appeared in the *Sunday Times* article, "spectacularly improved" being an exact quote), and perhaps that the moon is made of green cheese. Anything to help put the skids under Philips, who in the last few decades have uniquely managed to put one over on Japan (Electronics), Inc.

For the record, prerecorded material on DAT will be made to the same standards as CD. Home recordings will use 48kHz sampling, which gives a 2kHz improvement on frequency response, or about a semitone (count 'em!). If the extra bandwidth is used sensibly, it will allow the fabrication of slightly more gentle anti-aliasing filters, but oversampling, as used by Philips for CD right from the start, allows for gentler analog still. And no-one, to the best of my knowl-

edge, has demonstrated any ability to produce an ADC with linearity beyond something like the 14-bit level that doesn't cost hundreds of dollars.

Oh, and one more thing. Where do you think the superior software is going to come from to make these vastly superior recordings on DAT? It won't be live music; people don't make live recordings, which is why many of the better cassette decks no longer have microphone preamps. I'll spell it out. It'll be your Linn Sondek. Now let the Japanese go out and promote *that* as a concept!

Their mistake, I suppose, was in thinking it would be hard to convince anyone of influence in the press that DAT really was qualitatively better than anything which has come before, or that it would make CD redundant overnight. They were wrong, though: apparently there really is one born every minute.

### **On the virtues of simple speakers**

Enough of this. Let's turn to what's happened in the six weeks or so since I last wrote for this organ. I seem to have made a habit of collecting big American loudspeakers for review, and this has been a bumper month, with no less than two seminal designs squeezing through my doors. One came, made a deep impression, and left. The other made an even deeper impression, so I rang a magazine, asked them if I could write a review, and when I got an affirmative, I promptly delayed the completion date so that I could hold on to them for as long as possible. Don't tell the importer I've done this. He just thinks I need the speaker for six months to do a proper review. I do, I really do.

The speaker concerned is about the unlikely candidate for fame I have ever come across, so unlikely that I felt compelled to keep it covered so casual visitors couldn't see what it was made of. If they did, or so my reasoning went, they would dismiss it out of hand.

One visitor recognized the speaker's characteristic shape, and told me that he had listened to a pair a couple of years ago: "They were so colored they were truly laughable." He left wanting to take them with him. He wasn't the only one.

I'm not telling you what it is yet. . . but get this. The speaker, in this country, costs the best part of £2,000. It has three very ordinary-looking pulp-cone/dome drive-units and is built into a largish, but not especially heavy or solid box. The baffle is large, wide, and—worst of all—lipped, these factors designed to increase diffraction and spoil imagery. The midrange and treble units are disposed in a horizontal line, and just to ensure that the thing can't image properly, they're on a sub-baffle, pointing over the listener's head. The bass unit is half a mile away, near the floor, and just underneath an absolutely huge port. There's also a tweeter on the rear, but that has been disconnected.

Some of you will recognize this description as that of a Snell Type C. I don't know exactly how this speaker goes down in the US, but I, for one, found it a revelation, even though it is one of the least glamorous loudspeakers I have ever come across. It has little of the stunning clarity or hear-through qualities of many panel speakers, does not have the world's smoothest or most expensive kind of sound, but—and I couldn't credit this at first—I had never heard a more homogeneous and integrated loudspeaker in my life. The whole speaker, as a system, speaks with one voice and one purpose. It is detailed, yes, and dynamic, certainly, with a rightness of tonal color and a precision which it would be difficult to explain. I'm still playing around with this speaker and don't wish to go too much further, but you get the idea, I'm sure. I know from a number of sources, and also from an earlier Type C that belonged to an amplifier manufacturer acquaintance of mine, that earlier Type Cs were colored as hell. But the speaker has been radically improved over the years in such peripheral areas as tonal quality, remarkably without losing that spark of greatness.

The other loudspeaker was really something else. It was the Martin-Logan CLS full-range electrostatic—the only electrostatic apart from the old and new Quads I have ever listened to in depth.

The M-L is undoubtedly amongst the most exquisite-looking loudspeakers ever made, but to listen to it was both tantalizing

and infuriating. It was certainly not what it should have been, even though it was closer in sound to the early Quads than the much inferior ESL-63s, and it took some time to find out why.

The M-L has elements in its make-up which put it at the very pinnacle of loudspeaker design. The diaphragm is very light, and there is virtually nothing between it and the listener to sit on the sound. It was no surprise, therefore, to find that the midrange and top had a clarity and immediacy that in my experience had no peers. Anyone looking at both the M-L and the Snell from a traditional hi-fi viewpoint—one that stresses neutrality, transparency, tonal quality, and lack of distortion—would place the M-L some orders of magnitude above the Snell. But there was something wrong: the speaker sounded curiously unintegrated. The bass, especially, had a heaviness and slowness I could not reconcile with the construction of the speaker and its sound elsewhere.

It was in conversation with Gayle Sanders, the speaker's co-designer, that I found out what was going on. "Yes, we've come across this before," I was told. "It happens as a result of the diaphragm slackening off. It can be cured quite easily—with a hair dryer." Plastic diaphragms are commonly tightened on their frames with a hair dryer. So far so good, but *was* this the cause? I asked whether the diaphragm is hygroscopic (absorbs water from the air), and discovered that yes, it is. For anyone who doesn't know, the UK is a dampish country on occasion, and we had just gone through a damp spell (in this country we call this climatic condition "summer").

The final and perhaps most important reason, though, became apparent later in the conversation. When I asked about the function of the two massive inductors in the speaker's base, Gayle explained that "The 2 diaphragm's, physical dimensions mean that the response rolls off at some 6dB/octave below around 100Hz. The inductors provide a complementary 6dB/octave boost below this figure, and therefore something like a flat anechoic response down into the 40-50Hz region."

Leaving aside the question of whether such a response is a desirable idea, given the

rather peculiar way panel speakers couple into rooms, it neatly illustrates what I think is one of the major shortcomings of the American way of loudspeaker design: the apparent necessity of providing deep bass *regardless of the cost* (and I don't mean financial). In addition to the other deleterious effects noted above, the CLS's artificial boost smears the bass in the time domain, and can introduce possible limitations on power handling, dynamics, and so on. I do believe in deep bass, but my point is that if the price is too high, it's not worth it. The Snell provides this extension quite naturally, and as a consequence of the way it works—not despite it. As a result, this three-way moving-coil speaker sounds almost ideally integrated, while the almost ideally simple M-L actually sounds far less together.

### **On the virtues of cheap hi-fi**

Cheap, or relatively cheap, systems are grist to the mill of hardened audio reviewers. They always represent thousands of hours of dedicated design work, the labor of many others who build the bits and pieces—and even then, the birth pangs are not over. Meanwhile, your casehardened hack, who, as everyone knows, spends his whole life surrounded by freebies from Apogee and Krell, will likely as not dismiss all these efforts in microseconds if what he hears doesn't match his preconceptions. Of course, if he actually had to pay for his own hi-fi, things might be different . . .

Well, I've just been listening to a cheap hi-fi—a fairly cheap hi-fi anyway. It's based on an amplifier you'll soon be able to try for yourself, known variously as the Musical Fidelity (UK) or British Fidelity (USA) A-100. The A-100 is not quite a budget amp; it will cost about \$699 in the US. As the name suggests, it is a grown up version of the tiny, transistorized class-A A-1. The styling of the A-100 follows the A-1 pattern, as does its minimalist set of controls. There are no functional differences whatever, in fact, except that the case is a little fatter, and the circuitry inside has been beefed up to provide 50 watts, still pure, unadulterated class-A. To help dissipate the heat, no less than two small fans have been added inside, venting through the sides.

The first sample of the amp had impossibly noisy fans. I demonstrated to Anthony Michaelson (British Michaelson to you) my Krell playing "No Signal" (Anon) and he whipped the amp away without further argument.

It came back this morning, cured, and even in this limited time, it's easy to tell that it's magic. Even from cold, the A-100 has more soul than Otis Redding, and more guts and drive than those gentlemen with the Right Stuff. When it's warm, it's hot—both

deal with them just fine.

The result? A system stripped bare of nonessentials: it does not have those semi-legendary thundering lows or scintillating highs; it is not the most transparent or neutral on earth—yet it has in microcosm everything that really counts in the reproduction of music. Looked at another way, this system is true to the spirit and meaning of music reproduction, and not just to the letter. The B&Ws and Rega are more than good enough to let this quality through, but it is the ampli-



### Musical Fidelity A100

literally and figuratively. It has the free-breathing quality that is the essence of good modern amplifiers, and the very antithesis of what amplifier design was ten years ago: all control and clinical efficiency. The A-100 has a heart as well as a head. And your pocket doesn't even need a sense of humor. I plugged it into a pair of B&W DMI 10s (the criteria for this choice were that they (a) were lying around, and (b) hadn't had tweeters destroyed by another amplifier I had been testing. I will not name the guilty party unless and until it goes on sale in the US). The '110s cost two-thirds of nothing at all, and for a source I used one of God's little children, the Rega 3 with the RB300 arm (it has a very smart finish in current guise), fitted with a Linn K9 cartridge. This is the kind of system for which the A-100 was made. It's an amplifier designed to make good but modest equipment really sing. I don't see it as the tool to drive Scintillas or the big IRSs, although for all I know it can

fier that makes them sing. Another amplifier—even a good one—can, and usually does, leave the remaining system components at a considerable musical disadvantage.

The only shortcoming I noticed was that the sound could become a little rough around the edges at high volumes. I traced this to the K9, whose Basik-like antecedents are exposed when the volume is too high. But I wouldn't give up this cartridge's essential vitality without a really strong reason.

This leaves just one little difficulty. Everyone knows that the source (turntable) is the most important thing in the world. But this system is one of the clearest examples yet of successful system-building in which the amplifier has come first. Put another way, if Rega themselves were to recommend a similarly priced system, I think they'd recommend a Linn.

Neither of us, at least, would suggest completing the system with a compact disc player. And DAT's DAT.

**S**



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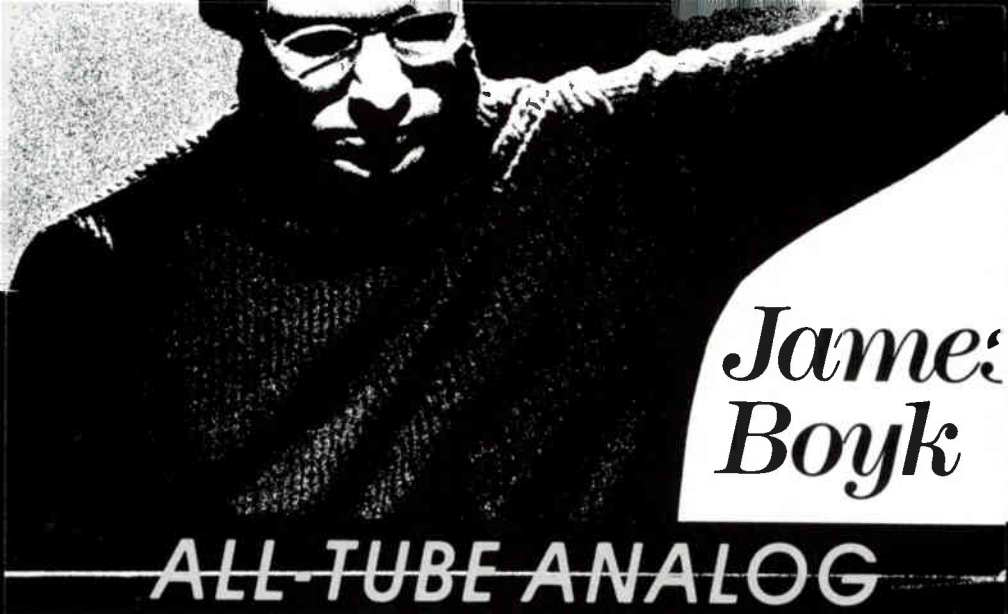
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# James Boyk

## ALL-TUBE ANALOG

**JOHN ATKINSON TALKS WITH CONCERT PIANIST, RECORD PRODUCER, AUDIO CONSULTANT & ICONOCLASTIC COLLEGE TEACHER JAMES BOYK, OF PERFORMANCE RECORDINGS & THE CALIFORNIA INSTITUTE OF TECHNOLOGY.**

It is a widely held belief that musicians do not assess hi-fi equipment in the same way as "audiophiles." I remember the British conductor Norman Del Mar—an underrated conductor if ever there was one—still being perfectly satisfied in 1981 with his 78 player, never having felt the need to go to LP, let alone to stereo. And some musicians do seem oblivious to the worst that modern technology can do. I was present at the infamous Salzburg CD conference in 1982, for example, where Herbert von Karajan, following one of the most unpleasant sound demonstrations in recorded history, announced that "All else is gaslight!" compared with what we had just heard. J. Gordon Holt proposed a couple of years back ("As We See It," Vol.8 No.1) that sound is not one of the things in *reproduced* music to which musicians listen. I have also heard it said that even the highest fidelity is so far removed from live music that a musician, immersed in the real thing, regards the difference between the best and the worst reproduced sound as irrelevant to the musical message: both are off the scale of

his or her personal quality meter.

Whatever the truth of the matter, there are, as with all widely-held beliefs, as many exceptions as examples, one such being pianist James Boyk, Artist-in-Residence at Caltech in Pasadena since 1974, where he runs an interdisciplinary course called Projects in Music and Science. Jim is also president of, record producer for, and sole featured artist of, the small record company Performance Recordings. (He tells me that he also sweeps floors, and answers the phone.) Despite being a classical pianist of renown, Jim is acutely sensitive to small nuances in reproduced sound, and, perhaps as a result, his recordings<sup>1</sup> are object lessons in how to capture the natural sound of a piano in a real concert hall, as opposed to the usual multimiked, cotton wool-acoustic, musically-sterile, sound featured by such companies as DG.

At Caltech, Jim has the wherewithal to perform one of the really meaningful listen-

<sup>1</sup> Performance Recordings LPs are distributed in the USA by Harmonia Mundi, 3364 South Robertson Blvd., Los Angeles, CA90034. Tel: (213) 559 0802.

ing tests: to compare the sound of a live microphone feed with the sound when a hi-fi component—gain and absolute signal polarity adjusted appropriately—is inserted into that feed. As a result of such tests, Jim is committed to tubes for amplification, and his opinion of what digital has to offer lies in stark contrast to, say, J. Gordon Holt's or, indeed, to those of the engineers for the major recording companies. Needless to say, his own recordings are strictly analog, and made with tube amplification, hence Performance Recordings' "All-tube Analog" trademark. He also uses ribbon microphones exclusively rather than the ubiquitous condensers. I visited with Jim in July, and we talked about his listening tests and his aversion both to transistors and to music by numbers. But first, at the beginning of what Percy Grainger might have called a "free ramble," we talked about the purpose of high fidelity . . .

**JB:** You're trying to preserve the sound of the music with high faithfulness, but in aid of what? The purpose of the exercise is to convey the emotion within the music. Music is about the communication of emotion.

The first thing to know about audio is that live musical sound is beautiful. That's the absolute bottom line. By "beautiful" I don't mean namby-pamby pretty, but something very definite: it means that the sound draws you in instead of puts you off. It means you can listen for almost arbitrarily long amounts of time without getting fatigued by the mere act of listening. (You may get fatigued from your emotional involvement with it, but that's a different matter.) When was the last time you heard a hi-fi system at any price where listening for three hours wouldn't fatigue you? You hear live music for three hours and it doesn't fatigue you.

The first requirement for doing a good listening test, therefore, is that the sound must have a reasonable amount of that beauty. It's easier to do that with tubes than with solid-state, in my experience. It's easier to do that with ribbon mikes than with condensers. You're helping yourself a lot, of course, by coming straight from the microphones rather than using stored material—I

don't care whether it's LP or CD or tape, straight from the microphone is just radically better—but you must make sure that the sound you hear out of the loudspeakers on your direct feed is beautiful. (That's already very unusual: you go into the typical commercial recording studio here in Los Angeles, and what you hear straight from the microphones is a travesty. I would set up what they felt was their best microphone on piano, somebody would hack on the piano, and I would listen on the direct feed through their board—there wasn't any remote semblance to piano sound!)

So you set up two microphones with musicians playing into them, and you run the signal through your microphone pre-amps, gain control, power amp, and speakers. You break the line at one point with a switch and insert the device to be tested. Obviously you can't do it with all components. For instance, to take the transducers at the two extremes of the playback chain, microphones and speakers, you have to listen to live acoustic music, then listen to what that transducer does in a system. That's really problematical, because no microphone set-up hears spatially the way your ears do. But some components—tape recorders, for example—are perfect for insertion in a direct feed. All a tape recorder is supposed to do is to act like a black box that does nothing to the input signal except delay it by an amount of time at your command. And repeat it at will. So you drop the tape recorder into a line, adjust for unity gain, and see if it changes what happens. The question then becomes, not "Do I like it or do I not like it?" but "Does it change the sound, is it different? Is it the same as the piece of wire?"

Of course I'm leaving out all kinds of technicalities, but it seems to be a completely valid idea. If you can't tell the difference when you insert the tape recorder, then you've got a tape recorder that nobody's yet made—a very good tape recorder!

**JA:** I understand that you've been using this listening test to evaluate tube and transistor amplifiers.

**JB:** This is a kind of open-ended project that was started in my Caltech course about three years ago. What we have are two stereo

line amplifiers, identical in the following ways: they're both designed to work more or less around the 1V or 750mV level; they're both x10 voltage amplifiers; each has a follower after the voltage amplifier, so that they can drive some kind of output load without too much difficulty; they're both very simple; and they're designed as much as possible to have similar figures for frequency response, distortion, overload level and so on. Then each is padded down with a resistive network so that the net result of each of these things is nothing, no gain. However, one uses tubes and the other transistors.

The idea is compare the sound of one with that of the other. (They both invert phase, so there has to be provision to compensate for that.) We set up our microphone feed with a three-way switch: the middle position, labelled "reference," lets you listen straight to the microphone and mike pre-amp. You listen for a while till you feel familiar with what you're hearing. Another position drops the tube line amp into the circuit, and the third position does the same for the transistor line amp. Then the question that is asked is "Which one comes closer to having neither of them in?"

When the student doing the project feels that there's a definite difference between the two, I give him a blind test, and if we get to the point where the student can tell them apart, I say, "Fine, now you're allowed to have an opinion about which is better. Which one *is* better?" He says "That one!"—whichever it is—and pulls off the black velvet cloth. Lo and behold, the *tube* line amp is better.

Then here's the game. The student takes the one that's less good and he gets to do anything to it to improve its performance. He wants to put in better transistors, fine. He wants to put in feedback, fine. He wants to take feedback away, fine. He wants to change the capacitors, the resistors, he has absolute *carte blanche*. Then he iterates. The intention is to leapfrog—only the problem is, there's never been any leapfrog; in three or four iterations, the tube unit has always come out on top. The students have tried various things on the transistor unit, but it simply doesn't begin to come close. (I want

to put a caveat on this: these undergraduates are very bright and able, but, with the rare exception, completely inexperienced in audio. We do not purport to be telling something about what's happening at the state-of-the-art. The point is to give students a hands-on feel for the differences between tubes and transistors.)

**JA:** Does the tube unit sound like the straight wire?

**JB:** No. But it's more like the straight wire than any of the transistor line amps. The thing about tubes generally is not that there's *no* difference in the sound, but the differences that the tubes introduce don't interfere with the semantics of the music. They don't get in the way of the musical content; the transistor unit disturbs the beauty of the music much much more, it just becomes uglier.

**JA:** Is the way the harmonics of piano tone change with time the kind of thing you feel to be less well preserved through a transistor amplifier?

**JB:** Absolutely. Let me show you how it matters. The thing which characterizes the Steinway is that it's got a rich harmonic structure that is very alive; which harmonics are prominent changes from moment to moment. Most commercial piano recordings don't have much of this information, it gets lost somewhere. At the end of the first page of Chopin's Etude Op.10, No.3, there's a phrase that ends on a long E; the next phrase begins with an E an octave higher. Now the way I like to play that, I want the new phrase to appear out of the ashes of the old; I want the first note of the new phrase to appear to steal in, to appear as though it's the second harmonic of the previous note merely being emphasized. I don't want to *bear* the attack on the note, therefore I listen for the second harmonic development in the old note and try to begin the new note when the second harmonic is strongest (within the time window we can still speak of as being "in time").

**JA:** And this kind of inner detail is passed best by the tube line amplifier in your test.

**JB:** Yes, I think so. Tubes generally are better at that kind of thing. And ribbon microphones are better than condensers. I am told that the fundamental resonances of con-

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denser diaphragms—which are almost always disc-shaped, like little timpani, typically between half-an-inch and an inch in diameter—are right in the middle of the audio band. Basically you have a microphone operating in two different regimes: in the low end it operates below its resonance, and in the high end it operates above it.

A ribbon, however, has a fundamental resonance at the *bottom* of the audio band, and therefore operates in one regime over the whole band. I believe also that most condensers have all kinds of high-end resonances intentionally put in to goose up their frequency response curves so that they will look flat to 20k. Of course, then when they do go, they go fast! Whereas a ribbon microphone is much freer from such intentional playing around. It certainly *sounds* it: you get a natural detail that I *never* hear from any condenser mike.

**JA:** I feel the same about the classic Coles/BBC 4038 ribbon, which I believe was used for the Sheffield *Firebird* recording. It is astonishingly neutral, its only problem seeming to be that, like the B&O, it doesn't have an extended enough high frequency range.

**JB:** Are my records rolled off in the highs? To me they sound musically natural: they may not be the brightest things around, but I don't have any sense of *missing* information. There's all kinds of artificial brightness in the extreme high end in condensers—what Steve Haselton of Sheffield calls “condenser cackle” —which is simply absent in ribbons. It can take a lot of getting used to for people not directly familiar with the sound of musical instruments. I think the reason some people find ribbons dull, when compared with the condensers, is the lack of cackle rather than their actual gentle HF rolloff.

**JA:** It has been said that, with the advent of digital recording, these fundamental problems with microphone behaviour will be much more important, because the digital process itself is much more transparent.

**JB:** The digital process as it now stands is a big disaster. I don't want to lean on it too heavily, but our double-blind test at Caltech [in which the digitally-processed sound was compared with the live microphone feed, to

its detriment] was really a very careful test; as careful as we knew how to make it. We never formally published a paper on the test and its results, but I did give two talks at Caltech, and one out at Bolt, Beranek & Newman, the acoustical consultants, which were complete in every detail. I told exactly what we had done, and nobody has yet pointed out any methodological flaws.

I've also done a lot of listening over the years at Sheffield Lab recording sessions where there have been various digital machines on line. The polarities were correct and the levels matched, so we really had a kosher playback. I've also co-engineered three records with Doug Sax for Sheffield in the last year and a half, including the *Kodo* drum CD and the Los Angeles Philharmonic *Firebird* recording with Erich Leinsdorf, all of which were also recorded digitally. I've had a lot of listening experience under what I would call “valid” listening conditions, where the comparison you are listening to *is* a comparison of what you think it is. Any scientific test must have valid listening conditions as a prerequisite, otherwise what you're doing is meaningless. Unfortunately, in my opinion most tests of digital—and most tests of audio equipment—are done under meaningless conditions.

The comparison of Sheffield Lab LPs with CDs is almost a scientifically valid comparison—there's one little ringer with the LPs, but if you do the CD versus the Nakamichi *cassette* then it's an absolutely fair comparison, the CD and cassette are symmetrical. I've played the LP/CD comparison for roughly 30 people over the last two or three years, and without exception—I don't think I'm a mesmerizer—everyone has said “Oh! The difference is day or night.”

**JA:** But a digital advocate, faced with the negative results from your blind insertion test, would say, “Yes, it's not surprising that you *can* hear the insertion of a PCM processor into the direct feed; nothing made by a human being is perfect. But surely what *is* important is the degree of that difference heard when compared with, say, that introduced by a professional-quality analog machine when *it* is inserted into the feed?”

**JB:** Absolutely. The analog machine also makes some difference, and although one



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can say until blue in the face that the digital machine made a *bigger* difference, you can't quantify that. If you *could*, it would be all done, we wouldn't need to worry about this stuff. So the only criterion that one can meaningfully use is to examine which comes closest to the direct feed in allowing the listener to get into the emotion of the music. It is the only conceivable criterion, because *that is* the purpose of what you're doing; that's what music is for. To use any other criterion is intellectually dishonest, and pretends to an objectivity that, in fact, it cannot have.

Each individual has to make the assessment for himself on the basis of "Which one lets me forget about the technology the most?" And it will always be the case that a good direct feed will go farther in this direction than either analog or digital. But I'll tell you what does come the closest: it is the direct-to-disc process. When we recorded the Los Angeles Philharmonic, Sax and I were in the control room all day listening to the direct feed, which, if I do say so myself, was gorgeous. It was really beautiful.

We had playback from five storage media: the direct-to-disc lacquer (an occasional lacquer that gets spoiled for some reason and doesn't get sent for metal-plating); the digital tape recorder (Sheffield's own highly-modified, very much improved machine); and three analog tape recorders. The machines were *not* in the control room, so this was an informal blind test with levels matched, polarity correct. The only medium that really stood up to the beauty of the direct feed—and it did so to an amazing degree—was the direct-to-disc lacquer. It was quite stunning. When you hear a lacquer, it's dead quiet; it's just been made, and the basic noise level is microscopic, especially when it's direct-to-disc and there's no tape hiss. It was close enough that I think that you could have taken a professional engineer in there, told him it was the direct feed, and he would have been more than satisfied that that *was* the sound we were getting from the mikes.

The next group down were the three analog tape recorders. They were all different machines—some experimentation was going on here—and I had my prefer-

ences among them, but all did honorably with the program material. Then, in a class by itself at the bottom, was the digital machine. Nobody could stand to listen to it, to the extent that one person in the control room spontaneously said, "Stop the comparison. Whatever that machine is, it's broken!" Doug said "No it's not broken; that's the digital!"

Now here's what's interesting: only one of those three media is pure analog, and that's the direct-to-disc. What we conventionally call *analog* tape is actually a sampled medium. The signal rides on the bias; in effect, the bias is turning the sampling on and off. This is at a very high rate, to be sure, and the turn-on/turn-off is very soft because it's a sine wave, but it's a sampled medium, nonetheless. So we have the *true* analog medium at the top (according to yours truly), then the "sampled" analog, with the sampled digital at the bottom. It was very clear-cut.

**JA:** Where are the specific subjective areas in which you feel the digital machines fall down? Many writers, for example (myself included), have said that digital has fantastic bass definition.

**JB:** Completely false! I know digital is supposed to have good bass—it *ought* to have good bass—but the bass in all the digital I've ever heard has been horrible, truly awful. All I can assume is that a lot of people don't know what musical bass, from live acoustic instruments, actually sounds like.

**JA:** Some writers have written that, whereas the best of the conventional media preserve the sense of space around instruments, the digital doesn't.

**JB:** The "room" does go away with digital, and the low-level information with it. The quietness of digital, the vaunted lack of background noise—which it certainly has, I'm happy to give that to it—in my opinion is a direct concomitant of the lack of detail and the lack of room. One side of the coin is no background noise; the other is no detail. And part of no detail is no instrumental timbre detail, no textural detail; the other part is no room.

**JA:** When I did the piano recording for the *Hi-Fi News* Test CD, comparing the live feed with the PCM-FI digital tape revealed that

the digital tape did make the acoustic drier, as though I had been recording in a slightly smaller hall. Depending on the player, the CD goes farther in the same direction. As far as I'm concerned, my miking becomes less optimally balanced for the ratio between direct and reverberant sound. But to someone who wasn't at the original session, they would assume that, yes, it was a small hall, but it is still believable. Does this distortion of perspective matter? To many it doesn't seem to. Digital may have such problems but people still happily buy CDs.

**JB:** Well look, anything anyone is happy with, I'm happy for. Happiness is what we want more of in life, and if someone tells me "I love CD, it's a terrific medium, I get into the music," I'm not going to tell him that he doesn't, that he isn't happy. But he shouldn't tell me that I *am* happy.

You can't magically throw away the room without also losing all kinds of other information. The signal doesn't know which part of itself is room and which part is instrumental detail, and such fine detail in the sound is actually a crucial part of the performer's art. Instrumental textures become homogenized. The difference between a solo instrument playing and a whole choir of instruments answering gets homogenized. Timbral differences—the difference between an oboe and a clarinet, or a violin and a cello—also get homogenized by digital. Can you still tell it's a violin rather than an oboe? Probably. But does the difference have the full impact of that it should have? No, it doesn't. One of the great pleasures in music is simply the different voices of the instruments. Sometimes it can actually be quite difficult to tell.

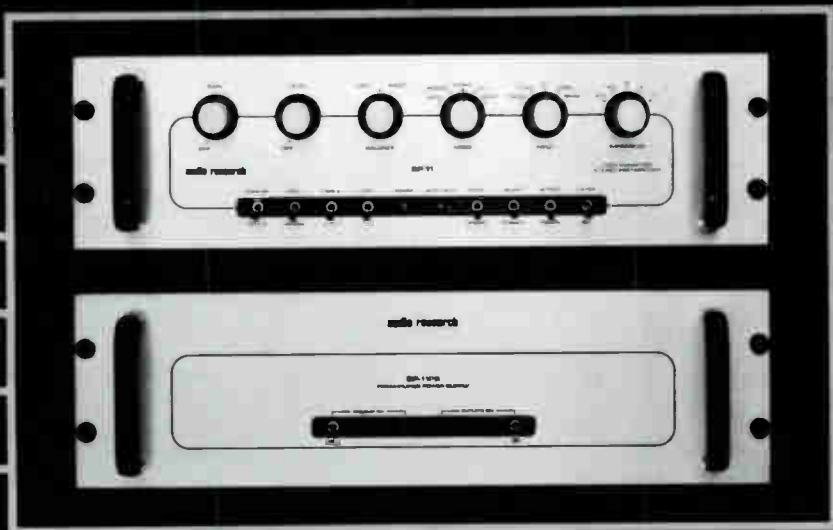
There's often—not always—something in the background, almost as though there is a wind machine in the back of the orchestra. It's not loud enough to hear explicitly, but it intermodulates with everything else. The homogenization of timbres and textures comes from that intermodulation, from the fact that you have clarinet *plus* wind machine, oboe *plus* wind machine, violin *plus* wind machine. To the extent that they all have a wind machine in common, they all sound alike.

I said earlier that the first thing about

audio is that music is beautiful. The second is that the beauty of music is the sensual bridge to its meaning. The raw sound of live acoustic music *is* a part of the meaning of the music. If the sound is different, the meaning is different. A thing I hear wrong in digital recording is the lack of what I've called "dynamic inflection," which is the natural rise and fall of dynamics. I'm not talking about gross dynamic range, but the thing that makes "Please pass the salt!" different from "Please pass the salt." Dynamic inflection is what gives natural expressiveness to music: analog seems to preserve it well, whereas it seems to be damaged by digital.

The *perceived* dynamic range of digital recordings, to me, is inferior to that of analog. There simply is so much less dynamic range, perceptually, than analog that it's a joke to compare the two. For instance—I'll give an extreme example—I've never heard a CD or a digital master tape that has a perceived dynamic range equal to that of the Sheffield *Firebird* direct-to-disc recording (with the proviso that you have to have a system that can play back the dynamic range). I think this record will be twiddling its thumbs five years from now, waiting for equipment manufacturers to make real systems for real people—as opposed to special custom-made commercial systems—that can *actually play* it. It's not hard to track, but the tough part is to reproduce the full power in the bass and midbass. There are very few systems around that can actually do that. The dynamic peaks are tremendous, +19dB over zero recording level. The cutter can legitimately put more energy in the groove, but Sax is a world-renowned expert in disc-cutting and he knows what real-world cartridges can really do. He sets his levels so that the highest peaks will be trackable by anybody. But then the average level goes down. The low average level shows that it's a wide dynamic range recording.

My complaint about current digital could be summed in two words: "Premature Standardization," except that "premature" implies that at some time you *will* be able to do it right, and that is a big question mark. I must make it make clear that I don't really feel like a voice crying in the wilderness on this sub-



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ject. The BBC recently came out with a report intended to answer the question "How many bits do you really need to handle music as it comes straight from the microphone without any compression, limiting, or dynamic processing?" They came up with 22 bits per sample—the current standard is 16. This is inconceivably higher resolution than anything we have available now, or anything that companies are even dreaming of. Quite apart from the fact that we already have a standard.

**JA:** It is said that 16 bits *is* enough if you know *everything* about the signal: where it's going to be loudest, and how loud; where it's going to be softest, and how soft; and, most importantly, if that is the final medium, for playback in the home. As I understand it, if you're in a recording situation and you need to mix and play with the signal at all and still want to end up with good 16-bit words, you need to start with, if not 22, then at least 18.

**JB:** There is something I would like to make clear. When you add a bit to 16, you're not adding a difficulty of one sixteenth, you are *doubling* the difficulty; so when you add six bits, you're making it two to the sixth—64—times as difficult. But it is not 64 times as difficult, it's a *zillion* times as difficult because there isn't anyone in the world who is even *dreaming* of 22-bit conversion at the kind of rate required for audio.

Let me indicate where the state-of-the-art stands. I called up a well-known manufacturer of converters for CD players, and asked what their fastest 16-bit converter was. They make one that will operate at 110kHz or 120kHz, so I asked if it was really linear at high precision. I'm glad I asked this question; the answer was that, if I wanted a *high-precision* 16-bit converter, the fastest rate it would operate would be just 6kHz! Which means you're looking at an effective signal bandwidth of just 1.5kHz, if you really want to handle things right. "What about these ones that go at 44k, for CD players?" I asked. "They're not as accurate," came the reply. You ask when they will have high-precision 22-bit converters, and they start laughing.

However, I don't believe that 16 bits *is* adequate, even if you do know everything about the signal. I think the BBC said that it's

adequate if you're going to broadcast 13 bits, which is what the BBC does. Then there's enough extra places to keep the accuracy of the 13 bits.

Now what if someone said that they had a machine that does 22 bits per sample at a 200kHz or 300kHz sample rate, with a truly linear—not just monotonic, which is an incredible cop-out—performance? I'm perfectly willing to believe that, if implemented correctly and surrounded by analog electronics of the highest level—and when you look at the requirements for that, it's incredible how good they have to be—it would be excellent. I don't expect that I will hear that in my lifetime. But suppose that it *were* excellent, suppose, magically, we had it here now—now a Compact Disc holds just eight minutes of music! Gee, eight minutes of music and an LP is as good and it

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*LP is a pretty  
dense storage  
medium.*

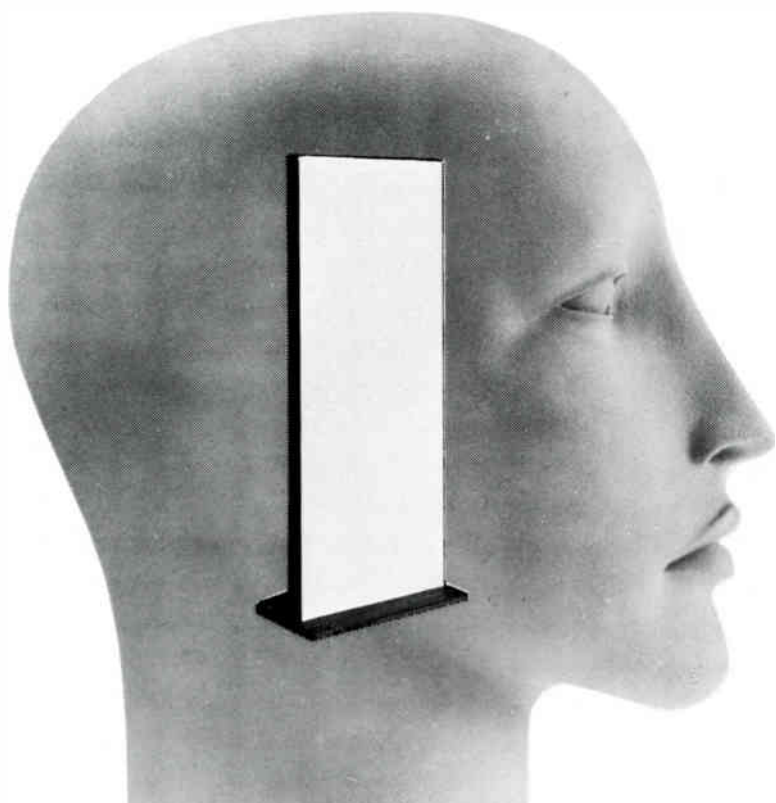
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can hold 40 or 50 minutes of music! Hey, an LP is a pretty dense storage medium, isn't it?

The answer is that it *is* a dense storage medium; it's a fantastic storage medium—it's our best! The proof of that is Sheffield's recordings over the last few years, where you have the LP and nothing else. Anybody who wants to hear what woodwinds sound like, go listen to the Sheffield Chicago Symphonic Winds record, the Mozart and Grieg. That *is* the sound of musical instruments. It's just extraordinarily transparent to the music. I would even make that claim, to almost the same degree, for a couple of my records on Performance Recordings. There just isn't anything to get in the listener's way with the Prokofiev Sonata record or the two we've made since then. If there were, I would have got rid of it (although I would like the hiss level to be lower).

**JA:** Can we talk about the slogan on your Performance Recordings T-shirt: "Digital finishes what the transistor began."?

**JB:** It comes back to the fact that some of the problems of digital are masked in typical studio practice by what's wrong with typical studio equipment. Condenser microphone diaphragm resonances can mask the



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additional harshness that digital can produce; the mikes don't have particularly good ambient pick-up, owing to their solid-state electronics, which masks digital's loss of ambience; and the mixing desks are mostly pretty bad.

There's been a lot of play recently about how wonderful some of the commercial recordings from the early stereo era of the '50s are. I think that's right; a lot of them *were* wonderful records, and it's significant that that was an all-tube analog era. People used high-resolution equipment then. In the '60s, however, mastering engineers and studio engineers started getting early solid-state power amplifiers to drive their loudspeakers, and the resolution went out the window. That has nothing to do with what solid-state is ultimately capable of, or what we have today, but solid-state amplifiers, we would all agree, were then a complete disaster!

I'm not just saying merely that I dislike what solid-state tends to do, and what digital definitely does; what I'm saying is that the one really leads to the other, that the degradation of solid-state is a step on the way to the degradation of digital. I believe that if you went in one jump from the state-of-the-art from 1958—stereo, but tubes and analog—to today's art—digital and solid-state—that leap would be absolutely unacceptable. It's only because it was first mediated by the transfer to solid-state that people accepted it.

I gave a talk at Caltech to explore that idea. It was called "1960 vs. 1985 in Recording" and, just so nobody was in any doubt as to where my own opinion lay, it was subtitled "A Quarter-Century of Degradation." I went to a used-record store and bought actual LPs that were 25 years old. God knows what their history had been. I played them on a decent, but not great, turntable/arm/cartridge combination; my idea was to play the same piece of music from the same record label in a current all-digital CD, played back on a Meridian MCD player through the same fine system, to compare what these companies thought was the way to do it then with what they think is the way to do it now. I played three such comparisons—the LPs came from 1958, 1962, and 1965—then

asked people if, assuming these three comparisons to be the Universe of such comparisons, did they feel that there was a difference between how well the music was served by the two technologies? Everybody said that there was a definite difference, no question about it. I then asked who felt that the technology of today—solid-state, digital—serves it better, and five hands went up. "Fine," I said, "How many people feel that the art of a quarter-century ago served the music better?" 46 hands went up!<sup>2</sup> Well, that's a stunning indictment!

**JA:** You seem to have ended up with conclusions which run counter to accepted wisdom. You make records with 20-year-old ribbon mikes; you think amplifiers sound more neutral when using tubes, and let the music through more benignly; you've proved, at least to your own satisfaction, that the highly touted digital recording system is not working as it should. How do you convince people that you're not saying all this from some reactionary stance?

**JB:** Oh, the convincing is easy! Just let them listen to one of my All-Tube Analog records on a well-chosen playback system—by which I don't necessarily mean an expensive one. The Sheffield *Firebird* is all-tube; their Lincoln Mayorga/Arnold Steinhardt Dvorak and Strauss violin and piano record

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***Over 80% of the biggest quality companies believe in analog for recording music.***

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is all-tube. When you say that I run contrary to the received wisdom, in some sense that is true, but in another it's not: if you look at the record companies that are internationally acknowledged as making the sonically finest records—Sheffield, Telarc, Reference Recordings, Audiofon, Wilson Audio, Harmonia Mundi, Hyperion, Meridian in England, Proprius and Opus Three in Sweden, (I'll modestly include my own company, Performance Recordings, but we're microscopic even when compared with these companies)—only Hyperion and Telarc are committed to digital recording.

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<sup>2</sup> Readers who are sceptical about such comparisons should compare the 1957 Becham *Scheherazade*—an early Blumlein-miked stereo recording—with the same work from Previn on an all-digital Philips CD. The difference is frightening. —JA

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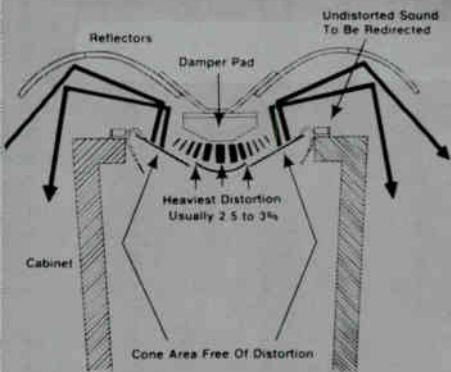
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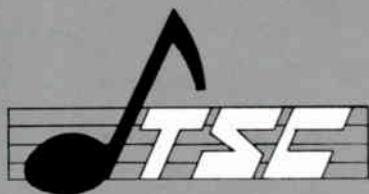
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**JA:** But when you look at these companies who are respected for their sound quality, their total sales are but a minute percentage of the sales of a company like Deutsche Grammophon, Philips, or CBS.

**JB:** We're not talking economics here, we're talking fidelity.

**JA:** But the received wisdom is laid down by the people with loudest the voices.

**JB:** Like Galileo, I say, "Still it moves!"

There's no question, however, that commercially it is all over. Commercially, it's all digital. Analog is dead.

For now!

The introduction of digital is like nothing so much as the introduction of transistors 25 years ago. If you looked at the situation in 1970, or even 1965, it was all over for the tube, it was *all* transistors. But a couple of years ago *The Wall Street Journal* had an article about the renaissance of tubes! In the last decade 20 or so companies have come into existence to manufacture tube equipment. Maybe the same thing will happen with analog; or maybe digital will get good enough. **S**

## PERFORMANCE RECORDINGS DISCOGRAPHY

(These are all live performances, recorded in front of an audience in Caltech's Dabney Lounge, the hall JB feels to be acoustically the finest in LA. Needless to say, CDs are not available. All-Tube Analog is a trademark and Performance Recordings is a registered trademark.)

**SCARLATTI**, Three sonatas; **BEETHOVEN**, Sonata Op.111—**PR 1**

**SCHUMANN**, Scenes from Childhood; **CHOPIN**, Fantasy in f Op.49—**PR 2**

**PROKOFIEV**, Piano Sonata 6—**PR 3**

**DEBUSSY**, Reflections in the Water; **STRAVINSKY**, Sonata (1924); **SCHOENBERG**, Six Little Piano Pieces; **RAVEL**, Sonatine—**PR 4**

**BEETHOVEN**, Sonata Op.13 (Pathétique), Seven Bagatelles Op.33—**PR 5**

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**Volume VIII of [Stereophile] was published in 1985, with Volume VII covering 1984, VI, 1983, V, 1982, IV, 1977-81, III, 1971-1977, II, 1967-71 and I 1962-67. All the issues listed are available from our back issue department (if out of print, they can be supplied in Xerox form). See the advertisement in this issue for details.**

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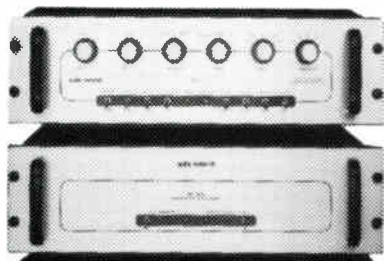
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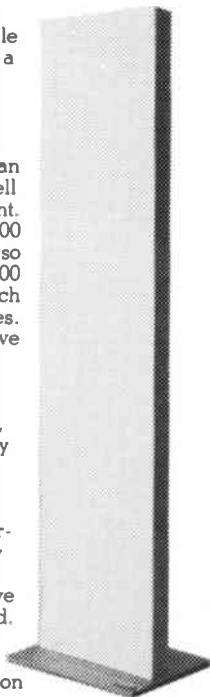
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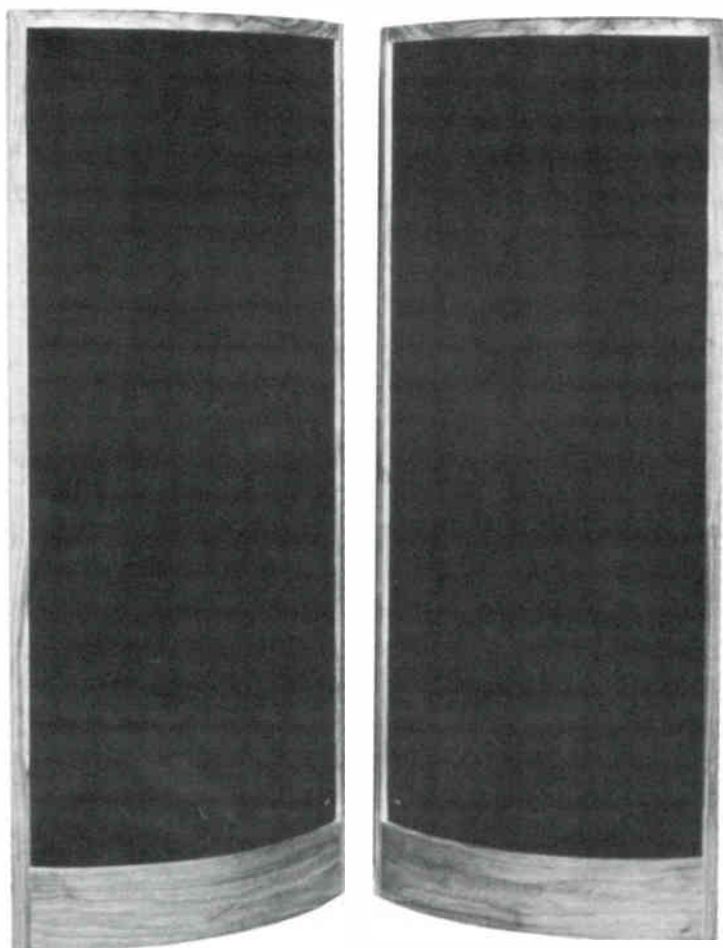
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## SOUND LAB A-3 SPEAKER SYSTEM

J. Gordon Holt



### Sound Lab Model A-3

Full-range curved-diaphragm electrostatic dipole speaker system. Frequency response: 32Hz-22kHz,  $\pm 2$ dB. Sensitivity: 88dB/W/m. Recommended minimum amplifier power: Maximum input power: 450W. Impedance: 6 ohms nominal, 4 ohms minimum. Dimensions: 73" H by 31" W by 9" D (Base extends depth to 19"). HF range control, 3-step LF compensation (+3dB, 0, -3dB at 35Hz). Weight: 145 lbs. Price: \$5750/pair. MANUFACTURER: Sound Lab, 6451 Mountain View Drive, Park City, Utah 84060. Tel: (801) 649 0172.

The Sound Lab electrostatic loudspeakers are legendary. Many serious audiophiles have heard of them, and rumors of their existence abound in audio circles. But, like gnomes, UFOs, and poltergeists, Sound Lab loudspeakers are sufficiently hard to find that it is sometimes difficult to prove to skeptics that they exist at all. Well, I can now report that they *do*. As proof of this contention, I can point to the two which are actually occupying solid, tangible space in my listening room at this very moment. I have even taken a photo of them, which will be published along with this report if they leave any sort of an image on the film emulsion. (Many such apparitions do not!)

I have even met, face-to-face, and conversed with, a flesh-and-blood person who lays claim to being the designer of, and the president of the company which manufactures, the Sound Lab loudspeakers. His name is Roger West, and he too is real.

Seriously, though, for a company which has been making loudspeaker systems for almost eight years, Sound Lab maintains an extraordinarily low profile. It has never advertised anywhere, almost never submitted products for review to magazines,<sup>1</sup> nor has it exhibited at CES for quite some time now (though their speakers were being used by both Rowland Research and Klyne Audio Arts at this past CES in Chicago). As a result, probably only a few thousand people have even heard of the company, let alone heard its loudspeakers. (After this issue of *Stereophile* is published, 35,000 people will have heard of Sound Lab.)

Why such diffidence? Because Sound Lab sees itself as a small company, staffed by people who believe in the product and take pride in their workmanship, and the Wests would prefer that it stay that way. Actually, I don't blame them; that kind of business, today, is a rare throwback to the dark ages, when running a business was supposed more to be fun than to be profitable.

But Sound Lab's attitude toward the promotion of their products is so laid-back, it's a wonder they sell any loudspeakers at all. How come they're still in business, after

eight years of virtual obscurity? Roger attributes this to the incredible quality of his products, whose owners are allegedly so pleased that they voluntarily promote Sound Lab speakers among their friends. It's the old build-a-better-mousetrap idea, which seems to make great logical sense, but which has brought failure to almost every manufacturing concern that adopted it as a way of doing business. In my opinion, it is *not* the quality product that usually succeeds today, but the most flamboyantly hyped product. Roger West does not believe in hype, and as proof of his opposite view, he cites Sound Lab's eight years of longevity and continued, if sluggish, growth. After having lived with a pair of his A-3 speakers for several weeks now, and scanning my notes for the review I am about to write, I think he should be making some contingency plans to cope with a sudden increase in orders: this review is going to be a rave.

First, though, a brief description of the A-3. It is a full-range push-pull electrostatic with a curved (semi-cylindrical) diaphragm. Unlike another curved-panel electrostatic, the similarly-sized (and \$900-lower-priced) Martin Logan Monolith, whose low end crosses over to a 12-inch cone woofer at 100Hz, the Sound Lab A-3 is a true full-range electrostatic, spanning the entire audio band down to a claimed 32Hz without the use of a dynamic woofer. Also unlike the Monolith, the A-3's diaphragm is not freely suspended between its four edges to produce a continuous curved surface. Instead, it consists of a number of small, vertically rectangular flat panels, arranged in a 90° arc. Each panel measures about 4 inches wide, and they vary in height from 2-½ to 7 inches. The varying vertical dimension, and varying tensions on the Mylar film diaphragm, cause each radiating panel to resonate at a different frequency; careful choice of those resonant frequencies produces a controlled rise in overall response at low frequencies, which precisely (in theory, at least) compensates for the LF rolloff that normally occurs in a dipole system of this size. (This front/back cancellation effect has been described often enough in these pages that I won't go into it again here.)

<sup>1</sup> Sound Lab had a somewhat scarring experience with a review in *TAS* several years ago, the resultant drop in sales led to their extreme caution in seeking reviews. —LA

The A-3 is large enough to impress, but, with its nicely patina'd walnut trim (with mirror-imaged grain patterns for the skirt strip at the bottom front of each speaker) and curved, horizontally ribbed black grille cloth, too attractive to offend or intimidate. Each speaker weighs 145 lbs, but (thank Heaven!) is equipped with 5 castors, so the speakers are a snap to move around in order to tweak locations and orientation. (Just warn the cleaning lady not to roll them out of the way for vacuuming. Tell her you *want* to accumulate dust under your loudspeakers.)

The Sound Lab A-3 is rated at 88dB sensitivity (1W at 400Hz input, 1m from the speaker), but my sample pair didn't even come close to that figure. Assuming the manufacturer's 6-ohm impedance figure to be correct for midrange frequencies, 2.45 volts of input would be equivalent to 1 watt of power. I fed one speaker with a 400Hz  $\frac{1}{2}$ -octave warble tone at that level, and measured the output at 1m from the grille with a General Radio 1565-A SPL meter (tripod-mounted, 70° incident angle, 40-inch height, C-weighted, Fast). The reading was 76dB, 12dB below the rated efficiency figure! Thus, the 100-watt minimum recommended power is by no means an overstatement.

Unfortunately, the speakers would not, on low frequency test tones, handle even that much power without strain. With a warbled sinewave centered around 45Hz, both of my samples sounded as if they were starting to bottom out at a mere 94dB—with a measured input power of only 12 watts. On musical material, fortunately, rather than bass tones, there were no signs of audible stress until playback levels reached about 100dB (150W input power). This is just about the minimum volume needed to reproduce symphonic and operatic music at realistic levels, but it was barely adequate for clean reproduction of such very-wide-dynamic range recordings as the JVC Rozhdestvensky Shostakovich Symphony 15. In other words, the large (+ Series) Acoustat speakers are still the only ones I have found that can handle large amounts of mid-bass energy, let alone the below-40Hz stuff.

But what does the A-3 sound like when it

isn't being stressed? I would liken it to a superb tubed power amplifier. Though not altogether uncolored—no loudspeaker is—its colorations have a strong personal appeal. The sound is rather warm and rich through the low end, rather rotund and gutsy through the lower middle range, and soft and sweet through the high end. Through its entire range it has the incredible transparency and delicacy that I have only, to date, heard from wide-range electrostatics. It is, in short, my kind of loudspeaker.

Because of these predispositions, it does not do well with tubed power amps, including the best I've tried: the Audio Research D-250-11-Servo. With that amp, the A-3's low end is overly warm and loose, lacking in extreme bottom, and rather flabby through the midbass. And its highs, although gorgeously smooth, are a bit *too* sweet.

Of the power amps I have on hand—Conrad Johnson Premier Fives, the Electron Kinetics Eagle 2a, a Perreux 5150B, an Audio Research D-250-11-Servo, and a pair of Threshold SA-1s—the A-3s sound best with the Thresholds. The result is a bit short on infra-LF range and midbass impact, but is otherwise almost impossible to fault—at least on recordings of acoustical instruments. Highs with the SA-1 amplifiers are simply gorgeous: open and detailed, yet amazingly sweet, smooth and delicate—very much like what I hear at those live performances where some audiophiles bitch about lack of high end.

As longtime readers know, my priorities for judging reproduced sound are not exactly those of your average audio perfectionist. (Read JA's editorial in Vol.9 No.5 for a second opinion from another perfectionist.) I value middle-range accuracy above all else, tonal balance second, freedom from distortion third, frequency range fourth, and imaging and soundstaging last. This is why I so frequently disagree with some of my associates' equipment reports, and must remind myself periodically that, among audiophiles, I am viewed as somewhat of a heretic. The Sound Lab A-3s, however, are the first speakers I have heard in which all such considerations seem somehow irrelevant. They seem, to me anyway, to do *everything* right—if not perfectly right, then at least so right that I

almost feel foolish trying to find *anything* wrong.

How do I love these? Let me count the ways. First off, they do midrange the way Andersen does windows! Cellos have bite and a marvelously luminous glow, piano bass strings sound just like what they are—high-strung steel wires—and the large brass instruments have an authority and awesome power that I rarely hear outside of the concert hall. For this reason, the A-3 gives an illusion of dynamic range like few speakers systems I have heard. (And those few did not do other things nearly as well as the A-3s.) No instruments are favored over others: all sound very convincingly real. Massed violins are particularly good, having that exceedingly rare mix of sweetness and resinous bite that is the earmark of a truly great upper midrange and high end. Bass range is deeper than that of most available program material, being subjectively flat to around 35Hz in my listening room, but is a little shy of delineation impact when compared with the best I have heard. The only low end I have had in my house that was clearly superior in extension, impact and detail, was that from the Infinity RS-1B's bass towers, whose overall performance above the LF range is, I feel, far less detailed, transparent, and convincingly real than that of the A-3.

But what about imaging and soundstaging, one area where the RS-1B has remained unsurpassed to date? I've heard more breadth and depth in my listening room from some other systems—the RS-1Bs, for instance—than I get from the A-3s, but I have proven to my own satisfaction, via tapes that I mastered myself, that the Infinities in their previous out-in-the-room location<sup>2</sup> were *exaggerating* both spaciousness and depth to some extent. (Since the RS-1Bs were moved closer to the rear wall, both qualities are markedly diminished but are more literally accurate. But who gives a hoot about accuracy, when inaccuracy *sounds* better!) The A-3s, also positioned near the rear wall, produce about the same breadth and depth as the RS-1Bs, but with much greater transparency.

Imaging from the A-3s is spectacular! With a mono source, the "image" remains tightly bunched between the speakers, with no perceptible wander either with changes of pitch or lateral changes of listening position, and this translates into almost incredible image specificity and stability from stereo sources. This is, in fact, the first electrostatic system I have heard which allows me to move from end to end of my listening sofa to the other (a distance of about two meters) without the "stage" position shifting almost entirely to one speaker and becoming, essentially, monophonic. As you might surmise, there is virtually no vertical venetian-blind effect from the Sound Lab speakers.

The A-3s are the most perfect embodiment to date of my ideal loudspeaker system. Never in my life have I lived with a speaker that has brought, and continues to bring, as much pleasure, excitement, and satisfaction. In short, I am madly, passionately in love with their sound, and I hereby give notice to Roger West that he is going to have a hell of a hard time prying them loose from me.

Now that I've expressed my feelings about the A-3s, I must add that they are not going to appeal equally to everyone. They do not do well on rock material, lacking both the requisite tartness and aggressiveness to do justice to rock music, and can't produce the kind of sound pressure levels demanded by most rock listeners. And, as I mentioned previously, their soundstaging breadth and depth are not as spectacular, however accurate I feel they may be, as those of some other systems. But give these a clean, honestly miked recording of acoustical instruments, and the A-3s seem to vanish, providing as transparent a window on the music as any I have ever heard, with greater naturalness and tonal accuracy than any other.

Quite unlike the sound—a bit lean and (generally) a bit slow—of such state-of-the-art planar systems as Magnepans and Apogeos, the A-3s' sound is rich and extremely agile. (I have not heard the \$6600 Apogee system, but I assume that it now embodies the same improvements that have been incorporated into the Duetts, Scintillas, and the new Calipers. Nor have I yet

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<sup>2</sup> See Vol. 9 No. 4 p. 37.

heard the latest incarnation of the Martin Logan Monolith, which was received a couple of weeks ago.)

Mind you, I don't want to give the impression that the A-3s are worth buying. Of course, I believe they are well worth the money, shortcomings notwithstanding—and more, if you consider the fact that you can pay more for less quality than these have to offer. I shouldn't say that in print, however, because if I do, the demand for Sound Lab A-3s may mushroom, Sound Lab will have to expand in order to meet the demand, and it will no longer be the cozy little family-and-friends company that it has been ever since its inception.

I view that prospect with very mixed feelings. On the one hand, I sympathize with Mr. West in his desire to avoid the chaos that would result from a drastically increased demand for his speakers—the angry phone calls from frustrated would-be customers, dealer cancellations because of an impossible back-order situation, the disruptive move to larger quarters, the frantic search for additional capital that could not be paid back until all dealers had paid up, and so on. And what if *Stereophile* were to do what *TAS* has been known to do: follow a rave review with a complete *volte face* put-down in the next issue? Sound Lab could go the way other companies have gone as a result of such a shift in the wind: down the tube.

Then there is the fact that much of the A-3's success as a sound reproducer is due to the careful hand-tuning of its diaphragm resonances—a procedure that, to date, Mrs.

West has done herself because she has been unable to train anyone else to do it right. *Could* Sound Lab step up production of the A-3s without significant sacrifices in reliability and sample-to-sample consistency? (The fact that other manufacturers of dipole speakers have been able to develop instrumentation to replace individual judgment when tensioning diaphragms does not necessarily mean the same could be done with equal success for Sound Lab speakers. But I do wonder how hard the Wests have tried—if at all—to devise such instrumentation.)

On the other hand, I am compelled to tell *Stereophile* readers whose sonic tastes parallel my own that a pair of A-3s may just be the last loudspeaker system they will ever feel the need to buy. I have only heard one other system that did a better job than the A-3 of reproducing the illusion of real, live, unamplified music, and that was the Wilson Audio WAMM, which sells for roughly eight times the A-3's \$5750.

It's my feeling that a pair of A-3s belong in the system of anyone who enjoys the sound of a real live orchestra (or chorus or string quartet or opera or what have you) and can afford the purchase price. But in order to help Sound Labs remain the kind of company they are now and have expressed the hope of remaining, I shall conclude by saying that the A-3 is one of the worst speakers I have heard, that it's an unconscionable ripoff at the price, and that the Wests aren't going to get the review samples back without a fight. **S**

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## THE VANDERSTEEN MODEL 2C SPEAKER SYSTEM

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Anthony H. Cordesman

Three-way speaker system with acoustic coupler (passive radiator). Tweeter: 1" textile dome with ferrofluid cooling, covering 4.5kHz-30kHz range. Midrange: 4½" curvilinear polycone with ferrofluid cooling, covering 500Hz-4.5kHz range. Woofer: 8" curvilinear polycone with ferrofluid cooling, 1.5" two-layer voice-coil, covering 35Hz-500Hz range. Acoustic coupler





**Vandersteen Model 2C**

is 10" long fiber cone, and 28-35Hz range of operation. The crossover uses first-order networks with 6dB/octave slopes, low impedance air-core inductors, polycarbonate, polypropylene, and IAR Wonder Cap capacitors in the signal path. Nominal impedance: 7.8 ohms from 100Hz-20.125kHz with minimal impedance of 6 ohms. Frequency response: 28Hz-20.125kHz  $\pm 3$ dB by FFT step function, 32Hz-17.025kHz  $\pm 1.5$ dB. Dispersion: 29Hz-16.125kHz  $\pm 3$ dB at 90 degrees off-axis. Size: 36 $\frac{1}{2}$ " H by 16" W by 10 $\frac{1}{4}$ " D. Weight: 58 lbs each. Price: \$1125 per pair without stands, \$1200 with stands. MANUFACTURER: Vandersteen Audio, 116 West Fourth Street, Hanford, CA 93230. Tel: (209) 582-0324.

Whenever I think of cone speaker systems, I think of three brand names: Snell, Thiel, and Vandersteen. There are many good loudspeakers and many good designers and manufacturers, but it is these three who, in my opinion, consistently produce the best cone loudspeaker systems. All three companies produce full-range systems, trans-

parent systems, and systems which mate well with a wide range of equipment. Their systems can be owned and enjoyed for years. Long after some fad or special feature has given a competing designer brief notoriety, these are the products you turn back to for music.

The Vandersteen 2C is a case in point.

Unquestionably one of the best speaker systems around, it is, at \$1200 (with stands), highly affordable by today's standards. It also has remarkable accuracy and overall balance. Many complex systems costing over \$5000 are much more dramatic in given ways, but the Vandersteen 2C will, over extended periods of listening, provide all the information from a wide range of music in a balanced and natural form.

The 2C's technical features are provided in the specifications, but several points deserve special note:

The 2C does a better job of providing true deep bass than any other speaker I've encountered close to its price range. The 2C has the ability to produce a true 30Hz at low to moderate volumes with excellent control, whereas most speakers in this price range either give up well above 35Hz or end up with considerable boom.

The crossover is extremely smooth across the band. Many speakers claim to have advanced technology and components but still reveal at least minor problems. The Vandersteen 2C rivals electrostatics in its seamlessness and integration.

The speaker's radiation pattern is extremely well chosen. Imaging is excellent over a relatively wide listening area, but room interaction remains limited. There are no major shifts in imaging and soundstage as frequency rises—a chronic weakness in virtually all speaker designs.

Power handling is greatly improved over earlier models. This is not a "rock speaker" in the sense (or lack of it) that you can drive your ear drums far into your skull. Neither can you push the bass output to the level of a speaker three or four times its size; for that sort of game, you'll need the higher priced Vandersteen or a subwoofer. It will, however, handle orchestral peaks, loud jazz, and rock exceptionally well.

The Vandersteen 2C has a very flat impedance curve for so sophisticated a design. It should be an easy speaker to drive; it could even (Heaven forbid!) be used with your receiver as you claw your way up after the latest visit to bankruptcy court. In a world where more and more speaker manufacturers assume it is their God-given right to make you buy a new amplifier suited to

their particular speaker, Richard Vandersteen is willing to sell speakers that allow you to keep the rest of your system.

The Vandersteen is visually inconspicuous, and its stands raise it to just the right height for good listening without having to worry about most minor furniture interference effects. "Livability" is not a common characteristic in high-end loudspeakers—the 2C is a real exception.

The 2C is intended for biwiring, but can also be easily used with only a single speaker cable. Biwiring, however, is clearly beneficial: the bass is more dynamic and controlled, and crossover performance seems smoother. Even non-tweakers will notice the clearer treble and midrange, particularly at low levels or in complex passages, and dynamic transients also improve. I was particularly impressed with the Livewire BC-6 cables supplied for testing this aspect of the Vandersteen's performance—they almost seemed tailored to the speaker, and provided exceptionally well-integrated and musically convincing sound—although the same benefits emerge with Kimber, Monster, and Straight Wire.

The Vandersteen is the product of both considerable design expertise and considerable evolution. Vandersteen, one of the most respected speaker designers in the US, introduced his model 2 in 1977. One of the first speakers to minimize baffle area, pay careful attention to driver alignment, and use first-order crossovers, it has since benefited from extensive use of the Gen-Rad 2512 Fast Fourier Transform analyzer and the Heyser Time Delay Spectrometry system. The Vandersteen 2 started out with all the bells and whistles of its time; the 2C has been refined over six years by an outstanding designer who is also an excellent listener.

The result is an extraordinarily revealing speaker. It will show the effect of small system adjustments, but does not exaggerate their effect. It is a good speaker, for example, through which to listen to differences in wires and VTA/SRA. It is very revealing of the differences between a DC and an AC input on an amplifier like the PS Audio 200C. You can clearly hear the Audio Research SP-11 and D-250-II warm up. While such reviewer quirks may not interest you, they rarely

emerge with such clarity in other cone speakers. In fact, the Vandersteen 2C will give the Quad ESL-63 one hell of a good run for its money in terms of resolution and transparency.

The Vandersteen 2C has a slightly warmer balance and timbre than the Snells and Thiels, although you can come close to the latter by boosting the 2C's treble adjustment. (Calibrated rear controls adjust treble and midrange levels.) The extreme highs are a real delight. Electrostatics and ribbons may be faster, but no electrostatic or ribbon I have ever heard is as smooth and coherent in radiation and overall integration.

As mentioned before, the bass is exceptional: extended and very well controlled over the entire bass spectrum, though the relatively small cabinet size means that bass *power* is somewhat limited. Natural reproduction of true bass power still demands a big enclosure, regardless of all the hype regarding acoustic suspension woofers.

Anyone who is sick of the apparent leanness in most speakers' 80-500Hz region—an area critical to musical pleasure—can be confident that the 2C is a speaker with an exceptional lower midrange. It provides natural warmth without dulling the rest of the sound; frankly, it is a joy. This is the ideal speaker for woodwind and string players.

Also well handled is the difficult transition area between the upper midrange and highs. The Vandersteen 2C will please brass and percussion fanciers, and is an exceptionally pleasant speaker for tenor and soprano voice—not only because it does well with voice, but because it does so little to color the sound of the music around them. Even the average Pavarotti record is soothed somewhat—although few voices have been so wretchedly recorded.

Dynamics are also very good, although the Thiels and Quads do a slightly better job of handling low level dynamics. The Vandersteen 2Cs have been improved, however, to the point where they are now exceptionally good in handling moderately-loud to loud passages and can outperform the comparable Thiels and Snells—and virtually all full-range electrostatics—in this area.

This kind of performance really matters to most listeners. Most audiophiles have been

through the unpleasant experience of being struck by the "life" and "dynamics" of a speaker during a brief listening period in a showroom, only to find that these characteristics are missing after prolonged listening at home. No need to worry about the Vandersteen 2Cs. Their dynamic performance and musical life are consistent over the entire frequency spectrum and dynamic range: you won't find your speakers becoming "dull" or "constrained" as you get to know them.<sup>1</sup>

As for imaging, bipolar and line-source speakers do a better job of representing the entire soundstage, but this speaker is still superb in every other respect. The image is wide, tall, and stable without the blurring of detail and transients common in omnidirectional speakers. The centerfill and depth are excellent, width is very good, height is good, and imaging is stable and convincing. Overall, the Vandersteen 2Cs place you in the middle of the hall, let's say rows J-M. Both the Thiels and Snells tend to offer a more forward and immediate sound character.

How does it compare with other speakers? Well, I recommend audition of the new Apogee Calipers, the comparably priced Snells and Thiels, the Magnepan MGIIIas, the latest Acoustat 1 + 1s, and possibly the Martin-Logan CLS (if that latter speaker ever turns out to be consistent and reliable). I can't think of much else that's both sonically competitive and priced under \$2000. I know of no British cone speaker system that comes close at anywhere near the price. The Vandersteen 2C is embarrassingly good evidence that a competent designer can produce a full-range speaker with true deep bass at an affordable price—a quest that seems beyond the intellectual and emotional grasp of many of today's speaker designers.<sup>2</sup>

The Vandersteen 2C is a truly good speaker that will grace even the best high-end system. Best of all, you can buy it simply with the money saved by giving up your subscriptions to *The Absolute Sound* or *IAR* for two decades. **S**

<sup>1</sup> Would that marriage were like that!

—LA

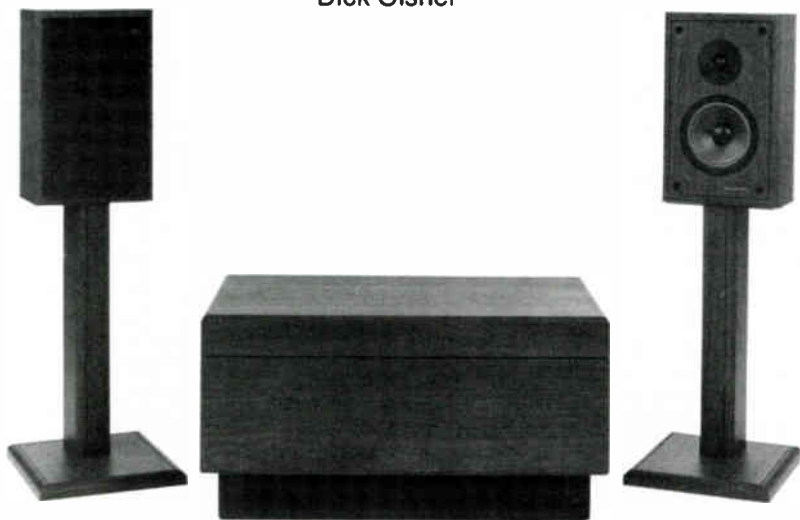
<sup>2</sup> Let me hasten to say that the much more expensive KEF R107 is a superb demonstration that British designers do recognize deep bass and can get it right. A short listening experience with the KEF R107s was very impressive indeed!

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# ACOUSTIC RESEARCH MODEL 19 LOUDSPEAKERS AND THE AR SUBWOOFER

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Dick Olsher



**Acoustic Research Model 19 Loudspeakers/Subwoofer**

**Model 19 specifications:** Type: Two-way acoustic suspension design. Drive units: 6½" polypropylene-filled woofer and 1" ferrofluid-cooled tweeter. Frequency response: -3dB points at 65Hz and 22kHz. Sensitivity: 88dB SPL for 2.83V RMS at 1m on cabinet axis. Impedance: 8 ohms nominal, 5.6 ohms minimum. Amplifier requirements: 75W maximum, minimum per channel. Dimensions: 16" by 10½" by 6¾" deep. Weight: 14.5 pounds per speaker. Price: \$320/pr.

**Subwoofer specifications:** Type: Floor-loaded acoustic suspension design. Drive units: Two 10" long-throw woofers operating in separate sub-enclosures. Low frequency response: -3dB at 31Hz with a Q of 0.9. Sensitivity: 87.5dB SPL for 2.83V at 1m. Impedance: 4 ohms nominal, 3.6 ohms minimum. Power requirements: 200W maximum, 15W minimum per channel. Dimensions: 30¾" by 18½" by 16¾" tall. Weight: 75.8 pounds. Price: \$500 w/o Module 1 crossover, \$600 with crossover. MANUFACTURER: Teledyne Acoustic Research, 330 Turnpike Street, Canton, MA 02021. Tel: (617) 821-2300.

It's been about 30 years since Edgar Villchur stood the audio industry on its ear with the acoustic suspension bass enclosure. Nowadays—in the post Small/Thiele era—when the art of closed and vented-box bass alignment has become as easy as operating a programmable calculator, it is difficult to appreciate what the all fuss was about. Extended bass from a small box, however, was a revelation at the time, and launched AR to

commercial success.

If you've just stepped out of a time capsule, you may appreciate the following brief description of the acoustic suspension principle—the rest of you may skip ahead. The first important point to realize is that the behavior of a woofer in an enclosure is fundamentally different from its behavior in free air. For one thing, the stiffness of the air trapped in the box raises the resonant fre-

quency of the system. For small boxes, the increase is significant—a factor of two to three—so that a woofer with a free-air resonance of 40Hz will exhibit an in-box resonance of, say, 80Hz—leading to poor bass performance. The norm, therefore, for closed-box design in the good old days was to use a very large box, with correspondingly minimal air stiffness compared to the woofer's suspension stiffness—the so-called "infinite baffle."

Villchur's breakthrough was the development of a woofer with a very floppy suspension (and therefore very low free-air resonance) whose LF resonant behavior was dominated by the air stiffness of the enclosure in which it was mounted; hence the name "acoustic" or "air" suspension. Properly tuned, the result was decent bass extension and control from a relatively small package.

Following the launch of their first "acoustic suspension" speaker, the AR-1, Acoustic Research became preeminent in the marketplace through the '50s and '60s. Many will fondly recall the AR-3a speaker, a true classic, that in its day was considered "best" by many commercial press reviewers. The AR edge dissipated somewhat in the '70s, but in recent years the company has fought its way back with such products as the Magic speaker, the rejuvenated AR turntable, and the Connoisseur series of loudspeakers, typified by the Model 19.

I auditioned the Model 19 atop the AR Model SW1 stands. These stands are designed for use with either the 19s or AR's Model 20s and consist of hollow wood pillars attached to 12" x 14" bases. The pillar may be filled with sand if desired. (My six-year old, Dahlia, was more than happy to take care of this particular chore. Thanks, Dahlia!) Rubber feet and spiked feet are both provided for use with the stand. The spiked feet are adjustable and work best on carpeting or wood floors; the rubber feet would be a better choice for a nonresilient surface such as stone or tile, where I feel spikes would merely chatter. Cosmetically, the stands match the Model 19s very well, but I don't consider them sonically the equal of a good metal stand of the QED or Chicago Speaker Stand variety. A pillar/base design just isn't

as stable as four-legged construction; in addition, the pillar has a large surface area and re-radiates vibrational energy coupled to it from the speaker. Sand-filling certainly helps alleviate the latter problem, but does not eliminate it.

As far as positioning is concerned, I ended up with the Model 19s about 8 feet from the back wall and 3 feet or so from the side walls. Imaging benefits from a slight toe-in of the speakers toward the listening position, but users should exercise care here, as excessive toe-in contorts the soundstage into the shape of a horseshoe, with the ends of the shoe at the speakers.

You don't have to be a golden-eared connoisseur of good sound (although it certainly doesn't hurt) to appreciate the virtues of the Model 19. This is by far the best budget speaker to have come my way. (And was I glad that it did so, having recently waded through a host of nasty little boxes.) This speaker is hard to criticize because it's so listenable (I didn't say *impossible* to criticize, as you will see in due course); there's nothing obviously irritating about the 19. Sure, the balance is a bit on the lean side, but it seems to do everything else one could ask a speaker to do pretty well.

Resolution of low-level detail and transparency of midrange information is good—quite remarkable, in fact, at the asking price. The treble is well behaved, with little apparent sizzle or grit through the upper octaves, but also without much air or spaciousness at the extreme treble. Midway into the listening tests, I removed the snap-on grilles and was quite surprised at the improvement. Treble quality and midrange transparency and focus improved. For example, my initial finding of a cupped-hand coloration, evident as a darkening of the middle and upper registers of female voice, was not as serious with the grilles removed.

Why should the grille make such a big difference, and not just in the treble? The culprit is probably the grille frame itself (the grille cloth appears to be reasonably transparent), which acts as a diffraction source for sound radiated along the plane of the front baffle. The remainder of the listening was conducted *sans* grilles.

I didn't expect any deep bass, so I wasn't



disappointed when I discovered it to be missing in action. The deep bass rolls off slowly below 70Hz, fairly typical for a speaker in the minimonitor class. The mid-bass is quite quick and reasonably well controlled, but not as tight and clean as the Celestion SL600—a speaker with a similar tonal balance. The AR 19 definitely puts out more mud than the SL600—but, then, the Celestion embarrasses a lot of speakers in its ability to retrieve mid-bass detail and, besides, it costs four times as much as the Model 19.

What bothered me most, however, was the lean character of the 19's lower mids, the so-called warmth region from about 100Hz to 300Hz. There's a broad suckout of several dB throughout this range. Its effect is to reduce the warmth of string tone and to lighten the body of a cello and double-bass. Piano bass also lacks sufficient "growl."

To some extent, such behavior is typical of all stand-mounted speakers, being an artefact of the room. Woofers radiate omnidirectionally in the lower octaves, so there are always floor reflections. These reflections interfere destructively and constructively with the direct woofer output, producing peaks and valleys in the response curve. For example, a reflection delayed by 2.7 feet to the listening position is exactly a half-wavelength out of phase at 200Hz with the direct acoustic output and will cause a cancellation at this frequency. Because first reflections in the lower mids are quite strong, the cancellations they cause can be serious. A series of such reflections will give rise to the broad dip noted in the warmth region. This predicament is addressed by designers like Roy Allison and the late Peter Snell, who put their woofers as close to the floor as possible. Also, line-source speakers (Acoustats, Infinity RS-1Bs, Beveridges) are much less affected than other types. Standard box speakers, mounted a normal distance from the floor, will almost always be afflicted with this problem, however.

The crossover point is specified by AR as 5kHz. I don't know any particulars about the crossover type or part quality. However, I did note some fuzz in the upper mids around the crossover point; the crossover could be partly to blame.

The Model 19 bass is aligned for a Q of 1.05 at resonance. "Q" describes the sharpness of the peak at resonance, and correlates with the transient behavior of the bass octaves. Alignments with a Q much above 1 yield peaky and loose bass. Many designers aim for a system Q around 0.7—maximally flat—or even for a slightly overdamped bass quality—the lower the Q, the higher the damping. The bass of the Model 19 may therefore be a bit too loose for some tastes. It certainly does not tolerate any further loosening of the bass octaves, of the kind attributable to tube amplifiers. Bass lines with my Michaelson & Austin TVA-10 amp were too vague, and a switch to the Boulder 500 improved matters greatly. A solid-state amp, with its good bass control, appears to be mandatory for use with this speaker.

High-powered and wide-range orchestral program material is no problem for the Model 19. The sound does not fall apart, and remains cohesive when pushed hard. The sense of dynamics and orchestral power is limited, of course, but it exceeds in this regard the performance of most small speakers, including the Celestion SL600. The SL600 can soak up power very well, and can consistently take the Boulder 500 to clipping, but beyond a certain volume level, it just does not seem to get any louder, no matter what the amp does. (And I don't listen that loud, guys—honest!)

The Model 19, then, though not a poor man's Infinity IRS, more than holds its own in the flyweight class. In my opinion, the Model 19, for a mere \$320/pair, outperforms all similarly priced budget speakers in *Stereophile's* Class D recommendations—including the Spectrum 108 and 208. Its long-term listenability is very good, and both resolution of low-level detail and midrange transparency compare favorably with speakers costing much more. The 19 is sufficiently flawed to keep it from Class C contention, but as of now, this is the budget speaker to own.

### The AR Subwoofer

AR's Subwoofer is ostensibly a mono design, but hides within its bowels two separate sub-enclosures, each housing its



own 10" woofer. The bass channel feed is true stereo, with each sub-enclosure handling only one channel, but this approach, though convenient and less expensive, sacrifices the placement flexibility of separate enclosures. The recommended crossover point is between 80Hz and 150Hz, and either an active or a passive two-way crossover may be used. AR provided me with a passive two-way crossover network, dubbed the Subwoofer Crossover Module 1, which is intended to match the Subwoofer to either the Model 19 or 20. The Module 1's crossover frequency is 80Hz, and both the high- and low-pass filter sections have second-order slopes with ultimate rolloff rates of 12dB/octave. The networks utilize electrolytic caps, non-inductive wire-wound, ceramic-core resistors, and high saturation ferrite inductors. I realize that at such low frequencies it is impractical to use film-type caps and air-core inductors exclusively, but I was hoping to at least see film-bypass caps used with the electrolytics. My impression is that this Module is intended as a starter crossover for people who have no desire to build their own passive networks, or who don't want to bother with the extra fuss and cost of biamping.

Personally, I prefer totally separate enclosures. Then I can position the woofer right next to the satellite, thereby creating, in effect, a time-aligned 3-way system. Such an arrangement has the added benefit of allowing a higher crossover frequency; say, 200Hz. There's a lot of music energy between 100 and 200Hz, and many minimonitors would be relieved to pass the buck in this range. (Crossing over a subwoofer positioned between the speakers, like the AR, at higher than 100Hz causes quite noticeable image problems; even with second-order crossovers, the woofers are radiating significant energy up at 500Hz, where a three- or four-foot horizontal driver displacement is very noticeable.)

Adding the Subwoofer to the system is easy enough. I positioned it midway between the Model 19s, on a line bisecting the two satellites. AR recommends 18-gauge stranded zip cord for runs up to 25 feet. I think we could all do better than that! I used

some old Kimber Kable for the runs from the crossover to the subwoofer. The accompanying instructions emphasize the importance of maintaining proper phase between the woofers and the main speakers. This is true, but all too often we presume that the drivers are properly wired to the binding posts with the correct polarity. There's an easy way to check this. All you need is a 1.5V battery and two short wires. Connect the positive battery terminal to the red post and the negative terminal to the black post and observe the woofer's direction of motion: it should move out or forward for correct polarity. If the woofer moves inward, its polarity has been reversed—probably accidentally, in the case of an add-on subwoofer, since reversed polarity in this case makes no sense. The AR Subwoofer passed this test with flying colors.

The Subwoofer is nicely finished, and blends cosmetically with the Connoisseur series. The woofers fire downward, the sound venting through slots along all four sides of the base. This type of design is referred to as floor-loaded, and provides smoother in-room bass response.

I liked the bass quality of the AR Subwoofer. It was not overly damped, and had sufficient quickness to work up to 200Hz. Near-field frequency response in my room was very smooth, with a half-power frequency (-3dB) a tad under 40Hz. The AR specification is 31Hz, and it may be that this difference is due to insufficient break-in of the woofers on my part. Bass impact was adequate, but far from frightening on explosive transients; after all, one can only expect so much from a single 10" woofer per side. With the AR crossover, the resolution of bass detail was just average for the price, there being a little too much mud overlying the lower octaves to suit my taste. The SL600, for example, while certainly lacking the AR's heft, extension, and impact, did uncover a wealth of bass detail glossed over by the AR Subwoofer.

## The System

With the Subwoofer and crossover module supporting the Model 19s, the mids appeared more relaxed and had better focus. However, the upper mids were more aggressive, with

the roughness around the crossover point more pronounced, as though the Subwoofer were highlighting the satellite's weak points. I don't think that the Subwoofer is to blame for this; it's more a question of the main speakers not being good enough building blocks for a high-cost system. At just under \$1K for the complete speaker system, it is no longer competitive with our Class C three-way recommendations. The sound is just not refined enough through the upper

mid and lower treble to compete, for example, with the Sendor SP1.

The best performer appears to be the Model 19 alone. Take it for what it is and enjoy it in the context of budget ancillary equipment. Although I did not have the time to try The Subwoofer with other speakers, I think it is worth pursuing with better satellites and a different crossover, probably in a biamped application. **S**

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## THE NEW YORK AUDIO LABORATORIES FUTTERMAN OTL-1 POWER AMPLIFIER

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Anthony H. Cordesman examines a Winning Difference between  
Glorious Folly and Wretched Excess

Four-chassis stereo output transformerless tubed amplifier. Nominal output: 150W into 16 ohms. Large-signal frequency response (-3dB down): 2Hz-40kHz. Small signal response: 1.4Hz-200kHz. Phase shift: 15 degrees at 10kHz and 45 degrees at 40kHz. Output impedance: 2 ohms at 10Hz, 0.15 ohms at 1kHz, and 0.3 ohms at 10kHz. Signal/noise ratio: 85dB unweighted, 92dB A-weighted. THD: less than 1% at full power from 100Hz-100kHz, dropping to less than 0.1% at lower levels. IM distortion: 1.2% at full power, dropping steadily at lower levels.

Price: \$12,000. MANUFACTURER: New York Audio Laboratories, 2 Westchester Plaza, Elmsford, NY 10523. Tel: 1-914-739-6267

Few people in the high end know the difference between glorious excess and wretched folly as well as Harvey Rosenberg. Harvey's audio equipment always strives towards the glorious folly of providing the most romantic sound possible with modern technology. This may explain why his relatively small company, New York Audio Laboratories, can build an amplifier like the Futterman OTL-1, which costs a glorious \$12,000 a stereo pair and actively competes for the title of best amplifier in the world.

At the same time, Harvey's prose always strives towards the most wretched excess possible with a modern word processor. In fact, one might almost suspect that Harvey deliberately writes prose designed to make people run out and listen to music on his equipment—if only to forget what they have just read in his advertising literature.

Fortunately, I am only an humble equipment reviewer and not a literary critic. I can

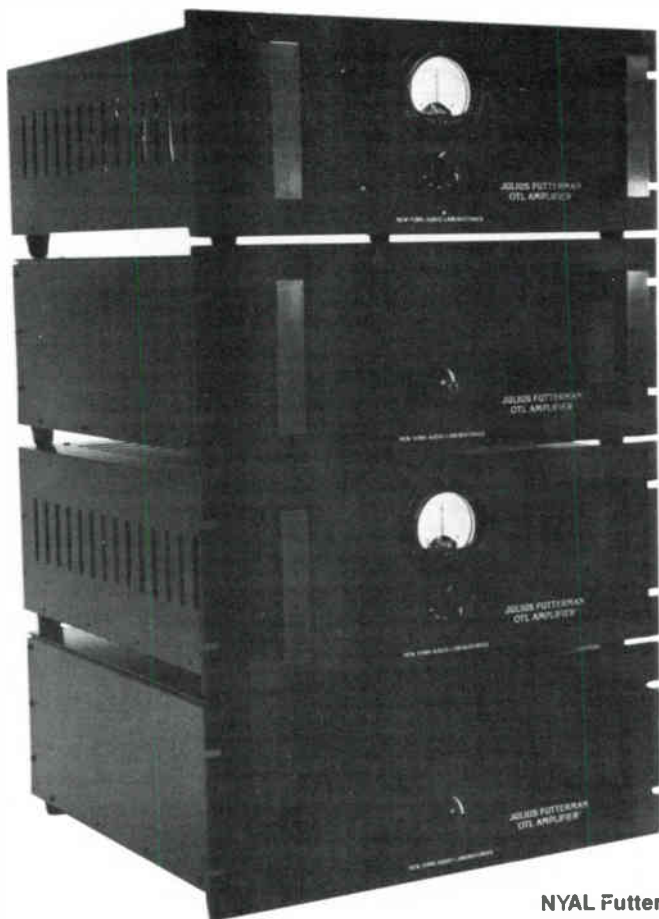
take advantage of the positive side of Harvey's character; his OTL-1 stereo power amplifier is so good that it even makes me forget his prose.

### The Technology

The Futterman OTL-1 is NYAL's attempt to build the best tube amplifier in the world.<sup>1</sup> Its designer has attempted to minimize the problems an output transformerless design

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<sup>1</sup> I exempt the Moscode Black Hole Power amplifier, which sells for \$267,000, and which is part of the Harvey Rosenberg "Wretched Excess Signature" series. The Black Hole is evidently New York Audio Laboratories' top-of-the-line amplifier, but has strictly limited distribution. I have listened extensively to the specifications of this design. While it is a bit pricey, no other amplifier I know of has quite the same styling or sound character. In this case the image is the sound! It is a unit you must hear for yourself, and I can assure you that any top audio dealer will instantly drop anything he is doing to spend hours auditioning this unit for you. For example, simply whispering "Harvey Rosenberg's Black Hole" in Mike Kaye's ear will produce fawning obeisance. One modification, however, is vital: a water tower is also needed on the left channel to balance the liquidity of the sound on the right.



NYAL Futterman OTL-1

encounters in coping with low impedance loads. The Futterman OTL-1 can provide 150W into a 16 ohm load, 65W into an 8 ohm load, and 35W into a 4 ohm load; it's effectively current-limited into loads below 16 ohms, but this is nevertheless an extraordinary amount of power for an OTL amplifier. Its ability to deliver the clarity of a transformerless amplifier into an unusually wide range of loads is enhanced by an extraordinarily large, regulated B+ power supply.

A regulated B+ power supply is unusual in any tube amplifier—the D-250, for example uses regulated supplies for the low-level stages and for the output screen grids but not the output plate supply—but is probably unique in an OTL design. It must be

able to handle both very high voltages and very high currents at the same time, dissipating up to 5000 watts. The OTL-1 supply is designed to provide 100% regulation from 2Hz-100kHz at full-power output.

The end result of all this power output capability and regulation is physically and acoustically impressive. The amplifier weighs 250 pounds and comes in four heavy rack-mountable 17½" by 18" chassis. It is styled using the kind of rugged industrial or laboratory quality meters, switch knobs, and heavy metal construction that was common in hand-built military test gear used during the 1950s ("Dr. Zharkov, we're going to crash!" "Don't worry, Flash, I know:").

The inside of each chassis is strictly 1980s,

though, filled with all the latest in active and passive components, and clean circuit boards and wiring layout; the construction standards are superb. Quite frankly, the kind of construction you find inside a Futterman OTL-1 makes the internal wiring of a product like the Jadis embarrassing. The Futterman exemplifies how high end equipment *should* be built.<sup>2</sup>

The NYAL Futterman OTL-1 measures up to its performance specifications, at least to the limited extent I can make such tests. It has an extremely fast rise time and an excellent squarewave response for a tube amplifier, and provides wide bandwidth up to full power. The signal/noise ratio is excellent, although I can't test much below 80dB.

I should also state that the Futterman OTL-1 amplifier proved exceptionally reliable. It came perfectly set up from the factory, worked right out of the box, and required almost no adjustment after very extended listening—which included use of a wide range of cables and speakers, and such reviewer mistakes as popping the odd interconnect out while the unit was playing. The OTL-1 is not a “hothouse” unit; you can have real fun with it and not worry about ongoing tube problems, shock, constant readjustment, etc.

## The Sound

The OTL-1 is probably the best amp available for the tube fanatic seeking the maximum possible emotional impact from recorded music. This does not mean that the OTL-1 is colored in any normal sense of the term. As I have already said, it measures very flat, and harmonic and intermodulation distortion are both exceptionally low for a tube amp. It reveals at least as much detail into compatible loads as any amplifier I have ever heard, and is so natural and convincing in overall sound characteristics that only a small handful of designs—the best Krells, the Conrad Johnson Premier Five, the Audio Research D-250-II Servo—are its rivals.

Nevertheless, use of the term “romantic”

is the only fair way to express this design's unique character. In fact, the Futterman OTL-1 qualifies for all the best buzz words used by reviewers in characterizing the romantic tube sound: “sweet,” “warm,” “transparent,” “dynamic,” and “musical” (in the best sense of the term).

This shows up on a wide range of music; brass has bite without bitterness; unlike many amplifiers that have high transparency, male and female solo voice have their full body and impact; strings retain their natural hardness without added hardness or loss of information; orchestral music has both natural power and convincing detail, even in soft passages; solo instruments never seem to be floating in limbo right next to the microphone to the extent common with most competing amplifiers.

The bass varies considerably with different loads, although the OTL-1 provides by far the most natural measured and apparent deep bass of any OTL design to date. With the right load, it is exceptionally fast and dynamic, without losing control. The Quad ESL-63 or Vandersteen owner is going to love this amplifier, as will owners of speakers which have fairly flat impedance characteristics greater than 4 ohms, especially if they are electrostatics and don't require biamping.

The lower midrange is strong and vibrant, with the punch and emphasis of the older concert and opera halls. The OTL-1 does not correct the evils of close miking so prevalent in the last couple of decades, but it certainly gets the best out of modern recordings. Its midrange provides the kind of conviction sadly missing in most modern power amplifiers precisely because it is transparent and dynamic, *without* attenuating the lower midrange. The OTL-1 is superior in this respect to any transistor amplifier I have heard, rivaling in this respect the Conrad Johnson Premier Five. It provides a flatter transition into the highs and bass than I've heard from the Jadis, and reveals what I regard as the one real weakness in the Audio Research D-250-II Servo: a slight recession of lower midrange power and dynamics.

While the highs are not quite up to the very best Audio Research designs, they are

<sup>2</sup> The OTL-1 comes, quite seriously, with a lifetime electrical and mechanical warranty. NYAL states (not so seriously) that this covers nuclear attack, and that the warranty can be extended into your next lifetime for \$50. (Readers may feel free to protest to *Consumer Reports*.)

slightly superior to those of the Conrad Johnson Premier Five, and far superior to the rolled-off highs of the Jadis designs. Nevertheless, the highs will not sound "flat" by the standards of most of the competition, because the OTL-1 provides the lower midrange and upper bass power and dynamics missing in virtually every amplifier. One has the feeling of natural treble attenuation that one gets from sitting in rows G-M of a good hall.

Everything you need to enjoy the music is there, but this is a balance chosen for someone who wants to get all the emotional impact of the music on most recordings, not every little bit of music available at the violinist's armpit. If you want the purity of OTL designs and a more forward and slightly "flatter" sound, look to the Counterpoint SA-4. The SA-4 does not have quite the bass extension, power, or dynamics of NYAL's OTL-1, but it is still a truly superb amplifier and a good benchmark if you want to find out what OTL designs can offer.

The OTL-1's soundstage is open, wide, airy, and live, with natural imaging, good centerfill, and excellent stability. It is, however, a bit load-dependent. This is particularly true of depth, which can range from good to superb, depending on the speaker. The competition is also load-sensitive in

terms of soundstage performance, but the OTL-1 is a little more load-sensitive than most. I advise consultation with your dealer, and close attention to cables and speaker placement, to get the best soundstage performance out of this unit. This is one case where careful listening and a little effort can pull you from the doldrums of the merely excellent to scale the heights of the superb.

In fact, the one reservation I have about this design is the fact that it requires even more careful demonstration and set-up, and even more attention to speaker and cable compatibility, than the few top-quality products with which it competes. I never found a cone speaker, an electrostatic, or Magnepanar design that the OTL-1 would not drive, but "drive" simply isn't good enough with an amplifier this good. You can't substitute a Ferrari for a Rolls.

Accordingly, if you are one of the few audiophiles who goes beyond literary voyeurism to deliberately buy the ultimate system, I'd suggest you both spend a lot of time talking to your dealer and to the folks at New York Audio Laboratories. The New York Audio Labs OTL-1 is a serious candidate for such a system, and this is the highest praise I can give. It is a very difficult unit to have to return, and extraordinarily easy to fall in love with.

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## NEW YORK AUDIO LABS 'SUPERIT' PHONO PREAMP

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George M. Graves



NYAL "Superit"

Tube/MOSFET hybrid phono preamp. Price: \$269. MANUFACTURER: New York Audio Labs, 2 Westchester Plaza, Elmsford, NY. Tel: 1-914-739-6267

Basically, I have to admit that I am a Valvophobe. I would give you the dictionary definition of that word, but it has been sealed in a mayonnaise jar on Funk and Wagnall's porch since. . . Anyway, you get the idea. A Valvophobe is someone who doesn't like tubes in their 1986 stereo systems.

Harvey Rosenberg, the not-unflamboyant President of New York Audio Labs (NYAL), recently sent me a curious little black box he is purveying. Christened with the unlikely name of "Superit," this device turned out to be a hybrid tube/MOSFET phono preamp. When I say phono preamp, I mean just that! It has inputs for a phono cartridge, line-level outputs on the back, and that's it! No switching facilities, no tape monitor, no high-level inputs, only a DIP switch, accessible from the back, which allows the user to match cartridge loading. There are two potentiometers on the front: Volume and Balance. There isn't even an on/off switch, the Superit being plugged into the wall by its combination power transformer/mains plug (as used by calculators) and left "on" all the time. Indeed, the instructions say that it *must* be left on for best performance, and that it won't really sound its best until it has been on for about a month. (It's true. The darn thing sounded better every time I listened to it for about 3-4 weeks. Then it "settled into the groove" and has not changed appreciably since.)

The internal construction is good, and the parts, while not of ARC calibre, are certainly not cheap. The power supply feeds well-regulated voltage both to the plate circuit of the tubes—three name-on-request 12AX7s, with no markings of any kind, not even tube numbers—and to the MOSFETs.

Why design a phono-only preamp, I hear you asking? Good question. Harvey says that it was designed to give owners of Japanese receivers and mid-fi preamps the taste of tubes. They can just plug the Superit into the auxiliary jacks on their receiver, preamp, or integrated amp, and bypass the cheap transistor phono stage sported by most equipment of this ilk. The improvement should be dramatic.

Well, I don't know about owners of cheap mid-fi gear. My guess is that most of them have abandoned phonograph records alto-

gether in favor of CD—or cassette! Where, then, do I think the Superit fits into the scheme of things? Why, it exists to ensure the conversion of valvophobes among the upper mid-fi and lower high-end audiophile community into valvophiles. For this task, the Superit is perfect.

Rather than use the Superit fed into the spare line-level input of my (transistor) preamp, I used it to drive my three-way crossover and power amps directly. The Superit readily lends itself to this arrangement. First, it has more than enough gain for the task (about 60dB), and the balance and volume controls make a main preamp redundant. Second, the MOSFET output stage means that the inputs of my passive crossover are essentially fed from the same kind of load as they would be from my transistor preamp. This would not be the case if the Superit were a tube-only design, even if used a cathode follower.

How does it sound? Just fine! The Superit has that elusive harmonic rightness said to characterize the best tube electronics. This is most noticeable at the top end, where the glaring hardness featured by many solid-state designs is most annoying. The Superit is smooth and sweet. Strings take on that special velvet-like sheen that says "This is real. This is what music sounds like." Brass instruments have the bite they have in the concert hall, and woodwinds have rarely sounded so mellow. The ability to do right by these instruments, the bulk of whose energy is in the midrange, will attest to any component's competence in this region.

The Superit's bass really surprised me—it is quite exceptional. Records had a firm, tight, well-articulate foundation that I have rarely heard before. Certainly my reference preamp (a semi-custom solid-state design) exhibits nowhere near the weight and control in the low bass that I find with the Superit.

On the debit side, I find that when compared with a live performance (or, for that matter, some correctly miked master tapes), the Superit seems to gloss over small details in the sound, almost as if to say "This bit is too difficult, I'll skip it." I must admit, however, that this characteristic has lessened over the weeks, to the point where it is now



only noticeable in direct comparison with master tapes or with my reference preamp. I might also add that the transistor glare that my reference unit contributes to the sound of records is now *much* more annoying than the Superit's slight sin of omission.

In the imaging department the Superit is a mixed bag. My reference is better at localizing instruments in space—although this aspect of the Superit's performance also improved dramatically during the "burn-in" period—but the Superit has a better-defined soundstage. The soundstage is wider, higher, and deeper than I have experienced before, stretching far beyond the edge of the speakers, yet with clearly delineated boundaries. There seems to be a little narrowing of width in the back, but this is a very minor quibble.

I also find that the Superit reproduces music with much more apparent dynamic range than does my reference. When the orchestra gets louder, it does so without any of the congestion that seems to plague many designs.

Another aspect of the NYAL preamp which surprised me was its signal/noise ratio. In days of old, tube preamps (especially their phono stages) hissed. Among other reasons, this was due to the nature of tubes. Being thermionic devices, they work by the heat-propelled movement of electrons

from cathode to plate. Such electron movement, by definition, involves the production of noise, so I was not expecting the quietness of the grave from the Superit. Wrong again! In spite of this preamp having some 20dB more gain than most solid-state preamps (60dB at 1kHz instead of the usual 40dB), it is dead quiet. Only by cranking the volume control full-up was I just barely able to discern hiss from the speakers. Pretty impressive performance from what I believed to be basically a dead technology.

The NYAL Superit is not perfect—but what is? It is a helluva lot better overall than many highly touted transistor designs. This is all the more astounding when you consider that it sells at a price more befitting a mid-fi phono cartridge than a high-end phono preamp. It does many things well and some things superbly. It is true to the sound of music, and would be a grand introduction for anybody to the attractions of tubes. Be forewarned, though: tubes are addictive!

Please remove my name from the roll of Valvophobes. But don't put me on the Valvophile list quite yet. Having tested the thermionic waters and found them agreeable, I am up for getting wet. I look forward to trying other NYAL products, or maybe a Conrad-Johnson. Who knows? **S**

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## TWO VIEWS OF PERFECTION?

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Anthony H. Cordesman & Steve Watkinson live with the SME Series V Tonearm



Specifications: Pivoted, dynamic balance tonearm with fiber-damped, tapered, straight magnesium arm-tube with a fixed headshell, optional viscous pivot damping, spring sidethrust correction, sliding base overhang adjustment, ballrace bearings. Effective mass: 10-11gm. Length (pivot to stylus): 233.15mm. (Pivot-to-spindle distance, 215.35mm (8½")); offset overhang, 23 degrees 38 minutes; overhang, 17.8mm ±9mm; tracking error, 0.012 degrees/mm maximum with 0 degrees error at 66.04mm and 120.9mm from the record center.) Cartridge balance range: 0-14gm. Vertical tracking force: 0-3gm., adjustable to 0.15gm. (tracking weight can be set using both counterweight and an adjustable spring). Net weight: 720gm. Internal wiring: silver Litz. Phono cable: monocrystal silver. Mounting: standard SME tonearm hole. Price: \$1750. MANUFACTURER: SME Ltd., Steyning, Sussex BN4 3GY, England. Importer: Sumiko Inc., PO Box 5046, Berkeley, California 94705. Tel: (415) 843-4500.

### Steve Watkinson opens . . .

Once upon a time, SME made "the best tonearm in the world." That claim may have been justifiable through the '60s and early '70s, but then something happened—SME failed to keep pace with their competition in coping with the increasing popularity of low- to medium-compliance, highish-mass, moving-coil cartridges. I had just about written SME off as a serious high-end company when, at the 1984 Summer CES, I saw the first prototype of the Series V. It wasn't being played, there was no way to tell how it sounded, but it certainly looked the business. Delays due, among other things, to problems in finding subcontractors who could carry out work to the desired degree of quality—SME's Alastair Robertson-Aikman will not release a product until he feels that it is right—meant that it took almost two years for that arm to hit the market. However, SME is now back—with a vengeance! I believe that, once again, it is fair to say that SME makes "the best tonearm in the world."

### The Technology

To call the Series V a good-looking tonearm is something of an understatement. It not only looks good, it looks *right*. The arm-tube and headshell are pressure-diecast in one piece, magnesium alloy being chosen because of its very high stiffness-to-weight ratio and its suitability for diecasting. Diecasting produces an alloy both very homogeneous and highly amorphous. More conventional metals—such as titanium, which cannot be diecast, or aluminum, which can be diecast but is normally machined from a block—have far more crystalline structures and higher Q reso-

nances (the material has less inherent damping). The arm-tube itself tapers radically from pivot to headshell, lowering its contribution to the effective mass—or alternatively allowing rigidity/stiffness to be increased for a given effective mass—and again lowering the Q of its resonant behavior.

The counterweight is very close to the pivot point (again minimizing the effective mass), and hangs down from the rear of the arm-tube, placing the center of gravity in the horizontal plane, at the surface of the record. In addition, the hanging design (also employed on the Eminent Technology Type II) avoids the concentric reflection of vibrations back into the arm-tube, which can be a problem with conventional counterweights. A thumbscrew moves the counterweight on a track to allow the arm to be balanced, a lever then locking the weight in place. In lieu of the traditional headshell slots, there are only two holes to take the supplied Allen-head mounting screws. Rather than having to move and twist the cartridge in the headshell to minimize the lateral tracking error, the entire arm assembly is moved on a track.

While this would seem to reduce the effectiveness of the coupling between arm and armboard, SME asserts that the design causes locking force to be shared equally between the pillar and track assembly, "effectively locking the components into a single unit." I must say that I heard no imperfections in the sound that could be attributed to a poor arm/armboard interface. The VTA/SRA can be adjusted while playing by means of a threaded shaft. The fittings are internally spring-loaded, so that adjustments can be made without the need

constantly to loosen and tighten set screws. Only when the desired settings are finally obtained is it necessary to lock the set screws. The Series V makes no provision for adjusting azimuth, the manufacturer claiming that this could not be incorporated into the design without sacrificing rigidity.

I found the Series V to be one of the easiest arms to set up I've ever encountered, ergonomic considerations having been very well thought out. The arm has a solid feel; though I didn't try it, I had the sense that had I inadvertently dropped the arm into the bathtub, it still would have worked fine after drying out.

## The Sound

I pitted the SME Series V against a group of arms widely recognized as among the more serious contenders for the title of "Best Pick-up Arm in the World," including the Eminent Technology Type II, the recently discontinued Sumiko MDC 800 ("The Arm"), and the latest revision of the Alphason. Testing was done with a SOTA vacuum turntable (Mark II model), as well as a standard SOTA 'table to insure that any differences heard were not attributable to better compatibility with the vacuum clamping system. The acrylic Supermat and SOTA reflex clamp were used on both 'tables. A wide range of different cartridges, including the Virtuoso DTi, Monster Alpha 1, and Kiseki Purple Heart Sapphire, were employed to confirm that results were not cartridge-dependent. All arms were used on both 'tables and with all cartridges.

There was not a lot to criticize with any of these arms, but it didn't take long to hear the difference made by the Series V. In comparison with the other arms, the Series V's sound could only be described as unique. Let me first give my impressions of the three arms used for comparison.

The British Alphason, made from titanium alloy, is S-shaped with an integral headshell. Its looks are rather plain, but the workmanship is first-rate. In sound quality the Alphason is my least favorite of the three arms. It has excellent bass, and takes a lot of detail off the record, but, even with the recently improved internal damping of the arm-tube, there are noticeable resonances,

particularly in the upper midrange and lower treble. This gives the Alphason a bright, juicy sound with a slight sense of false detail—which some audiophiles prefer.

The Sumiko MDC 800 ("The Arm"), though now discontinued, has become something of a modern classic. Handmade in the state of Washington, it is an exquisite example of the machinist's craft. The Arm was fabricated from machined aluminum, and pressure-fitted by hand to avoid the introduction of a different material at the mechanical interfaces. The bearing assembly is the best I have ever seen in a tonearm. The Arm has incredible bass, and takes even more information off the record than the Alphason, but it, too, has noticeable resonances above 1kHz. Though not as severe as with the Alphason, these resonances still lead to a general loss of HF detail.

Prior to the introduction of the Series V, the Eminent Technology II was, in my opinion, the best arm on the market in terms of overall sound quality. Though the ET doesn't pick up quite as much detail as the Alphason or The Arm, it has a better tonal balance than the former and fewer resonance problems than either. The ET also has outstanding high-frequency performance, with exceptional accuracy and extension. The ET does have a slight lower-treble prominence, which can result in a mild glare on some recordings, but it is far less extreme in this regard than the Alphason. The soundstage it produces is very spacious and quite stable.

There are, however, weaknesses with the ET. The bass is flabby, with a slightly bloated midbass and a weak (and definitely rolled-off) bottom octave. It also has a general air of futziness that requires true dedication to sound quality (as well as a great deal of patience) to forgive. The ET's propensity for going out of adjustment is unmatched by any arm I've ever encountered. This problem is vehemently denied by many ET aficionados, and I suspect the problem may be to some extent sample-dependent. Despite its flaws, however, the ET seems like a bargain at \$800; despite the Series V's somewhat superior performance, I consider the ET the most cost-effective high-end arm on the market.

As I said above, the sound of the Series V is unique, its most distinguishing feature being its lack of resonances. Compared with the Series V, resonances in other arms which had seemed reasonably well-controlled suddenly become intolerable. The word "neutral" is thrown around a lot in the hi-fi press—it often means "a component with no gross colorations"—but even minor aberrations can produce colorations readily noticeable when compared with truly neutral sound reproduction. After listening to the Series V, I am convinced that tonearm resonances are responsible for much of what gives records that distinctive vinyl sound. The Series V is startlingly neutral, endowing LP sound with many of the characteristics of good reel-to-reel tape, or with the better attributes of CD. There is a solidity to the sound that I've not heard with any other arm. This results in a far greater sense of the physical presence of performers in the listening room, and adds body to the music *without* adding coloration.

Since tonearm resonances are most noticeable in the upper midrange or lower treble region, they can produce a brightness or glare which, even if minor, grates on the nerves after extended listening and—because of the ear's greater sensitivity in this region—limits the volume level at which one can listen comfortably. With the Series V, I found myself able to listen at higher average volume levels, despite the fact that the Series V seemed to have a greater dynamic range than the other arms.

I suspect the absence of resonances is also a factor in the SME's outstanding harmonic and tonal accuracy. It comes closer to getting the notes—and the relationships between them—right than any arm I've heard. The harmonic accuracy of the Series V is most apparent on woodwinds, particularly on solo passages where an instrument runs up or down a scale. With the Virtuoso DTi cartridge (reviewed in Vol.9 No.4), which is also outstanding in this respect, the results are little short of amazing.

In terms of the absolute level of detail the Series V can pull off the record surface, it is not noticeably superior to The Arm or the Alphason in the midrange, but the absence

of resonances results in a much cleaner sound, and a greater sense of detail. The Series V is considerably better than the Alphason or The Arm in retrieval of HF detail, coming very close, in fact, to the ET, and having a better tonal balance in the top octaves. The soundstage and imaging are good, but not vastly superior to that of any of the other arms used for comparison. The Series V does produce an exceptionally wide soundstage matched only by the ET, but the soundstage is not quite as deep as The Arm's. The image is very stable, and the instruments are well separated and properly placed on the soundstage. Speaker placement is very critical; unless the speakers are precisely aligned, there is some tendency toward "hole in the middle" effect, a problem shared with the ET or, in fact, with any component that throws a very wide image.

The bass on the Series V is so tight you can crack an egg on it, but it's a bit lean in the lower midbass region when compared with most arms. Whether the SME's bass balance sounds right or not is largely system-dependent, determined by the bass response and rolloff characteristics of your speakers. With speakers that rolloff noticeably below 40Hz, the SME's bass sounds slightly thin and lacking in drive, though it does retain the tightness referred to above. The Series V reproduces the octave below 32Hz with a power and authority matched only by a good CD player, especially evident when heard through subwoofers. On a system capable of accurate reproduction in the low bass, the Series V sounds right. It can walk a bass line like nothing you've heard short of live music, and the distinction and separation of different instruments in the bass, particularly the distinction between synthesized and natural bass percussion, is a major improvement over any arm I've heard.

The one major disadvantage of the Series V is its price. At \$1750 it is not the most expensive tonearm on the market, but still out of reach of most audiophiles. The best rarely comes cheap, however, and the quality of both sound and construction justify the price tag.<sup>1</sup> While the Series V may not be

<sup>1</sup> Unlike many audiophile components made in the UK, the importer does not seem to be sticking it to American

perfect, it represents the state-of-the-art in tonearms, defining a standard against which all comers will be judged for some time. It is a sufficient improvement over the competition that I recommend any audiophile seriously striving for the best possible sound reproduction to consider upgrading to the Series V—regardless of what arm he now owns.

### **. . . and Anthony H. Cordesman closes**

I get quite a number of excellent products to review, but I only want to steal a few of them. This list, naturally enough, includes those items where performance has been the design goal regardless of price, or which have superb performance but also some minor quirk that limit their value as references to a reviewer! It is, in many ways, an honor roll of the high-end, including such items as the Koetsu Signature Red, Audio Research SP-11, New York Audio Laboratories OTL-1, Apogee Scintilla, and so on.

### **Technology Worth Stealing**

The SME Series V tonearm joined this list of equipment worth stealing within hours of being mounted on my turntable. The very idea of a \$1750 tonearm leads to considerable culture shock, even in this hardened reviewer, and I would dearly love to say it isn't worth the money. Unfortunately, I can't. There is one annoying design problem, but the SME Series V is simply too good. Accordingly, I am forced to adopt the Abbie Hoffman school of reviewing: few may be able to pay this much for a tonearm, but the SME

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customers. (Perhaps this magazine's prior criticism of price gouging on UK imports is having some effect.) At current exchange rates, the price of the Series V in the US is only about 10% higher than in the UK. Even with the VAT saving on export, custom duties, freight, and insurance probably would put the final price of a privately imported Series V about even with the cost of one brought in by the authorized importer. In view of the potential need to return the arm to England should servicing be required, there's no reason to buy from other than an authorized US dealer.

I remember that a reviewer needs extremely broad compatibility in his reference electronics, long term reliability and consistency without change in sound character or tweaking, the ability to quickly move components in and out, the ability to move speakers in and out, and wide-ranging freedom from technical limits that degrade the sound. Consumers have far more freedom in creating a top quality system. All they have to do is listen to music!

Series V is definitely good enough to steal!

More seriously, the Series V is a superb reference tonearm. It provides virtually every adjustment the audiophile needs, its medium mass is well chosen for most of today's best cartridges, and its variable damping feature allows good performance with even the few cartridges having compliances over 18cu. Most high-end audio products are packaged as if they have somehow escaped from Igor's basement, along with the spare parts for Dr. Frank's latest monster. The SME Series V looks like it had been packaged and shipped by Tiffany's.

It is almost an insult to the manufacturer to say that the bearings appeared superbly made, with just the right amount of freedom from play. In a world where far too many products are half-finished or have obvious quality-control problems, the SME Series V has a finish and overall standard of machining and manufacture which set a new standard for the industry—certainly a new standard for tonearms. All the proper adjustment tools and gauges are provided and—for once—the tonearm cable is really excellent!

### **Technical and Ergonomic Quibbles and Nitpicks**

The arm is so flexible in use that I should probably focus on its few limitations, rather than spend several pages describing its merits. Just assume that where I don't complain, the SME Series V deserves nothing but praise.

This is a medium-mass arm, unsuitable for ultra-high compliance cartridges unless careful attention is paid to damping. Check with Sumiko or SME if you use a cartridge with a compliance over 18cu.

The V can bring the rear of the tapered arm-tube a bit too close to the record with some cartridges and turntables, and can foul on warped records. This problem is not uncommon, and is probably the arm's one really serious design fault. You should check carefully with your cartridge and turntable on a mildly warped record to be sure that the SME V will be compatible. This limited arm clearance at the rear, as the arm moves towards the inner grooves, could mean that the arm will cause prob-



lems with some future cartridge or turntable of yours. You can solve the problem in part by putting washers under the arm base, or shims between cartridge body and headshell—clamping down like hell in either case—but that does kind of destroy the whole concept of rigidity around which the SME has been designed. Hopefully, the manufacturer or importer will announce a magic solution . . .

The wires and cables are a little short: about 0.5" more length is needed in the headshell leads to accommodate the Clearaudio cartridge, and another 0.5m in the tonearm cable would be desirable in many installations.

The mounting hole is the standard SME mounting hole, but a few turntables, the Linn for example, require some attention to the woodwork for the cable to clear without fouling. The tonearm cable must be carefully looped to free the suspension in those turntables that are cable-sensitive.

The VTA/SRA adjustment is essentially a one-way adjustment if you adjust while playing, and is not as precisely calibrated as I'd like.

Azimuth adjustment is impossible, except by using shims. This is a significant shortfall, since proper alignment of the cartridge cannot be achieved with many cartridges and tonearm mounting boards without adjustment of tonearm azimuth; even a 5° error can be significant in terms of separation and upper octave performance. But the name of the game is rigidity, and I see no way to provide azimuth adjustment without giving up a level of rigidity which probably has no equal.

The use of an adjustable base to set overhang makes it impossible to twist the cartridge to optimize tangency of the stylus to the groove. A fair number of van den Hul, line contact, and MR styli come slightly misaligned with the cantilever. This, however, is a laboratory exercise to check; most users will find the inability to introduce errors to a properly aligned stylus to be a major advantage, this feature improving performance over arms which permit play in mounting the cartridge.

If this list seems a bit overwhelming, remember that most fixed headshell

pivoting arms also don't provide VTA/SRA adjustment, azimuth adjustment, or flexible overhang adjustment. The Syrix is the only high quality competition with adjustments in all these areas, but it is not the sonic equal of the SME Series V; nor can the VTA/SRA be adjusted during play.

I should also stress that the SME does what it does with more grace and precision than any tonearm I know of. I could, for example, fool around with overhang while the tonearm was playing; it was fascinating to listen to the effects. Even minor VTA adjustment quickly allows you to tune in the right setting by ear, and no tonearm I have ever used has coped so well with mildly warped records. More important, this is the arm for audiophiles who don't want to tweak, but who do want absolute reliability and consistency. This is a Rolls Royce product: completely hassle-free.

### Overall Sound Quality

I must stress that my findings are preliminary; I want to make much more extended comparisons with other arms, using a wide range of turntables. However, I can already say that no pivoting arm I know of is a full rival, the SME Series V simply redefining the state of the art in terms of transparency, detail, and control. It is amazing to see how many "exciting" colorations and resonances in other tonearms disappear with the Series V.

The initial impression is of a slight loss of life and excitement, but only until one really starts to listen. Then, the SME Series V emerges as the arm which sounds musically natural, accurate, and introduces the fewest surprises or question marks. You begin to recognize how much of the musical "life" from moving-coils played on lesser arms simply isn't real, and how important *control* is in sustaining the natural enjoyment of music. A significant part of the forward or bright sound of many passages turns into more natural depth, imaging, and timbre.

The SME Series V also defines the state of the art in the bass. It has more control, more extension, more frequency resolution, and more *true* bass than any tonearm around. This is as close to true concert-hall bass as I've ever heard with analog records; in this



regard the SME Series V clearly outperforms Sumiko's The Arm and some of the classic high-mass Japanese arms. Not only is the SME unequalled in the bass, it clearly outclasses the Alphason, Syrinx, and Zeta in overall sound quality, consistently providing more convincing detail than these three leading contenders. If you want reference quality in a pivoting arm, the SME is Class A in a world where even the nearest competition is Class B.

Where the SME Series V does have competition—from a few of the very best straight-line-tracking arms—is in the mid-range and highs. It has no peer in handling low-to-moderate compliance cartridges, although I cannot rule out the possibility that relatively low-mass pivoting arms, like the Alphason or Well-Tempered arms, would work better with high-compliance cartridges if you encounter problems with the Series V's damping provisions.<sup>2</sup>

### Some Initial Comparisons

The three straight-line arms I see as competition are the Goldmund T-3F, Eminent Technology Two, and Souther Triquartz.<sup>3</sup> The Goldmund T-3F has good bass, outperforming the Eminent Technology Two and Souther Triquartz in this area, although I have never heard it equal the SME. It can sometimes provide more inner detail than the SME Series V, particularly in quiet passages, but the SME generally rivals the Goldmund's extraordinary strength: removing the noise from the record to reveal the music.

Both arms are excellent in terms of the feeling of musical life and excitement. The Goldmund sounds more alive and dynamic, the SME Series V more realistic and natural. Even Goldmund owners will admit that their arms are more variable than the pivoting kind, varying slightly in sound quality with the phases of sun, moon, and local power company. In balance, the SME Series V emerges with the same superb control and silencing of external noise and col-

oration, and more consistent resolution. This, not excitement, is the state of the art in tonearms.

The Eminent Technology and Souther Triquartz are not rivals in the bass and lower midrange to either the SME or the Goldmund, having only good, rather than excellent, bass, regardless of the cartridge used. Both, however, allow very precise adjustment of azimuth; to my ears, this is more important than precise adjustment of overhang, and as important as proper adjustment of VTA/SRA. When properly set up, both also offer a kind of detailing and life which seems extraordinarily realistic.

The SME Series V also always seemed more natural playing orchestral or concert hall music than the Eminent Technology Two or the Souther Triquartz, which, with the optimal cartridges, are slightly more forward in hall position, have slightly more air, and are slightly more dynamic. (Although all three straight-line-tracking arms sound different in small ways, they are remarkably alike from about 100Hz up, in terms of overall sound.) The SME gave a natural listening-position character to the timbre, dynamics, transients, imaging, and depth, while the Eminent Technology and Souther Triquartz seemed to move the listener a bit closer to the performance, slightly elevate the midrange and highs, and add detail and life at the expense of naturalness and sweetness. With chamber music, jazz, solo instruments and voice, however, I kept hearing small differences that simply did not lead me to a clear preference. The Eminent Technology Two also has a special ability to extract musically convincing detail in the mid and upper octaves with low-to-moderate compliance cartridges that makes it a seductive rival to the SME.

In balance, I came to prefer the SME Series V in terms of overall integration of musical dynamics and timbre. Its superb bass and lower midrange kept providing the added degree of natural warmth that I hear in live music, but rarely in home systems. The Series V gave strings, male voice, and woodwinds a special natural quality.

I slightly preferred the Eminent Technology, however, in terms of ultimate resolution of both the top octaves and imaging

<sup>2</sup> Which I did not encounter, even with an old ADC-10EII and an experimental moving-coil with a compliance over 25cu.

<sup>3</sup> I have not heard a Goldmund T-5 that approaches the sound quality of the SME Series V, Goldmund T-3F, Eminent Technology Two, or the Souther Triquartz

placement, although the SME Series V was perhaps just slightly superior in depth, and slightly more stable in imaging and center-fill, at the expense of soundstage width. The Souther had similar merits, though it was not as stable or consistent in the details of imaging as the Eminent Technology.

As for cartridge compatibility, the SME Series V gradually emerged as superior. It handled virtually all moving-coils without any damping, although, curiously, it generally sounded better with half the tracking force applied by the counterweight rather than by the spring adjustment. The relatively high horizontal mass of the Eminent Technology Two is not much of a problem with most cartridges, since once the mass starts to move at the start of the record, it keeps moving at a constant rate on any decently centered record.<sup>4</sup> However, the Eminent is still not the arm for the highest-compliance cartridges. The Souther will deal with any moderate-to-high compliance cartridge, but is not the arm for really high-mass, low-compliance, cartridges, or the bigger Kisekis and Koetsus.



### SME Series V

Oddly enough, the one thing I never heard was any difference between the pivoting and straight-line arms in terms of inner groove coloration, even at the point

of maximum tracking error in the SME. I cannot say that such overhang error is not audible, but I didn't hear it. I would not, therefore, buy a straight-line arm on the grounds that it somehow has superior geometry. In fact, normal parallax and mechanical set-up error may introduce at least as much tracking error with the Eminent Technology and Souther over the entire record as the SME Series V set up with the Dennessen protractor.

This ability to equal the best straight-line tonearms on their home turf is a powerful argument for the sheer simplicity of the SME. The Eminent Technology and Souther now have excellent set-up and adjustment instructions, but they are demanding products and require tweaking. I am sure that many audiophiles with \$1750 in loose change may just love to spend hours at such tweaking, but a few may be as lazy as I am. This is the arm for audiophiles who want an arm that can be set up quickly and easily—and then stays set-up.

### Is it Really the World's Best?

I cannot say that the SME Series V is the world's best tonearm in every respect. I also feel that something needs to be done in a hurry about raising the rear of the arm-tube to clear warped records, as well as enabling it to work with all turntables.

I *can* say, however, that the SME Series V is the world's best tonearm in terms of bass response, and is a contender in every other respect. It has already taught me a great deal about what cartridges, turntables, and records are capable of, and if you enjoy live music, you may well find that no other arms is more consistently capable of giving you the natural enjoyment and beauty available from the very best recordings.

I still feel there is more to be learned from comparing the Series V with the Eminent Technology and Souther. Moreover, there is a definite difference between paying \$1750 for the SME Series V and paying less than \$1000 for the Eminent Technology or Souther Triquartz. Nevertheless, I can't think of a safer purchase than the SME Series V, and I will let you know whether I fall so much in love with the arm that I actually steal it!

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<sup>4</sup> Therein lies the rub!

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# TWO MOVING-COIL CARTRIDGES, THE ORTOFON MC-20 SUPER AND VAN DEN HUL MC-10

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Anthony H. Cordesman

One of the many problems with adding a CD player to your system is determining how to blend it in with your phono section. With very few exceptions, popular high-end cartridges produce different timbres, dynamics, and other sound characteristics from any other sound source. A high-end audiophile will probably have tailored his entire system around a given phono system. In practice, this means that cartridge, preamp, and speaker were chosen to produce a synergistic mix of colorations, with interconnects and speaker cables tweaked accordingly.

The chances are that such an audiophile will accept an imbalance in sound character when switching to tuner or tape deck, not caring too much because he neither listens much to those sources nor listens demandingly. While the tape recordings he made of his records probably produced significant shifts in timbre and dynamics, unless he seriously archives his records on tape he probably doesn't care.

As compact discs get better, however, they require as much concentration and listening effort as records. They cannot be treated simply as background music, and are far less forgiving than FM. Unlike most tape recordings, the highs on CD are both present and flat, revealing all the problems of the close miking now chronic in the recording industry. CD also introduces upper octave problems of its own.

If you use a Koetsu Signature Red, with its slightly overblown deep bass, warm mid-range, forgiving highs, and glorious musicality—and you have tuned your system around it—you are going to encounter problems when playing CDs. Most CD players are going to sound hard, with the more mediocre players sounding so much so that they become actively unpleasant. Ironically, if you've opted for one of the many moving-

coils with a rising high-end, and tuned your system accordingly, the shift back to CD may introduce a different kind of fatigue. The cartridge will usually have a peak or resonant effect in the highs that makes the music "exciting," with an altered transient response in the upper octaves. Once you get used to such a cartridge, CD will seem a bit "hard" and "flat" by comparison—although that same flat sound will be found on the master tape; it is the cartridge which is colored and exciting.

This is why serious CD lovers should consider choosing cartridges with flat tonal balance and upper octave dynamics similar to CD. You can live with some differences in sound character between your cartridge and CD player, but you should at least consider the fact that tuning your system around cartridges similar to CD sound may increase your ability to get the best out of the two leading recorded media. It may also make both seem more musically convincing.

The Ortofon MC-20 Super and the van den Hul MC-10 moving-coil cartridges provide you with this option to an unusual degree. At the same time, both are excellent cartridges by any standard, although the van den Hul is excellent to a truly world-class degree. Even if you hate CD with a passion, these are both excellent high-end products; they may even wean you away from the Dionysian rites of the Koetsu and Kiseki to a more Apollonian sound.<sup>1</sup>

## Ortofon MC-20 Super: \$350

The Ortofon MC-20 Super bears a considerable resemblance to Ortofon's superb MC-

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<sup>1</sup>JA & JGH: I am talking about the difference between loving Stravinsky and loving Mozart. LA: I am talking about the difference between loving Tubby the Tuba and loving Peewee the Piccolo.

Okay, but how about the difference between loving Tubby the Tuba and loving Mozart? —LA

2000 moving-coil cartridge. At the same time, it is a far more practical product. While its output is still a bit low at 0.23mV, leading to an apparent loss of midrange warmth and dynamic life with most tube headamps and the Audio Research SP-10 and SP-11 preamps, the output is high enough—almost five times as high as the MC-2000's—to properly drive virtually any



**Ortofon MC20 Super**

modern transistor preamp with a moving-coil gain stage. This is a real advance for Ortofon, which has tended to confront consumers with a product that could only be used with high-gain transformers that degrade the sound of the cartridge.

The MC-20 Super is also well suited to most of today's tonearms, although it does require some attention to tonearm compatibility to get the best results. The cartridge mass is about 10 grams, and compliance is relatively low at about 16cu. This isn't critical—in fact, many cartridges have higher mass and lower compliance—but it does mean a medium or low-mass tonearm will probably work better than a high-mass tonearm, particularly if you want full bass. A Premier MMT or Alphason tonearm will work perfectly. So will the Eminent Technology and Souther Triquartz, and most of the arms built into, or furnished with, medium-priced turntables. A Syrinx or Zeta may well be too massy.

The choice of tracking downforce requires some attention. You need 1.8-2.0 grams tracking weight with the MC-20 Super; even then it will only *perfectly* track 60 microns (though up to 80 microns at 2 grams, if you ignore some slight losses of information).

The MC-20 Super is the first Ortofon cartridge to use a van den Hul stylus, and adjustment of both VTA/SRA and azimuth are critical. Careful experimentation with VTA/SRA will be needed to balance transient speed and detail against hardness, and careful azimuth adjustment will be necessary to avoid imaging shifts and loss of dynamics and punch. Fortunately, the cartridge body is a good guide to proper set-up. When parallel to the record as seen from the front and rear, it is pretty close to the right setting.<sup>2</sup> The cartridge is easy to mount, and couples very well to the headshell.

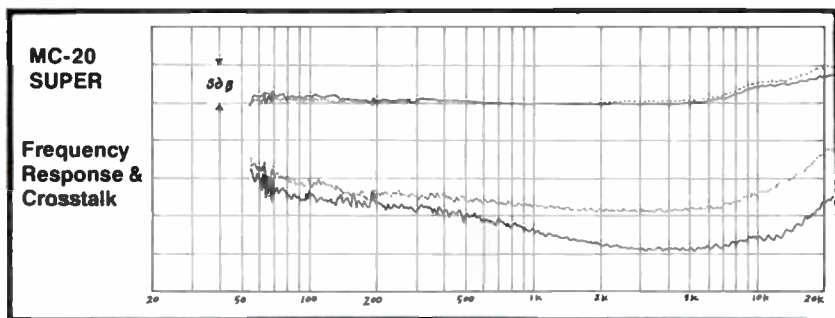
The Ortofon MC-20 Super has flat frequency response to about 7kHz, where it begins a slow upward rise to about 5dB at 20kHz. Channel balance is excellent, but a minor imbalance exists in separation, which is very good at about 30dB.

As for the sound, the Ortofon is exceptional, in most respects. The deep bass is a little lacking in power, and may be a bit soft or loose around 60-70Hz, but this will only be apparent on a very few loudspeakers. The upper bass and lower midrange are very good, and the midrange is warm and open, with full musical impact. The highs are extended and clear without any touch of hardness.

The MC-20 Super, though very detailed and revealing, never dissects the life out of the music by revealing too much detail. It can provide new insights into what is pressed into the record without making the sound artificial, or hiding the music's natural warmth. It is also relatively tolerant of electronics, not requiring really careful matching to speaker and electronics.

The soundstage is well defined, if slightly forward. This "forward" characteristic is,

<sup>2</sup> One major caution: "parallel to the record" means *exactly* what I say. I've seen a few dealers and audiophiles try to set up cartridges by aligning them to the turntable platter rather than by putting on a record. This is a real no-no. Always use a flat record. A one-sixteenth-inch height difference and consequent shift in tangential angle really matter.

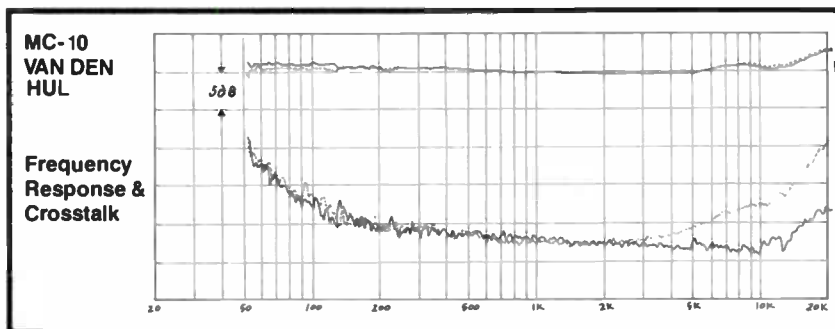


however, very sensitive to VTA adjustment. When VTA is correct, the MC-20 Super will provide exceptionally natural upper-octave imaging, and locate upper octave notes and harmonics clearly around the proper instrument. Depth is good; not excellent, but still impressive. The soundstage is also unusually wide and high, which contributes to the realism of the impression you are sitting slightly forward in the hall. You can experiment with high or low impedance loading, but you won't produce radical changes in soundstage presentation.

In short, the Ortofon MC-20 Super has most of the sound characteristics of the best

### van den Hul MC-10: \$695

I have not always been a fan of cartridges using the van den Hul stylus, finding that they often provide too much detail in the highs, which results in the over-detailed, analytic and "etched" sound, not to mention listener fatigue. The van den Hul MC-10, however, has made me change my mind. It is one of the first cartridges where AJ van den Hul has been able to match his stylus to a cartridge designed for it. The MC-10 is a handmade version of the Empire MC-1000 — which van den Hul helped design — and it shows that Mr. van den Hul knows about more than just styli. The MC-10 is one of



CD players. At the same time, it often produces a sweeter, more open, and more musical result from many records than most CD players produce from the same performance on CD. This is not the cartridge for those who want an apparent rolloff in their highs or a mid-hall sound. It is, however, an excellent product well worth considering, and is reasonably priced (as these things go). It will give outstanding performance in a properly balanced system.

the most revealing cartridges I have ever listened to, but does not produce listening fatigue. Quite the contrary—it is the kind of cartridge you want to listen to for hours.

However, to avoid treble overemphasis, it does require the same careful set-up and adjustment of VTA/SRA and azimuth as the Ortofon MC-20 Super. It is also a difficult cartridge to mount: if you screw it in too tight, you may strip its internal threads (though it only takes a few seconds to

widen the hole to accommodate standard stainless steel mounting bolts).

Tonearm compatibility also presents a problem. The MC-10's compliance is very high for a moving-coil, especially in the lateral mode, but its mass is only about 7 grams, which means it is best suited for low to medium-mass tonearms like the Souther, Alphason, Premier MMT, etc. Higher-mass tonearms will degrade the bass and lower midrange, as well as make the cartridge sound a bit bright.

Tracking weight also requires careful adjustment, and must be done by ear. The MC-10 will track properly at unusually low downforces for a moving-coil: I found 1.3 grams gave a solid ability to track 70um modulation, although others may prefer 2 grams, which gives stable 80um tracking. The choice is between maximizing the ability to handle difficult passages, and apparent transient speed and life. Some experimentation is necessary, because of the interaction between downforce and VTA -/SRA adjustment. If the cartridge sounds hard or bright, I suggest that you raise the tracking force and lower the VTA/SRA.

As for measurements, the graph shows very flat response up to 15kHz, very unusual in a moving-coil. The bass is also unusually deep and smooth, both in measurement and in sound. The MC-10 does preserve exceptional overall separation to about 13kHz, although it is a bit rough, with an irregularity in one channel beginning at 3kHz. This is just barely perceptible in passages with exceptional amounts of upper-octave information. Channel balance was excellent, and the 0.5mV output will be compatible with any transistor or tube preamp with a moving-coil gain stage.

Turning to the sound, the van den Hul MC-10 proves to be much more outstanding than any measurement can indicate. The deep bass is excellent, given proper attention to tonearm mass and damping, although the MC-10 does not have the power and conviction of a Koetsu Signature Red. With optimum set-up of VTA/SRA, the upper bass and lower midrange are excellent, and the midrange is very detailed, dynamic, and open. The MC-10 has great musical impact in the midrange, although a

little less natural warmth than the MC-20 Super. The highs are transparent, and full of life and air.

These highs do, however, demand both an excellent preamp, without grain or hardness, and careful system matching. The van den Hul MC-10 is not suited to a careless choice of interconnects, as there are a number of tonearm cables and interlinks that can make its highs sound hard. I'd recommend the MIT, Monster Cable Interlink Reference, Straight Wire, or something comparably clean at the high-end. In general, the kind of cables that brighten the highs, or provide exceptional high-frequency detail, are not suitable.

The MC-10 has excellent dynamic response, with a superbly defined, if moderately forward, soundstage. Once again, however, this "forward" characteristic is very sensitive to VTA adjustment, high frequency-detail being traded for a sound that appears to place the listener further back in the hall. Even then, the van den Hul MC-10 joins the Ortofon MC-20 Super in providing exceptionally natural upper-octave imaging and the ability to locate upper-octave notes and harmonics clearly around the proper instrument.

Depth is excellent, although not quite up to the very best Koetsu or Kisekis. The soundstage is wide and high, which again contributes to the impression you are sitting slightly forward in the hall. The MC-10, however, provides exceptionally good center-fill and imaging stability without impairing the ability to locate instruments outside of the speakers. This can engross you in the music with a record possessing exceptional soundstage information and overall musical detail.

To sum up, the van den Hul MC-10 is an unusual high-end cartridge in the sense that it is designed for maximum information retrieval with very flat response; it is not intended to produce a particular kind of euphonic sound. It is, without question, one of the best cartridges around. The MC-10 has many of the timbre and frequency response characteristics of a CD player, but can do an even better job than the Ortofon MC-20 in producing a sweeter, more open, and more musical result from LPs than typical CD



players manage with their software counterparts. MC-10 owners who like CDs will find themselves drifting back to the bigger black discs with the grooves and tiny center holes. (These discs are called *LPs*, for those of you have just joined the audiophile fraternity.)

### A Mild Caution

My suggestion you may wish to consider matching your cartridge to your CD player is not intended to make everyone rush out

to buy a new cartridge—although donations of Kisekis and Koetsus by audiophiles who do so may be mailed to this reviewer, care of *Stereophile*. I also do not wish to spark a new CD versus phono debate. Balancing the sound character of your principal signal source is just one of many tradeoffs you may wish to consider. However, I do find the MC-10 and MC-20 Super to be exceptionally CD-compatible cartridges, as well as exceptionally good ones. But please, listen for yourself! **S**

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## PS AUDIO CD-1 CD PLAYER

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J. Gordon Holt



### PS Audio CD-1 CD Player

No specifications provided. Dimensions: 19" W by 3½" H by 12" D. Price: \$790. MANUFACTURER: PS Audio, 4145 Santa Fe Rd., San Luis Obispo, CA 93401. Tel: (805) 543-6655.

At last! A perfectionist CD player that doesn't use Philips' miserable little first-generation flip-top deck! The CD-1 is an extensively modified Philips 2041, which features a slide-out loading drawer with reasonably fast response times. PS Audio keeps the standard Philips 4x oversampling, digital filtering, and dual 14-bit D/A converter digital circuitry, but replaces the 2041's audio board with one of their own design, which uses discrete transistors running in class-A rather than the NE5532 (or equivalent) op-amps standard in most CD players. The high-headroom audio circuitry is direct-coupled throughout, with no capacitors at all in the signal path.

Other modifications include 50,000uF of power-supply filtering, a separate, dedicated power supply for the laser tracking and focusing circuits (to prevent current-

depletion modulation of the digital and audio circuitry), and something called "passive analog prefiltering." The latter, for which PS claims Patent Pending status, involves analog filtering of the signal immediately following the D/A converter but prior to the usual analog reconstruction filter. This reduces the magnitude of out-of-band garbage spikes which, according to PS, can cause slewing-induced distortion in conventional analog-filter circuitry!

The instructions supplied with the CD-1 were amateurish, consisting of two four-page spreads, one written specifically for the PS deck, the other apparently just pulled

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I think what actually happens is that the analog prefiltering is used prior to the op-amps that all CD players use: Paul McGowan of PS Audio traced out the standard Philips circuit and found that the steep wavefronts output from the A/D converter were overloading the standard op-amps. Even with better op-amps, he found that slew limiting would still occur. —LA

out of the Magnavox instruction sheet for the 2041. (It still had the staples in it!) I assume that the CD-1 has a proper instruction pamphlet by now; the untidiness of what I got could give high-end an undeserved reputation for shoddiness.

The CD-1 loading-drawer operation is truly idiot-proof. If you forcibly prevent it from closing or opening, its motor drive will shut off after a few seconds. Pressing the Open/Close button again will move the drawer in the opposite direction from that originally selected. Thus, to open it again after it has shut down, you must press the Open/Shut button twice.

Drawer-drive shutdown will also occur if the disc is too far off-center for the door to close. Actually, it is difficult to get this to happen, as the unit has a remarkable tolerance for sloppily positioned discs. Usually, they center automatically when the door closes. If they're just a little too far off the mark, the drawer will close but the disc won't load, and the red Error light will go on. Simply pushing the Open/Close button brings the disc out again for re-seating. I found it impossible to damage a disc by improper placement in the loading drawer.

Ergonomically, the CD-1 leaves something to be desired. Each group of pushbuttons requires a different amount of force to actuate, and few of them are what I would call "feather touch" buttons. More disappointing, however, was the absence of all those operational refinements I have come to take for granted on even the cheapest Japanese products, such as wireless remote control and a numeric keypad for programming and calling out bands and indexes.<sup>2</sup> (There is, however, a receptacle at the rear of the CD-1 marked Remote.)

When you load a disc into the CD-1, the

LED display shows the number of tracks on the disc. This display can be toggled between the Track indication and a readout of the total Time on the disc by pressing the Track/Time button. When disc play is initiated by the Start/Replay button, the Track/Time button can then be used to toggle the display between current Track-and-Index numbers and elapsed Time into the current track. (If the disc is not indexed, Index 1 shows for the duration of each track.)

You can dial up any track by number, or by number and index, but you can't call it out by minutes and seconds into a track except by fast search (via the Search button). The Search buttons allow high-speed shuttling within the track being played, and there are three search speeds, each faster than the previous one. The longer you hold the button in, the faster it searches. The first two speeds provide audible cueing (at full volume); the third (fastest) is silent, providing only a time or Track/Index indication (selectable) of where you are on the disc. Since there is no numeric keypad, Track or Index numbers must be called out by leaning on the Advance or Search keys. Track access is reasonably rapid—typically a little less than a second per track—and is actually quite adequate for cueing music discs, few of which have more than 20 bands on them. But test records with 80 or more bands can try one's patience beyond endurance! Calling out track 64 on the *HFN/RR* Test CD—produced by our very own JA<sup>3</sup>—takes 61s, which seems like a small eternity when one has the need to access a number of high-numbered tracks in succession for testing purposes. (Interestingly, if you punch the Next or Previous button while the unit is playing, nothing happens until you release the Track Select button, at which time it goes to, and starts playing, the desired track.)

You can program up to 20 selections from a disc side, in any desired sequence, but if you think calling up track 50 is a pain, try programming the unit to play tracks 48, 3, 62, and 8! (This is less of a problem if all the

<sup>2</sup> Of course, the truly hair-shirted Audiophile is not interested in such amenities, and feels cheated if he doesn't have to do everything the hardest way possible. For example, we should all be pleased that it is now considered mandatory to clean each CD before playing to get rid of stray digital bits which have flaked off the reflective surface during storage, and that it is also necessary to place a stabilizer disc on top of the CD. A stabilizer disc is made of a soft or hard material (depending on whose opinion you ask), and is intended to damp spurious vibrations caused by rapid rotation of the disc, or airborne vibrations from the loudspeakers, or shock waves set up in the player chassis in reaction to sudden movements of the laser carriage. The PS-1 will accommodate a stabilizer disc, by the way; some players jam up if you try to use one.

<sup>3</sup> This disc—which I think is unique—contains 13 naturally-recorded music tracks with a discussion of the miking technique used for each, as well as a full selection of technical test tracks. Details from the *HFN/RR* Accessories Club, PO Box 200, Bedford MK40 1YH, England. Tel: (direct dial) 011 44 234 741152. —JA

tracks you want are similar in number, as each selected number stays on display after you punch Program, allowing you to increment up or down from the previous selection.) After programming is complete, depressing the Program button displays the stored track numbers sequentially, in the order selected. During programmed play, you can skip a programmed track by pressing Next, after which the unit played the next programmed selection. Or you can go back to the start of the current track by pressing Previous. Pressing Repeat at any time during the program causes the whole series of selections to repeat after the last selection is over.

The PS CD-1 is *very* resistant to jarring. I had to pound the thing quite hard with my fist, in any direction, to get it to mute. This player could probably go through a small earthquake without glitching. But ah, yes, how does it sound in between mutes?

Well, it probably sounds about as little like a typical CD player as any I've heard. While most players are more or less forward in sound (almost hard, in the case of most Japanese units), the CD-1 is, if anything, a trifle laidback through the upper middle range, in much the same way as many of the best solid-state preamplifiers. In this area it reminds me quite a bit of the Meridian Pro. At the low end, though, it is not remotely like the Pro. The British player sounded slightly warm and rich through the low end; the CD-1's bass is very deep, taut, and punchy—equal to the best low end I've heard from any CD players (the latest Sony models).

Depth and soundstaging are exceptional!

Whether because of the somewhat laidback middles or something else, the PS-1 produces greater depth and a wider stage than any CD player I've tried, including the previous champion in this area: the Meridian Pro. Is it more accurate? Who knows? But it sure *sounds* more impressive—who am I to argue with that?

There's only one fly in the ointment, and it's a very small gnat. The upper mids and high-end have a somewhat dry quality, which seems to strip the upper registers of some delicacy and sweetness that some other players (the Meridian Pro and the California Audio Labs Tempest) produce from the same discs. This is not, mind you, anything that could be described as a roughness or graininess; it's much too fine-grained for that. I'm not even all that confident that the PS-1 high-end isn't, in fact, correct and that the "sweeter" highs from other players are "euphonic."<sup>3</sup> This kind of determination is more difficult to make than you might imagine, for reasons that I discussed at some length in a recent editorial (Vol.8 No.2), but we will be undertaking a project in the near future that should shed some new light on the *real* sound of CD.

Meanwhile—that slight dryness notwithstanding—the PS has to be counted among the best-sounding of any of the current crop of CD players. I have a feeling, however, that it will prove more satisfying in the long run with a system that tends to be a little soft at the top than with one a little on the topish side.

**S**

<sup>3</sup> But see my review of the CAL Tempest player elsewhere in this issue.

—JA

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## CALIFORNIA AUDIO LABS TEMPEST CD PLAYER

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John Atkinson

Technical specifications. 4x oversampling CD player (Philips transport, control logic and digital circuitry). Frequency response: +0, -0.5dB, 5Hz-20kHz. S/N ratio: 105dB. Output level: 2V RMS. Dimensions: 19" W x 5.5" H x 12" D. Weight: 17.6 lbs. Price: \$1895. MANUFACTURER: California Audio Labs, 21962 Annette Avenue, El Toro, California 92630. Tel: (714) 532 3431.



### CAL Tempest CD Player

*"A thing divine—for nothing natural I ever saw so noble."*

*"I do smell all horse-piss, at which my nose is in great indignation."*

Willie the Shake appears to have a quote for every occasion: the two above—appropriately from *The Tempest*—neatly illustrate the diversity of opinion regarding Compact Disc. Either audiophiles greet the new medium, with its supernatural lack of background noise, with outstretched arms of joy, or they wrinkle up their noses at what they hear as a lack of fidelity to the true beauty of music. There is a third path, however: like me, they are attracted by much of what CD has to offer but find that, all too often, they have to make more of an effort to get into the music than with the century-old technology of the LP. They also have the perennial problem of forever having to cast paranoid glances over their shoulders in case a "real" audiophile should see them toying with their little silver bijoux.

But now, at least, it should be possible to enjoy CD without guilt: the Summer CES saw the launch of a compact disc player that such undecided audiophiles can own. Will the inherent tonal brightness—if it exists—of the CD medium be tamed by the inherent warmth—if it exists—of thermionic circuitry? Can the audiophile bask in the reassurance that the player has been conceived by a designer aware of the subjective

subtleties accompanying high-end electronic technology, and not by a faceless committee of corporate test-bench engineers? The California Audio Labs Tempest CD player should supply the answers to both questions, but, most of all, its owner can enjoy the pleasure of owning a piece of hi-fi guaranteed to turn heads—"You mean it uses *tubes*?"

### Scene: A (previously) uninhabited island . . .

As with other "audiophile" players, California Audio Labs have based their machine on a Philips chassis, in this case the Magnavox 2041 also used by PS Audio for their player (reviewed in this issue by JGH). The Meridian Pro-MCD player (my last reference) used the same digital electronics as the 2041 player, but was based on an earlier Philips transport and chassis. The 2041 transport uses a faster drive, to reduce track-access times, and is based on a precision plastic chassis. This chassis is said, surprisingly, to be closer-toleranced, as well as more stable, than the diecast metal chassis used by Philips' previous two generations of machines. I'm not convinced, though. I like the reassuring clink of metal—does anyone else feel that SLR cameras went rapidly downhill when Nikon substituted plastic bodies for brass?

I had better make it clear right from the

start that I have great respect for the Philips approach to D/A conversion, as you can see from my feature on the subject (p.47). There is an elegance to the strategy adopted by the Dutch company's engineers which you can't help admiring, even if you feel that practical implementation of the theory is not always what it should be. By contrast, until the current generation of players from Technics and Sony, typified by the CDP-55 reviewed by JGH in this issue, appeared, the Japanese—apart from Yamaha—seemed to have misunderstood the whole process. To be sure, the typical Japanese players produced respectable specifications, but the approach—one relatively inexpensive 16-bit DAC, which measurements revealed to achieve somewhere between 13- and 15-bit resolution, shared between both channels, coupled with a vicious brickwall analog reconstruction filter which in no way acted in an ideal manner—could best be described as a "kludge". (For those intimidated by electronics, a "kludge" is something which works, perhaps, after a fashion, in a quick and dirty manner, but which nobody admits to having any pride in conceiving.)

The familiar Philips CD drawer and Time/Track display can be discerned hiding in the Tempest's fascia, with acrylic pushbuttons added, but the changes are more than cosmetic. A new, deeper case, with a standard 19" front panel finished in black or aluminum, houses the Philips transport and digital board, as well as a second, more gutsy, power transformer, to supply HT and heater current to the tubes. A new board, containing the tube analog stages, rides piggyback over the digital board. The parts are all highest audiophile grade: the tubes are RAM 6DJ8 twin-triodes; output sockets are Tiffanys; signal-coupling capacitors are the well-respected SideraalKaps; signal wiring is LC-OFC; and the whole construction has the quality feel mandatory for something costing as much as a high-end LP front-end.

Regarding the circuitry, it's all pretty much as Philips intended up to the DAC outputs: the signal from the laser pickup is error-corrected and split into the two channels; the resulting streams of data pass through the Philips SAA7030 digital filter chip, from which they emerge at 28-bits per

sample at a 176kHz rate; these are truncated to 14-bit words by Philips' "noise-shaping" circuit, then fed to the twin TDA1540 DACs. (Although nominally 14-bit devices, the fact that these operate at four times the normal rate means that they give 16-bit resolution—more on this apparent conjuring trick in a future issue.)

The DACs produce a current output which has to be converted to a more conventional voltage form. Normally, solid-state op-amp circuitry performs this task, but in the Tempest, the current-to-voltage conversion is performed by triodes running in class-A! Conventional Philips-based players follow this stage with a gentle Bessel-type low-pass filter to reject the ultrasonic spurious around 88kHz and 176kHz, and a switchable feedback-type HF shelf filter to perform de-emphasis where necessary; this circuitry is almost ubiquitously based on solid-state op-amps. The Tempest, again, uses class-A triodes exclusively, with "zero negative feedback"—presumably CAL mean by this that there is no overall loop feedback, just local cathode degeneration—and what CAL term "active distortion correction," for which they have applied for a patent. No details, by request. Both final low-pass filtering and de-emphasis shelving are performed with passive networks, which have the benefit of being overload-proof: some designers, such as PS's Paul McGowan, feel that conventional active filters can be driven into slew limiting by the ultrasonic spurious. Again here, the use by Philips of an elegant digital filter for primary reconstruction of the signal means that a benign passive filter is practicable.

Lifting the lid reveals a couple of op-amps; these, however, are used for "house-keeping" of the tube operating points and are not in the signal path. The automatic switching of the de-emphasis network is also claimed not to be in the signal path.

The Tempest is not supplied with a remote control, but owners can use the Magnavox 2041's control. Elsewhere in this issue, JGH describes his dissatisfaction with the ergonomics of the Philips transport used in the PS Audio CDI. Well, I suppose it all depends on what you want from a CD player. Certainly something like the Sony

CDP-55 allows you to program tracks in any order, with astonishingly quick access. Other machines allow you to place "markers" and repeat bleeding chunks of music *ad nauseam*. But so what? I think music deserves a little more respect.<sup>1</sup> Having lived with various Linn Sondexs for nearly nine years, I am used to functional simplicity. The transport in the Tempest gives me all I need: location by track or index; display of track time; enough programming facilities to make life convenient; and not enough to get in the way of enjoying the music.

And music is what it is all about; how does the Tempest fare?

### Scene: A tempestuous noise of thunder . . .

The problem with assessing CD players is that, to a large extent, you are stuck with the unknown sonic quality of the software. If you get a bad sound with a CD player, how do you know that what you have is not a mediocre player, but something ruthlessly transparent and revealing of all the sonic nasties recording engineers have kindly included in the mix? If the sound is warm and natural, the player may be showing how good a job responsible engineers, mindful of the delicacy of live sound, have done; on the other hand, it may, as JGH has proposed, be less faithful to what is encoded in the pits, er, bumps. Either the CD is too dry and the player adds euphonic warmth; or the CD is faithful to the digital master tape and the player is accurate.

Unless the reviewer has access to the master tape, he is in a double-bind; what can he do?

Well—long drawn-out breath—he can trust to his feeling that if the sound is consistently good, with many discs, of all musical kinds, from a number of companies, statistical truth will ensure that his conclusion that the player must be good is probably correct.

Or he can indulge in a little conjecture.

For example, a couple of years back, I recorded a young Polish pianist, Anna-Maria Stanczyk, playing Chopin, with both a

Revox A77 and a Sony PCM-F1. The microphone was the Calrec Soundfield, used as a crossed pair of synthesized figure-eights, and although the hall had a sympathetic acoustic, it took quite some time to establish the optimum balance between the direct sound of the Steinway and the reverberant background. Comparing the off-tape sound with the direct feed at the time revealed that, hiss and modulation noise aside, the analog tape closely approached that balance. The F1 tape was more transparent, and more true to the bass weight of the piano sound, but interfered a little with that balance I had worked to achieve.

Both those tapes are still in the UK, but one track, the Waltz in C-sharp minor, Op.64 No.2, mastered from the digital tape, appears on the *Hi-Fi News* Test CD. With every player I have tried, that delicate balance between direct and reverberant sound has been further affected in the direction of dryness, only the Meridian Pro-MCD and the Sony '520 getting close to the digital tape.

Until now.

The sound of the CAL Tempest playing that track gets closer than any CD player I have heard in remaining true to what I had originally intended!

I am running ahead of myself, however. CAL states that Tempest needs around 20 hours' warm-up before use. They also recommend swapping the polarity of the line plug, keeping it on the setting that sounds best. The first, no problem; the second I couldn't decide. I sat the Tempest on a Mission Isoplat, for environmental isolation, and, as my SP-10 was away in Minnesota having WZJ's magic wand waved over it to enable it to run on 110V, the Tempest was used straight into the power amplifier, or via a British Fidelity MVT Mk.II preamplifier—one of the few UK solid-state designs that can hold its head up in the Colonies. The power amplifier was either a Robertson 4010 or a Krell KSA-50 Mk.II, driving Celestion SL600 and Martin-Logan CLS loudspeakers. Cables were all Monster: Interlink Reference A and Powerline 2.

The most immediate impression was of a slightly bright—but not hard—tonal balance, coupled with excellent staging and a

<sup>1</sup> But what about musicians who need to study/learn new pieces of music? Such programming can be invaluable.—Copoly Editor.



tight, if a little dry, low register. Violin tone was about as natural as I have heard from CD, and discs that had hitherto been a little strident—Sting's *Dream of Blue Turtles*, for example—mellowed out a little in character, despite the Tempest's slightly thin tonal balance. CDs that were already excellent, such as the London Rachmaninov Piano Concertos 2 and 4 from Ashkenazy and Haitink, opened up even more. (This disc is one of the few concerto recordings in which the producer has seen fit to leave the balance between piano and orchestra as the composer intended it, the solo instrument image naturally small, the orchestra surrounding it rather than peeking over its shoulders—buy it.)

The delicacy of imagery, with a believable depth, was the consistently most impressive aspect of the Tempest. The Nigel Kennedy Elgar Violin Concerto recording on EMI (another CD to buy) was revealed as being recorded so that there is actually space around the instrument—which remains small and natural sized—no matter what else happens within the soundstage. The passage where Elgar sets the solo violin cadenza against thrumming strings was magical. There was actually ambience and space, all the kinds of things audio critics expect as their right. (Contrast the dreadful sound of the Anne-Sophie Mutter Brahms concerto on DG, the artificialities of which were even more clearly laid bare by the Tempest.)

The Tempest gets closer to the spirit of the music. Consider the Michael Murray Telarc CD with Bach's Fugue in D. History tells us that this is very juvenile Bach, its main subject a little up-and-down scale and its answer a descending half-speed scale! The CLS/Krell/Tempest combination, however, let me forget musicology and get into the music—from CD, no less.

It's not all roses. The output impedance appears to be a high 5k-ohms, which could give rise to a prematurely rolled-off bass with preamps having an input impedance much below 22k. With my minimalist *Hi-Fi News* DIY AMP-01, which features an unusually low 6k, the combination of this with the Tempest's high output impedance and choice of coupling capacitor leads to a -3dB

point at 40Hz. Take care that your preamp will be compatible in this respect; those who like to use a passive preamp should be warned that unless interconnects are kept very short, there may be some HF loss.

One apocryphal problem with tube gear is noise. Although I don't have access at the moment to measuring gear sensitive enough to assess a CD player's noise floor, that of the Tempest was way below what I could hear with the preamp gain up, and way below breakthrough from other inputs. I don't think that there is any problem here. The other problem concerns tube life. I used the Tempest for seven weeks in all, leaving it on nearly all the time. Again no problem.

I checked that the Tempest's slightly bright sound, similar to a typical moving-coil, was not due to a frequency response anomaly: the measured response was flat to around 13kHz, above which there were the usual minor ripples, rising to +0.4dB at 20kHz. I can't see that this will lead to a subjective brightness. AHC has suggested that this tonal character is typical of 6DJ8s nearing the end of their useful lives and adding increasing amounts of second harmonic distortion; he will be discussing the results of his findings in a future issue of *Stereophile*.

## Epilogue

Although I would happily live with the CAL Tempest, this was nevertheless a hard conclusion to write. Given its excellent performance, it is still on the pricey side. Not for a front-end component, I hasten to add, the price is about par for a high-end LP player, but high for one that uses digital technology that will most likely be superseded within a relatively short time. The 16-bit-with-over-sampling Philips machines are now appearing, for example, from Mission, Tandberg, and Meridian, as well as Magnavox and Marantz, and preliminary reports of their sound are good.

Is it worth spending a lot of money on any CD player, given what many feel to be the medium's general sonic underachievement? Shouldn't you just buy the cheapest respectable player, spend the money saved on discs, and wait to buy the ultimate machine—the one that will get the most from

those discs—in two, three, four, or five years' time?

To be honest, the last strategy, sensible enough on the face of it, means that you will probably never get a machine which lets you enjoy your collection of discs. Cheap CD-player sound just doesn't get you involved enough to want to play the discs much, and if you don't play them, you won't make CD a large part of your musical life.

If your system has high-end pretensions, then, grab the discs that give you musical

enjoyment, march down to your CAL dealer, and audition the Tempest. I like what it does; if you do too, buy it and forget it. What else would you spend \$1895 on? Enjoy the glow of the tubes, but more importantly, enjoy the music.

However . . .

It may or may not become your main source of reproduced music. To paraphrase Prospero, "But this rough magic I here abjure: and, when I have required some heavenly music . . .", I'll put on an LP! **S**

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## SONY CDP-55 CD PLAYER

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J. Gordon Holt



### Sony CD P-55 CD Player

Compact Disc player with wireless remote control. Dimensions: 17" W by 3¼" H by 11¼" D. Weight: 9 lbs, 4 oz. Price: \$400. MANUFACTURER: Sony Corp. of America, 1 Sony Drive, Park Ridge, NJ 07656. Tel: (201) 930 1000.

It's been so long since we (or, for that matter, anyone else) has listed the typical CD player's remarkable specifications—which we all take for granted these days—that I thought it appropriate to do so for the CDP-55. Here goes:

Laser output: 0.4mW (at 1.6mm from the read lens). Disc speed: 200-500rpm. Scan (seek) velocity: 1.2-1.4ms. Error correction: Sony "Super Strategy" Cross Interleaved Reed-Solomon Code. D/A conversion: 16-bit linear (equal steps). Frequency response:  $\pm 0.3$ dB, 2Hz-20kHz. Signal/noise ratio: 94dB. Dynamic range: 96dB. Harmonic distortion: 0.003% at 1kHz, 0dB (max) output level. Channel separation:

93dB. Wow and flutter: Unmeasurable. Power consumption: 13W.

Of course, such very impressive specs won't tell the whole story, for *any* CD player. And they certainly don't help to explain why, three years and four generations after the first players appeared, different makes and models *still* sound different.<sup>1</sup>

<sup>1</sup> I should say something about specifications in general, and CD's specs specifically, that the numbers listed in this report are virtually identical to those listed for the original CDP-101. In fact, none of the improvements in CD sound are reflected in standard measurements, though Martin Colloms has found some measurements—not the ones provided by manufacturers or generally referred to in reviews—that do correlate to sonic quality. They are distortion at low recorded levels (-70dB, -80dB); effective resolution, revealed by compression of the signal at low



Sony made the first CD player available in the US—the CDP-101—and although I was immensely impressed with many of the things it did right, it took me longer to realize how many things it *wasn't* doing right, and to realize (eventually) that it may ultimately prove to have been the worst-sounding CD player ever manufactured. (Although that remains to be seen; with player prices falling like snowflakes in February, can quality be far behind?) But Sony has never been a company to let grass grow between its weeds, and as new technologies were developed to cope with this fledgling medium's new problems, Sony's players have continued to improve (as has the state-of-the-art competition, of course). Sony has still not seen fit to go with 4x oversampling (as used by Philips), or all-tube or direct-coupled audio electronics, but just about every other development which improves (or conceivably *could* improve the sound) *has* been incorporated into the latest crop of Sony's CD machines.

The CDP-55, for instance, has true 16-bit DACs, intra-channel phase correction, 2x oversampling, steep digital filtering and gentle analog filtering, fiber-optic "wiring" for digital interconnections, separate regulated power supplies for the analog, digital, and servo sections, a minimum number of high-quality capacitors in the audio path, a highly inert shock-absorbing laser carriage and frame assembly, and linear traverse drive (straight-line "voice-coils" rather than a pivoted servo-driven lens carriage) for fast access to selected bands.

Discs are loaded via a motor-driven front drawer, and the player provides all the readouts any CD user could possibly want: number of tracks on disc; number of track being played; index number (if any) of track being played; elapsed time of track being played; total remaining time on the disc; numbers, order, and total playing time of programmed selections; and whether the

unit is in Repeat Play or Shuffle Play mode.

Shuffle play, a Sony innovation, allows you to play every selection on a disc side in random (rather than originally recorded) order. Each selection is played only once (unless you tell it to repeat one or skip one), and a 3s pause is inserted between each selection. You can also select the 3s pauses for normal playback of any disc.

Response and access times on the '55 are extremely fast. Drawer opening starts the instant you press the appropriate button, and takes a mere 1s for completion; access to track 99 from a standing Track-0 start takes 4s! The player is not extraordinarily resistant to jarring, particularly front-to-back, but it ignores any shocks of the kind and magnitude it might receive in normal use, as from nearby dancers on a bouncy floor. It has performed flawlessly and without a glitch throughout the entire one-month test period, showing none of the little quirks and lockups I encountered in some earlier CD players from several different manufacturers.

The remote control is one of the most potent I have ever used. I could not determine its operating range when pointed straight at the player; at 25 feet, I was out of the room and unable to get a line of sight on the player.

Sonically, I found little to criticize. The CDP-55 has the same tremendous impact and solidity at the low end that I observed from Sony's 520ES, but a rather sweeter high-end, and better depth, detail, and soundstaging capability. Its sound is very similar to that of the Kyocera DA-910 that I liked so much (and used for several months as a reference), which is to say it is somewhat more forward through the middle and upper middle range than the Meridian Pro, not quite as soft at the extreme high-end, and much more taut, detailed, and punchy through the low end. (I had not, at the time of this writing, heard the PS Audio CD-1, and didn't have a chance to hear the tube California Audio Labs player on the Sound Labs A-3s used to audition the CDP-55.)

I would have given this Sony player a strong recommendation had it cost \$900. At \$400, it is one of the best buys! **S**

levels i.e., a tone recorded at -90dB actually plays back at -84dB (the prototypes of the recently introduced Philips 16-bit 4x oversampling player, for instance, had effectively 10-bit resolution!); and presence or absence of ultrasonic spurious. I suspect that as time goes on there will be developed real torture tests for digital systems that reveal the differences everyone (except Len and Julian) are hearing. —LA

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Presto Audio  
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Audio Ecstasy  
1130 Garden St, Suite A

### San Mateo

Audio Venture  
306 Fifth Avenue  
Mateo Hi-Fidelity Inc.  
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## to the memory of an ANGEL



*In the first of a regular series, Christopher Breunig<sup>1</sup> discusses the various recordings of a single work.*

If Strauss's *Metamorphosen*, with its culminating quotation from Beethoven's "Eroica" Symphony, was a grieving survey of the damage done by Nazism, Alban Berg's Violin Concerto might be seen as a Requiem for pre-Hitler Europe. The best, most accessible, analysis of its construction comes in Leonard Bernstein's *Six Talks, The Unanswered Question*, given at Harvard in 1973 (Harvard University Press, pp. 301-312).

Berg, a pupil and devoted friend of Schoenberg, composed this work in response to a commission by the violinist Louis Krasner; a meticulous worker, he completed it in a four-month period in 1935. But the real spur was the tragic death of the 18-year-old daughter of Mahler's widow, then married to Bauhaus architect Walter Gropius. Berg was devoted to Manon Gropius and determined to portray her character in the piece—whilst pursuing 12-tone compositional techniques. The Concerto is divided into two parts (Andante-Allegretto,

Allegro-Adagio), the second a "catastrophe" and "deliverance," culminating in a sequence of two variations on the Bach Chorale *Es ist genug!* Berg's tone-row begins in alternating major/minor thirds, which permit shifting harmonies; with a long-held G-natural for the soloist, the concerto ends in B-flat. There's an obvious imitation of Baroque organ, in this same key, at measure 7 of the Adagio (marked *religioso*). This crucial tone-row was conceived to allow precise replication of Bach's own BWV60 harmonization.

Dedicated "To the memory of an Angel," the score was first heard in 1936 (Berg was already dead) with Louis Krasner as soloist under the baton of Hermann Scherchen—it was at Scherchen's suggestion that Berg wrote the "*Wozzeck* Fragments" which brought him fame. (Incidentally, Scherchen was also a fascinated audio technician: he patented the first quasi-stereophonic channel-dividing network!)

Louis Krasner's own 1938 recording of the Violin Concerto, conducted by Fritz Busch, was released by GM Recordings last year (GM2006). Pre-stereo, Andre Gertler's

<sup>1</sup> Christopher Breunig recently became Music Editor of the British magazine *Hi-Fi News & Record Review*, and has been writing about music, records and hi-fi equipment for over 20 years.

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Philharmonia recording with Kletzki was the most memorable. Isaac Stern has long been faithful to the Berg Concerto; he made the pioneering stereo recording with the NYPO and Bernstein in 1962, but the engineering balances there worked against the scrupulous annotated score markings (Berg indicates "high" and "subsidiary" voice balances in a specially devised coding). Hopefully he'll rerecord it.

The editorial brief for this series was to discuss a major new release in relation to the competition, and Pinchas Zukerman's new CBS recording of the Berg Concerto, made at EMI's #1 Studio, Abbey Road, London, with Pierre Boulez and the London Symphony Orchestra (LP: IM 39741, MC: IMT 39741), seemed an obvious first choice. Before his New York conducting appointment Boulez had revitalized London concert life with his 20th century programs, and in 1969 had recorded the work with Menuhin. Although Menuhin's intonation tended to wander—his figurations not quite firm enough in the context of Boulez's boldly structured accompaniment—and the soundstage was limited in information (the atmosphere studio-like), this version offers a good candidate for refurbishment. Menuhin's heart was certainly in the right place.

Slightly earlier than that EMI production was Arthur Grumiaux's classically poised Concertgebouw reading with Igor Markevitch conducting (Philips 8027854). Grumiaux's neat, unnervy playing was focused in front of an orchestral backdrop at times too vague in definition, and the multi-miking lost cohesive overall perspectives. Markevitch underlined the instrumentation in a pointillist manner: this version is deeply sorrowing in the opening Andante. A more recent analog recording, highly regarded, is the Perlman/Boston SO/Ozawa; on Compact Disc it is coupled with Stravinsky's neoclassical Concerto (413 725-2, LP: 2531 110, MC: 3301 110). In the *Berg Edition*, published on LP last year, it is recoupled with Berg's transcription of the Chamber Concerto, and Johann Strauss's "Wein, Weib, und Gesang," performed by the Boston Chamber Ensemble.

Itzhak Perlman's 1979 recording catches equally Ozawa's vigor and the large Sym-

phony Hall ambience. Perlman's musicianship and technique are assured—the playing is powerful, authoritative—but he seems to have a rudimentary grasp of the potential of recorded sound, to judge from the grotesque close-ups that have been a continuing feature of his concerto discs. Here the larger than life instrument comes between listener and scoring: the contrast between the close, dry solo image and the washier orchestral ambience fails to cohere.

A less distorted sonic presentation comes from Decca, in a superficially impressive Chicago SO CD with Kyung-Wha Chung and Solti (411 804-2, LP: 411 804-1, MC: 411 804-4). Chung is a little cautious in the opening pages, but her rhapsodic approach and self-conscious applications of "color" suggest that she does not have a deep understanding of the idiom, and her reliance on conventional display combined with Solti's linear conducting—strands carefully balanced, but lacking variety of intensity—make this unsatisfying. (Their Bartok coupling is another matter.) There are likeable details: the sombre, deep-toned Chicago low-register timbres, the *Wozzeck*-like cry of trumpet. But Chung is too stressful—in the wrong way—in the Allegro, and the image is still too wide, tending to screech.

The new CBS Zukerman production is better balanced: at modest levels it sounds woolly and veiled, though the accurate pitching of notes and wide dynamic range are immediately evident. The sound needs to be "opened out"—then the massive climax in the second movement will be really shattering. The performance begins with an atmosphere of objective watchfulness (you sense the real intelligence at work here), and there's a numbed, expressive quality in the orchestral playing. Zukerman is clearly committed to great accuracy, and his stratospheric final *pianissimo* is memorably sustained. But, in between, what does he feel "behind the notes"?

There is some beautiful playing in his long cadenza like passage in (ii), leading to *Tempo I*, where harp glissandi thrust the orchestra into full confrontation with the soloist, and thence to the 4/4 Adagio, and landscapes suggestive of *Das Lied von der Erde*. Figure 160 brings some very fine LSO

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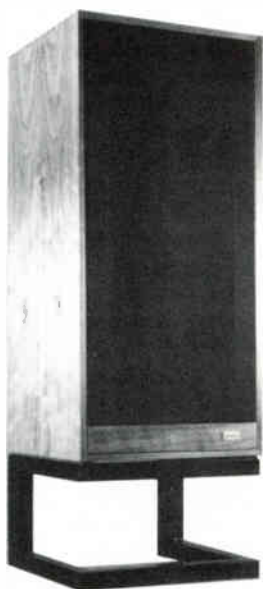
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brass, against sombre harp chords. Ultimately, however, this is not a deeply *involving* reading, and, at times, Zukerman's part sounds complacent: eg., at (ii) Fig.35. And at the solo entry in (i) Fig.55, it is disconcerting to hear the engineering convey a quite different stage location from that previously established!

In depth of understanding, Zukerman is surpassed by the controversial Gidon Kremer. It is not surprising that this rebellious violinist would excel in work deplored by the Soviets as "formalist." In his 1985 Bavarian RSO/Philips recording with Sir Colin Davis (CD: 412 523-2, LP: 412 523-1, MC: 412 523-4) the extraordinary expressive coloring of each note is a feature from the outset. His sweetly lyrical playing recalls Gertler, and the big Munich hall sound, with its sonorous bass and characteristic German horn and brass timbres, gives a certain authenticity to the whole. Of extant recordings this is the most closely matched to a Mahlerian world of pain and grief. Davis and Kremer begin rather more slowly than most, thereby defining the Allegretto contrast more acutely—Kremer gives these last pages a delicate, singing sustained vibrato. His playing is full of such consummate detail as the balance between plucked strings and the purity of long-bowed lines in the cadenza, or a deeply impressive stillness in the Bach variations. The long *calmando* brings a withdrawn silvery thread of sound, ghostly in character, yet again with gently insistent vibrato. And Davis works with him so well: the logic of the piece is consistently focused, the quirky dance steps of the Allegretto bringing close phrase matching between Kremer and the orchestral voices. Yes, this is the version to have.

(Yet it must be said that, with Philips and CBS both coupling Berg's Op.6 "Three Orchestral Pieces," it is Boulez, in his second recording with the BBC SO, whose account leaps out of the speakers with a daemonic force—at the same time controlled with fantastic skill, every strand anchored with the tenacity and vividness of embroidered silk. Davis's reverberantly engineered, more impressionistic account hasn't the same penetrative strength.)

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# RECORD REVIEWS

## CHRONOS

Original Filmscore by Michael Stearns  
Sonic Atmospheres CD 312.

Michael Stearns is described on the jacket of this disc as a "composer and musical visionary." Composer yes, but musical visionary? I don't think so.

Before getting into this review, though, I have a scream of outrage to direct at Sonic Atmospheres. Why in the name of heaven did you put out a CD with seven "movements" on it but *no track numbers*?!! The entire disc is Track 1!

So much for the botched format. I haven't yet seen the film that this music was written for, but I can tell you one thing: it's not the kind of music that stands well on its own. A film like *Koyaanatsqtsi*, filmed by the same man who filmed *Chronos* (Ron Fricke), can build slowly to a climax without losing the viewer's interest. But without the visual images, a score needs contrasting tempos and moods to sustain interest. This one does not provide them.

Like Philip Glass, who scored *K'sqtsi*, Stearns starts most of his compositions at whisper volume. (This is called triple *pianissimo* if you play an acoustical instrument, or 0.75 if you're operating a volume control.) From there, they build slowly—painfully slowly, it seems—to *fortissimo*, then a rapid *diminuendo* segues through nondescript grumbling to the next segment, which starts at whisper volume (called triple *pianissimo*...) You get the idea. By band 4, one begins to wonder if Mr. Stearns has a prejudice against moderate to fast tempos, but things start to liven up after that, and the work ends at an almost frenzied tempo. At which point one finds oneself wondering what the Hell all the fuss was about?

The music, entirely synthesized and encompassing a truly prodigious range of colors and timbres, is at times meltingly lovely, at times hair-raising in its intensity and power, but in totality cold and unmoving, as though composed by—as well as played

by—a machine. There is never a *ritard* or *accelerando*, never a nuance of dynamic expression, never a hint that a flesh-and-blood human was responsible for the music.

The sound itself is awesome in quality but almost chillingly alien in its mathematical precision and perfection. I could not fault the sound, but when you're listening to sounds which have no basis in the real world, with what can you compare them?

One of my personal criteria for judging the emotional impact of music and music reproduction has long been whether or not it can give me goose-bumps. (Do geese really have bumps? I know that plucked chickens do. I have never seen a naked goose. Should I be saying "chicken bumps?") The *Chronos* filmscore does this to me, but not from the emotional content of the music, rather, from the chilling thought that this may be the direction of music in the Western World is going. If this—as "visionary" implies—is the music of the future, I can only hope I will not be around when that future arrives.

—JGH

## NY CATS DIRECT

Jazz from John Tropea (guitar), Warren Bernhardt (keyboards), Anthony Jackson (bass guitar), Steve Gadd (drums) and others.

DMP CD-453

The arrival of this 63-minute Compact Disc from the all-digital company that brought us the gutsy *Tricycle* album triggered the thought that the CD medium and this kind of music were made for each other. If you accept that CD somehow removes tension from the music, then it doesn't matter with the sort of music produced by the ace sessioners featured on this CD-only release: I don't think there was anything to make the adrenaline flow in the first place.

The playing is first rate. These musicians just couldn't play a note out of tune or time. And Tropea is one of those guitarists who can vary his tone from the quietest of clean, amplified acoustic, through traditional mellow Barney Kessel musings, to scuzzy

and intense ball-breaking power rock without sounding ill-at-ease at the contrast. The sound itself is hi-fi squeaky clean, with high dynamics and extended highs and lows—Anthony Jackson's ultra-contrabass lines demand a *mansize* speaker to deliver their full weight. The engineering could almost stand as a model of how to record modern electric rock instruments.

But somehow, it just doesn't make it. One hour and seven tracks later—even on the tube California Audio Labs player—I felt as though nothing had happened. Even when the music should have been really cooking, as in the strutting brass riffing at the close of Tropea's own "Moroccan Nights," there just wasn't enough electricity in the air.

Perhaps, as someone who cut his teeth on rock, I am just out of sympathy with the politeness of new age jazz/fusion. A seemingly endless succession of superbly played solos hung on a riff or chord sequence like so many clothes on a line—so what? Where's the aggression, the sense of someone desperate to say something? If I am demanding too much adrenalin flow for jazz in the safe Reagan '80s, then ignore this review and treat your system to some high-tech sounds. But I don't think I am.

—JA

## RESPIGHI

*Church Windows, Poema Autunnale*  
(Ruggiero Ricci, violin)

The Orchestra of the Pacific, Keith Clark conducting

Reference Recordings CD RR-15CD

I gave the analog LP version of this a rave review for its sound and performance (Vol. 8 No. 7), and the analog disc didn't even include the *Poema*, which I found to be delightful if rather trivial Respighi, superbly played by Ricci and the Orchestra. Unfortunately, this is the second CD I have auditioned which I feel to be inferior to its analog release.<sup>1</sup>

Reference Recordings and Sheffield Records are, to my knowledge, the only record companies which, while releasing CDs as well as LPs, still feel that CD is a curse on the house of hi-fi. For that reason, I sometimes

wonder if they don't take a chips-fall-where-they-may attitude towards their CD releases, figuring that if a CD made directly from a master tape doesn't sound as good as the LP, tough titty: it's the fault of the CD medium.

As long-time *Stereophile* readers know, LA and I have maintained what you might call a gentleman's disagreement about CD. My feeling about the medium has been "Let's give it a chance; we don't yet know how good it can be." LA, who is not from Missouri, has nonetheless assumed a "Show-me-how-good-they-can-be" attitude, which might be summed up as "On the other hand, we don't know how bad they are, either." One of his major complaints about CD has been the way cymbal clashes are reproduced, which seem to take on an ear-shattering sizzliness. When LA heard RR's LP of *Church Windows*, he said "If the CD version can reproduce cymbal clashes that well, I'll have to agree with you about how good CD is."

Well, Larry, as far as this CD of *Church Windows* is concerned, you win the round. The cymbals on the CD do not *sound* shimmering and brassy the way they do on the LP; they sound sizzly. Worse, even the violins are shrill.

But there's more. The low end on the analog release, at least through my system, is what can accurately be described as awesome. When the pipe organ enters, the room shakes, the short hairs at the back of my head stand up, and LA says something like "Jeez, that was incredible! Play that part again." LA hasn't heard the CD of *Church Windows* yet. I can predict that he won't ask me to replay it. I probably won't even bother to play it for him at all. It is *that* disappointing.

This is what I mean by *laissez-faire* on the parts of Sheffield and RR when it comes to CD transfers. Both firms, it seems to me, are overlooking two facts of audio life. The first is that tonearms, tape recorders, and turntables have imperfections which cause inadvertent peaks and dips at certain bass frequencies. Professional tape recorders, like their amateur counterparts, have what are called head bumps. These are frequency response anomalies due to the relationship between the length of a tape machine's pole

<sup>1</sup> The first was Sheffield's *The Missing Link*, which could have been a winner had someone merely hyped its low end a bit during the transfer to CD.

# stereophile

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pieces and the wavelength of the signals recorded on the tape. The effect is a low-end frequency response from tape which resembles a sinewave, but in the frequency domain: a series of humps and dips. If a bump happens to occur at the center frequency of a bass drum or a dominant organ pedal tone, the result is what audiophiles call "fantastic" low end.

Tonearms and cartridges also introduce a low-end hump, as the result of resonance between the compliance (flexibility) of the stylus elastomer and the combined effective mass of the cartridge and the tonearm. This, too, tends to exaggerate a disc's low end, again resulting in "fantastic" bass.

Another potential source of LF augmentation from analog disc is marginal acoustic feedback between the phono unit and the speaker system. If you don't think you have it, try gently tapping the base of your tonearm while playing a disc at "normal" listening level. Ideally, it should go "thud" or "boop" (rhyming with "book"). If it goes "thudddd" or "boom," dying out rather than ceasing abruptly, acoustic feedback is boosting (and muddying) your low end.

The point of this digression is that analog disc playback is not likely to sound like master tape playback, nor like the playback of a CD made from that tape—particularly if the tape-to-digital dub is done with a different deck from that used to master the tape. If the sound of the analog disc is "good," there is at least a 50-50 chance that the digital copy will not sound as good. And as far as I'm concerned, there is no reason why this should be the case—at least when the master tape is analog to begin with.

It is known that some major record companies "sweeten" the sound of their digital masters before transferring to CD, and that they do this by converting them to analog form, equalizing them as they see fit, then reconvert to digital. With the conversion processes remaining the weakest links of digital, it is inevitable that that kind of thing will markedly degrade the sound.

But when the master is analog to begin with, as was apparently the case with this RR CD, and now that there are equalizers as good as Mark Levinson's Cello Palette, there is not only no reason not to equalize the

original master tape during CD transfer, it may be inexcusable not to.

It is difficult to tell from listening whether the high-end shrillness of the *Church Windows* CD is a result of distortion or of HF frequency response anomalies, since it is possible for either problem to sound very much like the other. But there is no question in my mind that a bit of equalization, particularly at the low end, could have made this CD sound much more like the (superb) analog release than it does. It might even have sounded *better*. Perhaps RR will see fit to re-release this with the necessary corrections. I hope so.

Incidentally, my initial review of this recording had some nice things to say about the performance, based on no previous familiarity with the music. A number of readers have written (and phoned) to tell me that I was all wet, and that there have been much more exciting recorded performances, by Ormandy and Dorati, for example. I stand corrected. In my blissful ignorance, however, I still find Clark's performance on this RR release to be quite satisfying. **S**

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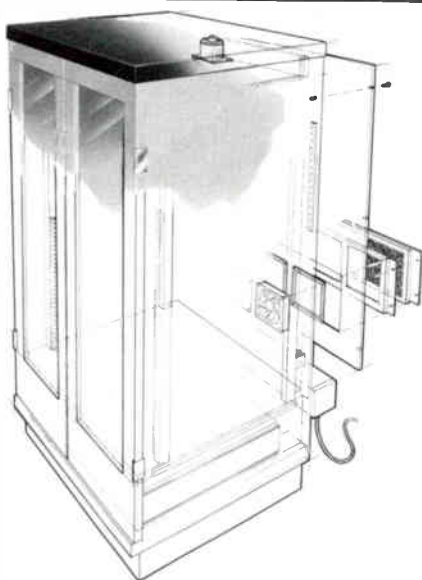
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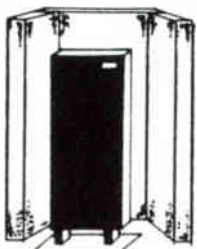
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## CABLE QUICKIE

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A cable story from CES: a visitor came into an amplifier manufacturer's room and, after a few minutes' listening, remarked that the sound was pretty good but that the mid-range was a little dark and laidback. The visitor then noticed the cables and asked if they were Livewire? Receiving a positive reply, he expressed satisfaction; he knew that Livewire always affects a system in this way. The manufacturer breathed a sigh of relief since the blame for the coloration could not be laid at the door of his product. As the first visitor left, a second listener settled down in the chair. He, too, expressed satisfaction with the sound, except that it was a little too bright. Upon spying the Livewire, he shook his head knowingly: Livewire always made a system sound bright!

—AE

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## CD at What Crossroads?

*continued from p. 4*

player has brought improvements in an unimprovable system, so has the increment of change lessened in recent units. Soon, I suspect, only tiny improvements will be available through improved playback units. Then the process will start over at the recording end. Unfortunately, the recording studios—which don't have huge budgets for new equipment purchase—are still reeling from the quarter million they spent a few years ago to "go digital"; it's unlikely they'll be eager to spend a similar amount to upgrade to the second generation of recording equipment (with widely varying digital standards between manufacturers, including *two* different open-reel formats), and unthinkable they'll be up for the third generation—when digital recorders start to make the dramatic progress we've seen in players.

Meanwhile, the consumer waits, forking over \$12-\$16 a throw for the little silver discs, trying to give the new medium a chance. It's unfortunate that almost none of that money goes to improving the product he's buying—it goes instead to amortize the new plant investment, to the distributor, to the retailer, and simply to make the damn things—and hardly at all to improve the quality of sound obtainable from those little pits.

Nor are the player manufacturers likely to be a source of beneficence. Other than supporting their overhead, it's unlikely any of the Japanese manufacturers have made a penny on CD, and it's getting harder and harder with vicious price competition and the strength of the yen. Will the CD be deserted in favor of R-DAT, as Alvin Gold surmises? Or have the Japanese been holding back R-DAT in fear of killing their once and future golden goose, as I suspect? (When I visited Technics in April 1984 they were just in the process of "finalizing" the R- and S-DAT standards, with first production to be ready for January 1985. I've heard of delays due to technical shortfall, but not two years.) I think that the Japanese still hope to recover their investment in CD, but are becoming fearful that as time goes on and margins get lower, they never will. On the other hand, I think they're similarly fearful that launching a new digital technology will just get them in a similar boat. After all, there's just so much of the "let's buy a new technology" pie to split up, and they'll likely be competing against themselves. Moreover, none of the design issues with R-DAT address any of the complaints about CD (the move to 48kHz sampling rate falls short of what's needed in that department by a factor of about 3.5). Kind of makes you yearn for the days of a continually upgradable technology—what was it called, analog?

Larry Archival

# MANUFACTURERS' COMMENTS

## NYAL OTL-1 & SuperIt

Editor,

As I requested that *Stereophile* judge the polarities of our design efforts in this issue, I would like to address both George Graves' review of the \$269 SuperIt and Tony Cordesman's review of the \$12,000 Futterman OTL-1.

Comments on HR's Wretched Excesses: I have failed miserably trying to be tame. Meditation, yoga, psychoanalysis, group therapy, prayer, a frontal lobotomy, and jogging, have all been tried and proved ineffective. I apologize to all whom I have offended with my prose, and ask their forgiveness. No matter how hard I try, my excitement and enthusiasm overpower me. Any suggestions from physicians in the readership?

Comment on the Glorious Folly #1: To stimulate further the tube vs. transistor debate, it should be noted that the Futterman OTL-1 uses a circuit created in 1954 with a modern, electronically-regulated, power supply. We are 14 years from the 21st century, but are not yet at the limits of tube technology, which still appears to dominate the state-of-the-art in musical reproduction. Recent research indicates that it is reasonable to assume that we will not see the maturity of tube circuitry until the next century.

Comment on the Glorious Folly #2: I have a dream. I want the average man to be able to own a reliable/affordable sound system that possesses the quality of the best tube gear. The SuperIt, which exploits our new Moscode hybrid tube/FET hypercascode circuit, is just the beginning. Can you imagine tube gear without tube tremors? There will be a \$169 It available in December.

Comment on the Glorious Folly #3: There are enough people in this world who put the creation of the illusion of music in the home at such a high level, that they enthusiastically support the existence of \$12,000 amplifiers. (There is a six-month waiting list.) \$12,000 is a nice Japanese car, a sailboat, the down payment on a small

home, or a trip around the world. I am thankful that we can competently serve these people's need—especially since we share it.

The Black Hole Mod #1: The Mod Squad's Steve McCormack has tweaked the Black Hole water tower so that it is now filled with 10,000 gallons of Cuvee Dom Perignon 1954. This gives the upper octave a little extra dry sparkle. Mike Kaye would also like to extend his personal invitation to everyone in the audience to come to his home, audition this esoteric amplifier, and share a free 12-course dinner. Call him so he can arrange to send the Lyric limo to pick you up. (Offer ends September 1st.)

Wrestling with the perimeters of audio technology is still an art form. NYAL has a unique vision of the musical illusion we would like to create in our customer's living room. What makes the high-end audio community is that different companies have such diverse opinions about this illusion. Why does the pursuit of a musical illusion arouse such passions? According to William James, there would be no passion without illusion!

This fall, NYAL will open a demonstration center in New York City so that music lovers may experience both the Futterman and Moscode electronics in an excessively pleasant environment. Please come and visit.

Thanking you I remain wretchedly and excessively committed to the glorious folly of creating the illusion of music in the home.

**Harvey Rosenberg**  
Elmsford, NY

## The Sound Lab A-3

Editor,

It is truly interesting to see one's product through the eyes of another person. Our commitment at Sound Lab is to manufacture the highest quality product possible and we appreciate the comments of the reviewer since helpful insights are gained. In passing,

we determine sensitivity, etc., using full-spectrum pink noise as a test signal since it minimizes the effects of room reflection modes on measurements. We find that with this method our measurements have been quite repeatable. However, we also realize that specifications don't tell the whole story. Live music is our ultimate standard and we embrace it as the final judgement tool. Thank you for a fine review.

**Roger West**  
Park City, UT

## PS Audio CD-1A

Editor,

Thank you for JGH's review of the PS CD-1A. I would like to address one of the points J. Gordon brought out about our "perfectionist CD player." "Depth and soundstaging are exceptional! Whether because of the somewhat laidback middles or something else, the PS-1 produces greater depth and a wider stage than any CD player I've tried, including the previous champion in this area: the Meridian Pro." says JGH.

While I wouldn't want to change a word

of this statement, I think a little clarification is necessary. The "something else" referred to is the key to our player's performance. There is no mystery here. First, our exclusive Passive Analog Prefilter is responsible, in large part, for the depth and the "somewhat laidback middles." Second, the soundstage extension to which JGH refers is due to the extra transformer we add for the analog amplification section.

We also appreciate that someone in the media paid attention to the CD-1A's low-end response. Most people have no idea how difficult it is to design all the capacitors out of a circuit and make it DC foolproof.

It is refreshing to reap the rewards.

**Paul McGowan**  
San Luis Obispo, CA

## Sony CDP-55

Editor,

Thank you for JGH's comments on the CDP-55 CD player. Normally, Sony refrains from responding to reviews, preferring "to let the chips fall where they may." However, JGH's observations reinforce a fundamental

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Sony policy towards CD player design, which has always been that it is a music configuration that's ideal for a variety of lifestyle applications. The development of car and portable CD players, along with component players that cover the complete price spectrum, have validated this concept.

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As to JGH's comments regarding the original CDP-101, let me point out that, while the '101 did not do everything "right," it was far from the "worst-sounding" CD player ever to have been manufactured" (though it may have been the worst-sounding first-generation player that JGH ever heard). More importantly, it should be remembered that the '101 served as a "yardstick" for the industry as a whole. In point of fact, its original design precepts gave the industry true 16-bit D/A conversion, the three-beam ("spot") laser pickup assembly, and horizontal drawer-loading, accompanied by textbook ergonomics. This player has not only stood the test of time, but remains a model that has been emulated by

more manufacturers than any other competitive first-generation unit.

If only all other "worst-sounding" first-generation players could have fared so well...

**Mark Finer**  
Park Ridge, NJ

### **Monster Interlink CD Cable**

Editor,

I feel that Mr. Cordesman has not properly evaluated the claims made for, or the performance of, Monster's Interlink CD cable in his CD Accessory article (Vol.9 No.3), when he states that Interlink CD makes all but the earliest Sony players "sound notably worse."

Worse compared with what? Compared with an audiophile interconnect like Monster Interlink Reference A, or compared with the standard patch cord that comes with most CD player? If the former, then it depends on the player. In all of our advertisements, we have always compared Interlink CD with conventional cables, not with audiophile cables. Interlink was designed to sell at a certain price point, and while relatively sophisticated, it does not have the complex three-wire network of Interlink Reference A. However, it does use our "Balanced Bandwidth" construction with two precisely-wound networks.

If Mr. Cordesman is talking about the standard, garden-variety, patch cord, I suggest that he relistens. It doesn't take a golden ear to recognize that Interlink CD is in *every* way better than a conventional patch cord.

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We strongly object to the suggestion that Interlink works only with early Sony players. This is not true. There are many players currently in production that sound worse than those first Sonys. Not everyone can afford to buy a Mission, Meridian Pro, or similar fine audiophile machine. In these days of falling CD prices *and* quality, the performance of an inexpensive—or an expensive—player can be upgraded by using Interlink CD.

Mr. Cordesman's put-down of the dealers who sell Interlink CD as "tin-eared" is uncalled for. These dealers are some of the most credible and respected specialist audio retailers in the country. Most only decided to sell Interlink CD *after* listening evaluations with many of the machines they sell. It has been to their pleasure and surprise to find that Interlink CD does work as claim, so they recommend it to their customers in good faith. They wouldn't remain in business long if they didn't.

We realize that the claim that an interconnect cable can make CD players sound better might look like snake-oil. To alleviate the fears of our customers of being ripped off, we have always offered them a money-back, 30-day, full-refund, performance guarantee—printed on the package—from the factory. After selling thousands of pairs of Interlink CD cables (it has been one of our

most successful products), we have had less than ten pairs returned!

We invite readers of *Stereophile* to listen for themselves, and we are confident that they will be more than pleased with the results when compared with *conventional* patch cords. However, we would agree with Mr. Cordesman that with a truly good CD player, use of a good audiophile cable like Interlink Reference A, might be preferable.

Noel Lee  
San Francisco, CA.

## Norberg BCS-16

Editor,

My thanks to Dick Olsher for his review of the Norberg BCS-16 loudspeaker (Vol.9 No.5). The speakers were submitted for review in February 1985—yes *five*—and have undergone several improvements since then. We are now using our own proprietary 6.5" LF driver instead of the Peerless, which has a larger magnet (18 oz rather than 16) and a vented pole-piece. This extends the response to 42Hz (-3dB point). The crossover switch has been replaced by a Full Space/Half Space switch, which compensates for the mid-bass heaviness that usually accompanies placement on a console or shelf. The response is also smoother, due to changes in the crossover and to tighter tweeter quality control. The price is now \$595/pair.

A note on design priorities. The BCS-16 attempts to achieve (albeit imperfectly) the subjective impression of listening to music rather than to machines reproducing music. I agree with JGH ("Down with Flat," Vol. 8 No.4) that flat response alone does not accuracy make. Flat response is actually design

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priority #3, after phase coherence (and time alignment) and linearity. In my opinion, it is these factors that provide true accuracy of soundstage reproduction, approximating the inner detail and impact of live music. The BCS-16 is as flat a speaker as I can make without compromising the first two priorities.

**Robert Norberg**  
Northridge, CA

### MAS 925 III

Editor,

I would like to thank JGH for his positive review of the MAS 925 III loudspeaker (Vol.9 No.3), but his statement that the top end was a "little hot" needs some additional comment.

We agree with JGH; let me explain. The MAS 925 III had undergone one additional modification since we sent our then "latest version" back for re-review, and we were fairly confident that the tweeter level had been dropped sufficiently to balance the full musical spectrum properly. Subsequent listening, however, led us to change our

minds and we added two resistors to the crossover to drop the tweeter level a further 1.5dB. Since this change, we have been completely satisfied with the 925's sonic performance, as have our dealers and customers (to judge from the comments on warranty cards). All speakers shipped since April 1986 have this modification, and speakers sold prior to that date are retrofittable at no charge: contact Music & Sound Imports directly for details.

**Mel Schilling**  
Huntingdon Valley, PA

### The CAL Tempest

Editor,

We would like to thank John Atkinson for his insightful review of our Tempest CD player; it is gratifying to know that he likes it. We have spent two years and hundreds of hours of listening tests, both with ours and with other CD players, to arrive at the sound of which JA speak so highly. It is particularly pleasing to hear JA comment so favorably on the Tempest's ability to recover ambience and a sense of space from digital recordings,



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as this was one of our primary design objectives. We have often felt that these are qualities missing from other players, but which are essential to the proper enjoyment of music. JA also states that "the Tempest gets closer to the spirit of the music." This is high praise; indeed JA states that our Tempest let him forget his critique and get into the music. That is, after all, what hi-fi is all about.

**Art Paymer**  
El Toro, CA

## Ortofon MC-20 Super

Editor,

*Webster's New Collegiate Dictionary* defines "dionysian" as "being of frenzied or unrestrained emotion." It also defines "apollonian" as "harmonious, measured, ordered."

Anthony Cordesman's impressions of the Ortofon MC-20 Super and the van den Hul MC-10 are very much in accord with our own at Ortofon. Many "reference" analog playback systems have been considered

superior to compact discs in their ability to reproduce the emotion of a musical experience. Products like the MC-20 Super and MC-10 prove that analog reproduction can also rival the accuracy of digital technology, providing further argument that, more and more often, the differences we hear are due more to recording and mastering than to the playback process.

**Kevin Byrne**  
Plainview, NY

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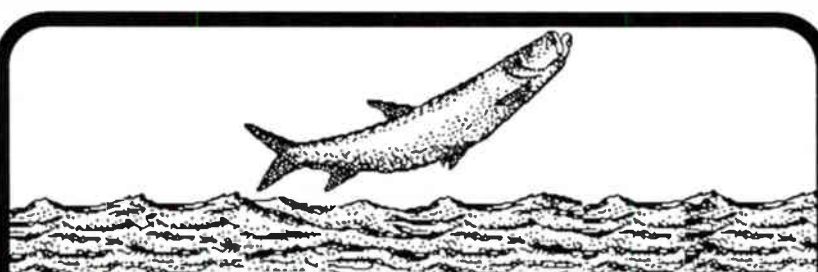
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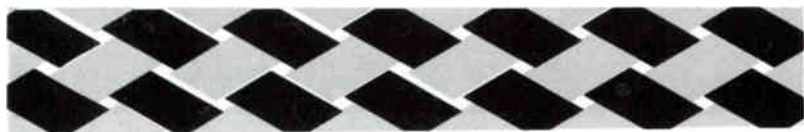
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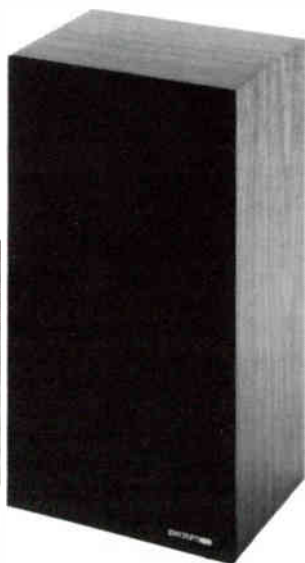
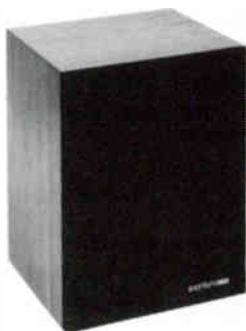
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